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A POPULATION OF LINEAR, SECOND ORDER ELLIPTIC PARTIAL DIFFERENT--ETC(U)

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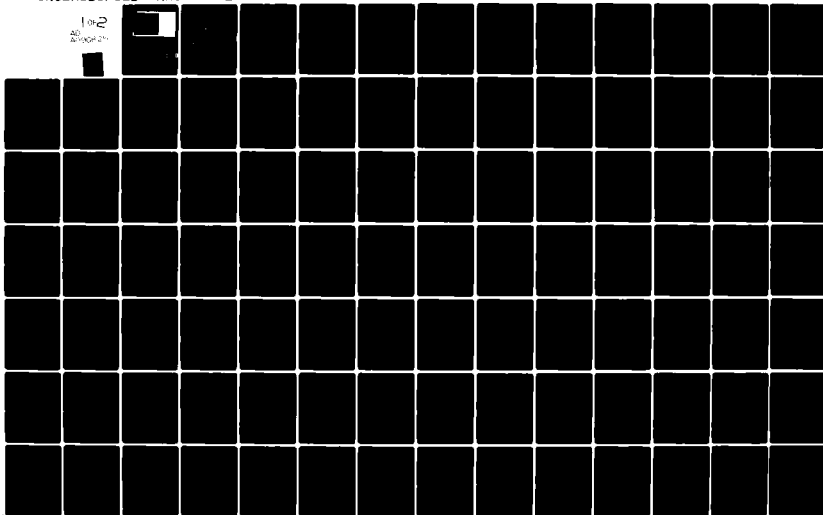
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A POPULATION OF LINEAR, SECOND ORDER,
ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS
ON RECTANGULAR DOMAINS - PART 2

John R. Rice, Elias N. Houstis
and Wayne R. Dyksen

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ON RECTANGULAR DOMAINS - PART 2.

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Technical Summary Report # 2079
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ABSTRACT

This report contains the machine readable form of the 189 partial differential equations presented in MRC Technical Summary Report #2078 "A POPULATION OF LINEAR, SECOND ORDER, ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS ON RECTANGLES - PART 1." These are two large files: EQNFIL contains 189 entries which are either complete statements of a PDE in the ELLPACK language or a reference to an entry in MACFIL with parameter values given. MACFIL contains the 42 parameterized PDE's in a form suitable for automatically substituting in parameter values. A few other small files are given to facilitate using this problem population within the ELLPACK system.

AMS(MOS) Subject Classification: 65N99

Key Words: elliptic partial differential equations, machine readable, population of problems, linear, second order

Work Unit Number 3 - Numerical Analysis and Computer Science

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SIGNIFICANCE AND EXPLANATION

This is machine readable information associated with MRC Technical Summary Report #2078 provided for people who are actually involved in computing with the population of PDE problems. Many of the 189 problems are very complex and the only reliable way to transmit them accurately is in this form.

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A POPULATION OF LINEAR, SECOND ORDER
ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS
ON RECTANGULAR DOMAINS - PART 2

John R. Rice, Elias N. Houstis and Wayne R. Dyksen

1. INTRODUCTION

It is assumed that the reader is familiar with Part 1 of this report, NRC Technical Summary Report #2078. This second part presents the population in machine readable form. There are seven files; the first is a program that takes information from the other files and creates complete ELLPACK program with the PDE problems. The second and third files are quite long and contain the actual descriptions of the PDE problems. The last four files are quite short and have information needed to form complete ELLPACK programs; these are not essential to the populations. Each file has extensive descriptive comments at the beginning.

The file EQNFIL has 189 parts, one for each PDE. Each part corresponding to a problem without parameters is just the ELLPACK statement of the operator, domain and boundary conditions along with associated Fortran functions. Each part corresponding to a parameterized PDE states the values of the parameter; the detailed statement of the PDE is in the third file MACFIL. The entries in MACFIL are ELLPACK statements of the PDE with the points where parameters are to be inserted marked by &A, &B, etc.

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PROGRAM GENPGM (TAPE1,TAPE2,TAPE3,TAPE4,INPUT,OUTPUT,TAPE7,	GENPCM	1
\$ TAPE8,TAPE9,TAPE10,TAPE5=INPUT,TAPE6=OUTPUT)	GENPCM	2
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	GENPCM	3
-----	CCENPCM	4
PROGRAM GENPGM	CCENPCM	5
-----	CCENPCM	6
AUTHOR: RONALD F. BOISUERT	CCENPCM	7
DEPARTMENT OF COMPUTER SCIENCES	CCENPCM	8
PURDUE UNIVERSITY	CCENPCM	9
AUGUST 4, 1978 (REVISED JANUARY 29, 1979)	CCENPCM	10
REVISED: WAYNE R. DYKSEN	CCENPCM	11
DEPARTMENT OF MATHEMATICS	CCENPCM	12
PURDUE UNIVERSITY	CCENPCM	13
NOVEMBER 1, 1979	CCENPCM	14
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	CCENPCM	15
GENERAL DESCRIPTION:	CCENPCM	16
-----	CCENPCM	17
GENPGM GENERATES AN ELLPACK PROGRAM ACCORDING TO THE SPECIFICA-	CCENPCM	18
TIONS GIVEN IN AN ENCODED INPUT STRING. THE RESULTING ELLPACK	CCENPCM	19
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N2 IS THE PARAMETER SET NUMBER (IF ANY)	CCENPCM	26
N3 IS THE OPTIONS SEGMENT NUMBER,	CCENPCM	27
N4 IS EITHER M1 OR M1,M2 OR M1,M2,M3 GIVING EITHER A	CCENPCM	28
GRID NUMBER OR THE SIZE OF A 2 OR 3 DIMENSIONAL	CCENPCM	29
UNIFORM GRID RESPECTIVELY,	CCENPCM	30
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MACFIL
.....

MACFIL CONTAINS THE INFORMATION NEEDED TO FULFILL THE MACRO
CALLS ORIGINATING IN EOPFIL.

MACFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,...
ETC. THE END-OF-RECORD IS DESIGNATED BY EOPR (EOPR ON NON-ERC
INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION
OF MACFIL. RECORDS 1, 2, 3,... CONTAIN THE INFORMATION NEEDED TO
GENERATE THE ELLPACK PROGRAMS CORRESPONDING TO PROBLEMS 1, 2, 3,...
OF THE ELLPACK PRE-POPULATION. ALTHOUGH SOME OF THE PROBLEMS ARE
NOT FULLY SPECIFIED AND HENCE HAVE NO MACRO CALLS, YET, THERE ARE
PUNY RECORDS FOR THESE PROBLEMS ON MACFIL SO THAT THE PROBLEM AND
MACRO NUMBERS MAY BE IN A ONE-TO-ONE CORRESPONDENCE. RECORDS
1, 2, 3,... HAVE THE FOLLOWING FORMATS:

LINE 1-3: LINES 1 THROUGH 3 CONTAIN THE MACRO NUMBER.

LINE 4: LINE 4 CONTAINS THE PROBLEM TYPE INFORMATION STARTING
IN COLUMN 11 WHICH IS USED TO TEST THE COMPATIBILITY OF THE PRO-
BLEM WITH THE ELLPACK ROUTINES SELECTED IN THE ENCODED PROGRAM
(SEE ROUTINE COMPAT). THIS INFORMATION BECOMES A COMMENT IN THE
GENERATED ELLPACK PROGRAM.

REMAINING LINES: THE REMAINING LINES OF THE RECORD CONTAIN
INFORMATION COPIED INTO THE EQUATION, BOUNDARY AND FORTRAN SEG-
MENTS OF THE GENERATED ELLPACK PROGRAM IN THE ABOVE ORDER.
THE EQUATION BOUNDARY AND FORTRAN CARDS ARE MARKED BY 0, 1, 2,
OR 3 IN COLUMN 1 RESPECTIVELY. NOTE THAT FORTRAN CARDS SHOULD
BEGIN IN COLUMN 7 AS USUAL AND THAT A FORTRAN COMMENT CAN BE
WRITTEN BY TYPING A C IN COLUMN 2. FOR PORTABILITY PURPOSES,
THE END-OF-RECORD IS DESIGNATED BY THE PRESENCE OF A '-' (DASH)
IN COLUMN 1.

OPTFIL
.....

OPTFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE
OPTIONS SEGMENT OF THE ELLPACK PROGRAM.

OPTFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,...
ETC. THE END-OF-RECORD IS DESIGNATED BY EOPR (EOPR ON NON-ERC
INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION
OF OPTFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMATS:

LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

LINE 2: LINE 2 MUST CONTAIN THE 8 CHARACTERS OPTING. IN
COLUMNS 1-8, FOLLOWED ON THE SAME LINE BY ALL OF THE OPTIONS
CHARACTERS.

OPTFIL
.....

OPTFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE
OPTS SEGMENT OF THE ELLPACK PROGRAM.

OPTFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,...
ETC. THE END-OF-RECORD IS DESIGNATED BY EOPR (EOPR ON NON-ERC
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RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION
OF OPTFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMATS:

LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

LINE 2: LINE 2 MUST CONTAIN THE 8 CHARACTERS OPTING. IN
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C DIRECTLY INTO THE GRID SEGMENT OF THE GENERATED ELLPACK PROGRAM.
C FOR PORTABILITY PURPOSES, THE END-OF-RECORD IS DETECTED BY THE
C PRESENCE OF A '-' (DASH) IN COLUMN 1.

C CUTFIL

C

C CUTFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE
C OUTPUT SEGMENT OF THE ELLPACK PROGRAM.

C CUTFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,...
C ETC. THE END-OF-RECORD IS DESIGNATED BY *EOR (*EOR ON NON-CDC
C INSTALLATIONS).

C RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION
C OF CUTFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMAT:

C LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

C REMAINING LINES: THE REMAINING LINES OF THE RECORD CONTAIN THE
C OUTPUT SEGMENT EXACTLY AS IT WILL APPEAR IN THE GENERATED ELL-
C PACK PROGRAM. TO SPECIFY AN ELLPACK CONTINUATION LINE, TYPE A
C '-' (DASH) IN COLUMN 2. THE INFORMATION OF THIS RECORD IS COPIED
C EXACTLY INTO THE OUTPUT SEGMENT OF THE GENERATED ELLPACK
C PROGRAM. FOR PORTABILITY PURPOSES, THE END-OF-RECORD IS
C DETECTED BY THE PRESENCE OF A '-' (DASH) IN COLUMN 1.

C HOBATA

C

C HOBATA CONTAINS THE INFORMATION NEEDED TO DECODE ENCODED ELLPACK
C PROGRAMS AND CHECK COMPATIBILITY.

C LINE 1 HAS THE NUMBER OF MODULES (NRMODS) IN I3 FORMAT. NEXT
C FOLLOWS NRMODS PAIRS OF LINES. THE FIRST OF EACH CONTAINS A UNIQUE
C NUMBER IN THE RANGE 1,...,NRMODS IN I3 FORMAT AND AN ELLPACK
C MODULE NAME STARTING IN COLUMN 6. THESE GIVE THE CORRESPONDENCES
C BETWEEN MODULE NUMBERS USED IN ENCODED PROGRAMS AND THE NAMES OF
C OF MODULES TO BE USED IN THE GENERATED ELLPACK PROGRAM. THE SECOND
C LINE OF THE PAIR CONTAINS A LIST OF INTEGERS IN I4,2013 FORMAT
C THE MODULE NUMBERS THAT MAY IMMEDIATELY FOLLOW THIS MODULE IN
C ELLPACK PROGRAMS. AFTER THIS SET OF LINES THERE IS ONE LINE
C CONTAINING A SINGLE INTEGER IN I3 FORMAT GIVING THE NUMBER OF
C DISCRETEIZATION MODULES (NRDIS). THIS IS FOLLOWED BY NRDIS LINES
C EACH CONTAINING A SINGLE NUMBER IN I3 FORMAT AND 15 DIGITS
C OVERFLOW IN COLUMN 3 GIVING MODULE COMPATIBILITY INFORMATION
C (SEE FOLDER COMPAT).

C ***** ALL INPUT FILES MUST BE TERMINATED BY A CARD *****
C ***** COLUMN 5 IN COLUMN ONE. *****

C THE OUTPUT FILES PRODUCED BY GENPACK ARE:

C GENERATED CUTFIL: A SUMMARY OF WORK DONE, MESSAGE,
C ELLPACK, AND GENERATED ELLPACK PROGRAMS. GENERATED BY *EOR
C *EOR. A SUMMARY OF THE PROGRAMS AND CHARACTERISTICS, AND
C A SUMMARY OF THE PROGRAMS ARE SAID HERE FOR LATER
C REFERENCE. THE OUTPUTS INCLUDED WITH THE ENCODED
C PROGRAMS ARE ALSO INCLUDED HERE. SEE FOLDER 2.15.

C FOLDER 2.15: A SUMMARY FOR THESE FILES ARE PROVIDED IN THE
C FOLDER 2.15.

C COMPATIBILITY

C

C THIS FILE CONTAINS NO STANDARD FORTRAN (1955) WHEREVER POSSIBLE.
C A STANDARD FORTRAN IS CALLED HOWEVER. THEY ARE:

C 1. A STANDARD FORTRAN FUNCTION DEFINING DATE IN I3 FORMAT. CALLED

C 2. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 3. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 4. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 5. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 6. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 7. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

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C 14. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

C 15. A STANDARD FORTRAN FUNCTION DEFINING TIME IN I3 FORMAT. CALLED

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OFFERED -- INFORMATION THAT COMES OFF THE TEN DEVEIL CATCH
 ONER -- INFORMATION THAT COMES OFF THE TEN DEVEIL CATCH
 REMARKS -- INFORMATION THAT COMES OFF THE TEN DEVEIL CATCH
 KNOW OF THE FACT THAT COMES OFF THE TEN DEVEIL CATCH
 SKIP -- INFORMATION THAT COMES OFF THE TEN DEVEIL CATCH

THE PROGRAM ON THE MAIN PROGRAM MUST BE REMOVED FOR NON-
 DDC INSTALLATIONS.

SKIPPING FILMS AND RECORDS:

THE METHOD OF OVERVIEWING FILMS AND RECORDS USED IN SEARCH INDEX-
 ING FILMS AND RECORDS IS SKIPPING FILMS AND RECORDS ON FILMS
 EDIT, INDEX, OR FILM, OR FILM AND FILM.

FOR EXAMPLE, IF THE INDEXED PROGRAM WERE TO REQUEST PROBLEM 5-8,
 IT WOULD BE NECESSARY TO SKIP FILMS (PROBLEMS) ON FILM TO FILM 5
 AND THEN, WITHIN FILM 5, SKIP RECORDS (PROBLEMS) TO RECORD
 8. HOWEVER, SINCE PROBLEM 5 CALLS RECORD 8, IT WOULD ALSO BE
 NECESSARY TO SKIP RECORDS (PROBLEMS) ON FILM TO RECORD 8. SIMILAR
 SKIPPING MAY BE DONE ON FILM, OR FILM AND FILM DEPENDING ON
 THE INDEXED PROGRAM.

IN ORDER TO AVOID THE SLOW PROCESS OF SKIPPING THROUGH FILMS
 FILMS LIKE BY LINE TO FIND THE DESIRED FILMS AND/OR RECORDS, WE
 HAVE TAKEN ADVANTAGE OF SOME NON-PERFORMABLE FEATURES IN THE FORMER
 DDC INSTALLATION. THE END-OF-FILE AND END-OF-RECORD MARKERS
 ARE AND ARE RECORDED IN THE FORMER DDC INSTALLATION. WE HAVE
 CIRCUMVENTED THE OLD FILE SYSTEM. WE HAVE THE NEW
 INSTALLATION IS THE NEW DDC INSTALLATION. WE HAVE THE NEW
 WHICH WE HAVE MARKERS TO BE RECORDED IN THE FORMER DDC
 OF FILMS AND/OR RECORDS.

PLANNING THESE MARKERS AND NEW-TO-FILE, NEW-TO-FILE HAVE
 BEEN TAKEN ADVANTAGE OF SOME NON-PERFORMABLE FEATURES IN THE FORMER
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C	CLEN	= ACTUAL LENGTH OF ENCODED INPUT STRING.	GENPCM	301
C	PTR	= CURRENT POSITION IN CODE.	GENPCM	302
C	FILE	= FILE CURRENTLY BEING PROCESSED.	GENPCM	303
C	LINE	= CURRENT CARD FROM FILE FILE. (VECTOR)	GENPCM	304
C	PTYPE	= PROBLEM TYPE, SEE ROUTINE COMPT. (VECTOR)	GENPCM	305
C	PCHAR	= PROBLEM CHARACTERISTICS. (VECTOR)	GENPCM	306
C	...MOD	= ELLPACK MODULE NUMBER, WHERE ... IS EITHER DIS, IND, OR SOL.	GENPCM	307
C	...REC	= RECORD NUMBER IN FILE ...FIL, WHERE ... MAY BE EON,OPT,OUT,GPD.	GENPCM	308
C	ALG...	= POINTER TO START (ALGST) OR TO END (ALCEND) OF THE METHOD SPECIFICATION IN THE INPUT STRING CODE.	GENPCM	309
C	DISPAR	= POINTER TO START OF DISCRETIZATION MODULE PARAMETERS IN THE ENCODED INPUT STRING CODE.	GENPCM	391
C	COMENT	= THE COMMENT IN THE ENCODED INPUT STRING CODE. (VECTOR)	GENPCM	392
C	FATAL	= SWITCH INDICATING WHETHER AN ERROR HAS BEEN DETECTED.	GENPCM	393
C	PROBNO	= PROBLEM NUMBER FROM EONFIL.	GENPCM	394
C	PRPARM	= PROBLEM PARAMETERS FROM EONFIL (VECTOR).	GENPCM	395
C			GENPCM	396
C	GLOBAL VARIABLES		GENPCM	397
C			GLOBAL	1
C			GLOBAL	2
C			GLOBAL	3
C	INTEGER EONFIL, GPDFIL, OPTFIL, OUTFIL, MACFIL, PCNFIL, PARAM, COMMA,		GLOBAL	4
C	\$ SLASH, LPAREN, RPAREN, BLANK, AMP, E, ZERO, ONE, TWO, THREE, SIX,		GLOBAL	5
C	\$ MODNAM, DMTYPE, VALID, LEVEL, DOT, NULL, NRMODS,		GLOBAL	6
C	\$ NUDDOL, STAR, DOLLAR, HEADER, DIGIT, LETTER, MODATA, DASH		GLOBAL	7
C	LOGICAL FATAL		GLOBAL	8
C	COMMON / GLOBAL / EONFIL, GPDFIL, OPTFIL, OUTFIL, MACFIL, PCNFIL,		GLOBAL	9
C	\$ HEADER, COMMA, SLASH, LPAREN, RPAREN, BLANK, AMP, E,		GLOBAL	10
C	\$ DOT, DOLLAR, STAR, NULL, ZERO, ONE, TWO, THREE, SIX,		GLOBAL	11
C	\$ MODATA, DASH,		GLOBAL	12
C	\$ PARAM(10,35), MODNAM(70,10), DMTYPE(70,15),		GLOBAL	13
C	\$ VALID(70,20), IZERO5(15), DIGIT(10), LETTER(10),		GLOBAL	14
C	\$ LEVEL, NRMODS, NUDDOL, FATAL		GLOBAL	15
C			GLOBAL	16
C	DATA CODIM/400/, NRTYPE/15/, CHARC/1MC/		GENPCM	400
C			GENPCM	401
C	READ TABLE OF MODULE INFORMATION		GENPCM	402
C			GENPCM	403
C	READ PAST FILE DOCUMENTATION		GENPCM	404
C			GENPCM	405
C	2 READ(MODATA,2042)CHAR		GENPCM	406
C	IF (CHAR .NE. DASH) GO TO 2		GENPCM	407
C			GENPCM	408
C	READ(MODATA,2033)NRMODS		GENPCM	409
C	IF (LEVEL .GT. 2) WRITE(6,2032) NRMODS		GENPCM	410
C	DO 5 I=1,NRMODS		GENPCM	411
C	READ(MODATA,2030) N, (MODNAM(N,K),K=1,10)		GENPCM	412
C	NP1 = N+1		GENPCM	413
C	READ(MODATA,2035) (VALID(NP1,K),K=1,20)		GENPCM	414
C	IF (LEVEL .LE. 2) GO TO 5		GENPCM	415
C	NONZ = 0		GENPCM	416
C	DO 3 J=1,20		GENPCM	417
C	NONZ = NONZ + 1		GENPCM	418
C	IF (VALID(NP1,NONZ) .LE. 0) GO TO 4		GENPCM	419
C	3 CONTINUE		GENPCM	420
C	4 CONTINUE		GENPCM	421
C	WRITE(6,2035) N, (MODNAM(N,K),K=1,10), (VALID(NP1,K),K=1,NONZ)		GENPCM	422
C	5 CONTINUE		GENPCM	423
C	READ(MODATA,2020) NRDIS		GENPCM	424
C	IF (LEVEL .GT. 2) WRITE(6,2034) NRDIS		GENPCM	425
C	DO 10 I=1,NRDIS		GENPCM	426
C	READ(MODATA,2031) N, (DMTYPE(N,K),K=1,NRTYPE)		GENPCM	427
C	VALID(1,I) = N		GENPCM	428
C	IF (LEVEL .GT. 2) WRITE(6,2035) N, (DMTYPE(N,K),K=1,NRTYPE)		GENPCM	429
C	10 CONTINUE		GENPCM	430
C	VALID(1,NRDIS+1) = 0		GENPCM	431
C			GENPCM	432
C	GET ENCODED PROBLEM		GENPCM	433
C			GENPCM	434
C	FATAL = .FALSE.		GENPCM	435
C	WRITE(6,2001)		GENPCM	436
C	CALL INCODE(CODE, CODIM, CLEN, PTR)		GENPCM	437
C	20 CONTINUE		GENPCM	438
C	IF (CLEN .EQ. 0) GO TO 200		GENPCM	439
C			GENPCM	440
C	GET PROBLEM NUMBER		GENPCM	441

[illegible][illegible]

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CALL COPYRFILE,PSMFIL,BLANK,THREE,LINE,.FALSE.)
GENERATE PORTION SEGMENT
WRITE(PSMFIL,2014)
CONTINUE
40 IF (LINE(1) .EQ. DASH) GO TO 42
   LINE(1) = BLANK
   IF (LINE(2) .EQ. CHARD) LINE(1) = CHARD
   IF (LINE(1) .EQ. CHARD) LINE(2) = BLANK
   WRITE(PSMFIL,2037) (LINE(J),J=1,30)
   CALL SETLINKFILE,LINE
   GO TO 40
42 CONTINUE
PROCESS OPTIONS RECORD
NOTE--- THE PREPROCESSOR LIMITS OPTIONS SEGMENTS TO ONE
        LINE EACH. HENCE WE ASSUME OPTIONS FILE RECORDS
        HAVE THE WORD OPTIONS. AT THE START OF EACH LINE.
OPTREC = NUMBER(CODE,PTR)
IF (OPTREC .EQ. 0) GO TO 43
SKIP RECORDS TO OPTION
        REMIND OPTFIL
        CALL SKIPR(OPTREC,OPTFIL)
VALIDATE OPTION NUMBER
        READ(OPTFIL,2040)NUMOPT
        IF (NUMOPT .NE. OPTREC) CALL ERREND(9,OPTFIL)
        CALL COPYR(OPTFIL,PSMFIL,NULL,DASH,LINE,.TRUE.)
        GO TO 50
USE DEFAULT SEGMENT
CONTINUE
45 WRITE(PSMFIL,2023)
50 CONTINUE
PROCESS GRID SEGMENT
GGRID = NUMBER(CODE,PTR)
IF (CODE(PTR-1) .EQ. SLASH) GO TO 50
UNIFORM GRID SIZE IS GIVEN IN ENCODED PROGRAM
M1 = GGRID
M2 = NUMBER(CODE,PTR)
M3 = 0
IF (CODE(PTR-1) .EQ. COMMA) M2 = NUMBER(CODE,PTR)
PTWPR(4) = ZERO
PTWPR(5) = M1
IF ((M1 .EQ. M2) .AND. ((M1 .EQ. M2) .OR. (M2 .EQ. 0)))
5   PTWPR(6) = M1
   GRC(1) = GRC(2000) M1:M2
   IF (M1 .EQ. 1) WRITE(PSMFIL,2000) M2
   GO TO 70
NON-UNIFORM GRID GIVEN IN FILE GRCFIL
CONTINUE
60 PTWPR(4) = ZERO
   PTWPR(5) = ZERO
SKIP FOR GRC TO GRID
        REMIND GRCFIL
        CALL SKIPR(GGRID-GRCFIL)
VALIDATE GRID NUMBER
        READ(PSMFIL,2010) NGRID
        IF (NGRID .NE. GGRID) CALL ERREND(10,GRCFIL)
        WRITE(PSMFIL,2021)
        CALL COPYR(GRCFIL,PSMFIL,BLANK,DASH,LINE,.TRUE.)

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S	/ 1H., 1H/, 1H(, 1H), 1H, 1H2, 1H3, 1H., 1H*, 1H\$/,	CENPCM	807
S	ZERO, ONE, TWO, THREE, SIX, NULL, DASH	CENPCM	808
S	/ 1H0, 1H1, 1H2, 1H3, 1H3, 1H3, 1H3, 1H-/,	CENPCM	809
S	LEVEL, NUDDOL	CENPCM	810
S	/ 3, 23/,	CENPCM	811
S	DIGIT(1), DIGIT(2), DIGIT(3), DIGIT(4), DIGIT(5), DIGIT(6),	CENPCM	812
S	DIGIT(7), DIGIT(8), DIGIT(9), DIGIT(10)	CENPCM	813
S	/ 1H0, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9/,	CENPCM	814
S	LETTER(1), LETTER(2), LETTER(3), LETTER(4), LETTER(5), LETTER(6),	CENPCM	815
S	LETTER(7), LETTER(8), LETTER(9), LETTER(10)	CENPCM	816
S	/ 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1H0/,	CENPCM	817
C		CENPCM	818
C	END	CENPCM	819
C	SUBROUTINE INCODE (CODE, CODIM, CLEN, PTR)	INCODE	1
C		INCODE	2
C	INCODE READS THE ENCODED ELLPACK PROGRAM FROM IO UNIT 5. THE INPUT	INCODE	3
C	IS ASSUMED TO START ON A NEW CARD AND CARDS ARE READ UNTIL THE	INCODE	4
C	INPUT IS COMPLETE (I.E. 3 SLASHES ARE FOUND). THE VARIABLE CODIM	INCODE	5
C	GIVES THE MAX ALLOWABLE LENGTH OF THE INPUT STRING. BLANKS ARE	INCODE	6
C	SQUEEZED OUT OF THE INPUT AND THE RESULTING STRING IS PLACED IN	INCODE	7
C	THE ARRAY CODE. THE LENGTH OF THE STRING IS THEN CLEN.	INCODE	8
C	PTR IS INITIALIZED TO 1.	INCODE	9
C		INCODE	10
C	INTEGER CODE(400), CODIM, CLEN, PTR	INCODE	11
C		GLOBAL	1
C	GLOBAL VARIABLES	GLOBAL	2
C		GLOBAL	3
C	INTEGER EONFIL, GROFIL, OPTFIL, OUTFIL, MACFIL, PGMFIL, PARAM, COMMA,	GLOBAL	4
S	SLASH, LPAREN, RPAREN, BLANK, AMP, E, ZERO, ONE, TWO, THREE, SIX,	GLOBAL	5
S	MODNAM, DMTYPE, VALID, LEVEL, DOT, NULL, NRMJDS,	GLOBAL	6
S	NUDDOL, STAR, DOLLAR, HEADER, DIGIT, LETTER, MODATA, DASH	GLOBAL	7
C	LOGICAL FATAL	GLOBAL	8
C	COMMON / GLOBAL / EONFIL, GROFIL, OPTFIL, OUTFIL, MACFIL, PGMFIL,	GLOBAL	9
S	HEADER, COMMA, SLASH, LPAREN, RPAREN, BLANK, AMP, E,	GLOBAL	10
S	DOT, DOLLAR, STAR, NULL, ZERO, ONE, TWO, THREE, SIX,	GLOBAL	11
S	MODATA, DASH,	GLOBAL	12
S	PARAM(10, 35), MODNAM(70, 10), DMTYPE(70, 15),	GLOBAL	13
S	VALID(70, 20), IZEROS(15), DIGIT(10), LETTER(10),	GLOBAL	14
S	LEVEL, NRMJDS, NUDDOL, FATAL	GLOBAL	15
C		GLOBAL	16
C	PTR = 1	INCODE	17
C	IDEGIN = 1	INCODE	18
C	IEND = 80	INCODE	19
C	NSLASH = 0	INCODE	20
C	NONBLK = 0	INCODE	21
C	10 CONTINUE	INCODE	22
C	CHECK IF INPUT IS TOO LONG	INCODE	23
C	IF (IEND .GT. CODIM) GO TO 600	INCODE	24
C	READ(5, 1000) (CODE(I), I=IDEGIN, IEND)	INCODE	25
C	IF (CODE(1) .EQ. DOLLAR) GO TO 500	INCODE	26
C	GO TO 20 I=IDEGIN, IEND	INCODE	27
C	IGNORE BLANKS	INCODE	28
C	IF (CODE(I) .EQ. BLANK) GO TO 20	INCODE	29
C	NONBLK = NONBLK+1	INCODE	30
C	CODE(NONBLK) = CODE(I)	INCODE	31
C	COUNT SLASHES	INCODE	32
C	IF (CODE(NONBLK) .EQ. SLASH) NSLASH = NSLASH+1	INCODE	33
C	20 CONTINUE	INCODE	34
C	IDEGIN = NONBLK+1	INCODE	35
C	IEND = IDEGIN+79	INCODE	36
C	CHECK IF INPUT IS COMPLETE	INCODE	37
C	IF (NSLASH .LT. 3) GO TO 10	INCODE	38
C	CLEN = NONBLK	INCODE	39
C	IF (LEVEL .GT. 0) WRITE(5, 2000) (CODE(I), I=1, CLEN)	INCODE	40
C	RETURN	INCODE	41
C		INCODE	42
C	END OF DATA	INCODE	43
C		INCODE	44
C	500 CONTINUE	INCODE	45
C	CLEN = 0	INCODE	46
C	RETURN	INCODE	47
C		INCODE	48
C	ERROR IN INPUT	INCODE	49
C		INCODE	50
C	600 CONTINUE	INCODE	51
C	PARCL = .TRUE.	INCODE	52

S	SLASH,LPAREN,RPAREN,BLANK,AMP,E,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	5
S	NOONM,ONTYPE,UNLD,LEVEL,DOT,NULL,NRNDIS,	GLOBAL	6
S	NRDOL,STAR,DOLLAR,RENDER,DIGIT,LETTER,MODATA,DASH	GLOBAL	7
	LOGICAL NOTAL	GLOBAL	8
	COMMON / GLOBAL : CONFIL,GRFIL,OPTFIL,OUTFIL,MACFIL,PCNFIL,	GLOBAL	9
S	RENDER,CONND,SLASH,LPAREN,RPAREN,BLANK,AMP,E,	GLOBAL	10
S	DOT,DOLLAR,STAR,NULL,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	11
S	MODATA,DASH,	GLOBAL	12
S	PARAM(10,35),NOONM(70,10),ONTYPE(70,15),	GLOBAL	13
S	UNLD(70,20),IERRB(15),DIGIT(10),LETTER(10),	GLOBAL	14
S	LEVEL,NRNDIS,NRNDOL,FATAL	GLOBAL	15
C		GLOBAL	16
C	READ NEXT LINE	GETLN	9
C		GETLN	10
	REND(FILE,1000) (LINE(I),I=1,30)	GETLN	11
	IF (LINE(1) .EQ. DOLLAR) GO TO 900	GETLN	12
	IF (LEVEL .GT. 3) WRITE(6,300) (LINE(I),I=1,30)	GETLN	13
	IF (FILE .NE. MACFIL) GO TO 500	GETLN	14
C		GETLN	15
C	EXPAND MACRO PARAMETERS	GETLN	16
C		GETLN	17
	IN = 1	GETLN	18
	OUT = 0	GETLN	19
10	CONTINUE	GETLN	20
	IF ((IN .GT. 30) .OR. (OUT .GE. 20)) GO TO 100	GETLN	21
C	SCAN FOR AMPERSAND (SIGNALS PARAMETER)	GETLN	22
	IF (LINE(IN) .EQ. AMP) GO TO 50	GETLN	23
	OUT = OUT+1	GETLN	24
	NLINE(OUT) = LINE(IN)	GETLN	25
	IN = IN+1	GETLN	26
	GO TO 10	GETLN	27
C	HAVE A PARAMETER	GETLN	28
50	CONTINUE	GETLN	29
	INP1 = IN+1	GETLN	30
	DO 55 I=1,10	GETLN	31
	NPARAM = I	GETLN	32
	IF (LINE(INP1) .EQ. LETTER(1)) GO TO 53	GETLN	33
55	CONTINUE	GETLN	34
C	UNDEFINED PARAMETER	GETLN	35
	CALL ERREND(6,LINE(INP1))	GETLN	36
53	CONTINUE	GETLN	37
	K = 1	GETLN	38
C	REPLACE DUMMY PARAMETER WITH ACTUAL PARAMETER	GETLN	39
60	CONTINUE	GETLN	40
	IF ((K .GT. 30) .OR. (PARAM(NPARAM,K) .EQ. BLANK))	GETLN	41
S	GO TO 80	GETLN	42
	OUT = OUT+1	GETLN	43
	NLINE(OUT) = PARAM(NPARAM,K)	GETLN	44
	K = K+1	GETLN	45
	GO TO 60	GETLN	46
80	CONTINUE	GETLN	47
	IN = IN+2	GETLN	48
	GO TO 10	GETLN	49
100	CONTINUE	GETLN	50
C		GETLN	51
C	RETURN LINE WITH EXPANDED PARAMETERS	GETLN	52
C		GETLN	53
	DO 120 I=1,30	GETLN	54
	LINE(I) = BLANK	GETLN	55
120	CONTINUE	GETLN	56
	DO 140 I=1,OUT	GETLN	57
	LINE(I) = NLINE(I)	GETLN	58
140	CONTINUE	GETLN	59
	IF (LEVEL .GT. 3) WRITE(6,300) (LINE(I),I=1,30)	GETLN	60
500	CONTINUE	GETLN	61
	RETURN	GETLN	62
C		GETLN	63
C	ERROR EXIT	GETLN	64
C		GETLN	65
	300 CONTINUE	GETLN	66
	CALL ERREND(6,FILE)	GETLN	67
	RETURN	GETLN	68
C		GETLN	69
	1000 RETURN(3001)	GETLN	70
	2000 RETURN(1,LINE,3001)	GETLN	71
	3001 RETURN(1,PARAM(1),LINE,3001)	GETLN	72

C	END	GETLN	72
C	SUBROUTINE EXPAND (LINE,FILE)	GETLN	74
C		EXPAND	1
C	EXPAND PERFORMS THE INITIALIZATIONS REQUIRED FOR THE PROCESSING	EXPAND	2
C	OF A MACRO. IN PARTICULAR, THE MACRO NUMBER IS FOUND IN THE	EXPAND	3
C	MACRO LINE AND THE MACRO FILE IS POSITIONED AT THE FIRST LINE OF	EXPAND	4
C	THIS RECORD. ALSO, FILE IS CHANGED TO MACFIL SO THAT FUTURE CALLS	EXPAND	5
C	TO GETLN WILL DO MACRO PARAMETER EXPANSIONS. FINALLY, THE ACTUAL	EXPAND	6
C	PARAMETERS FOUND IN LINE ARE PLACED IN THE PARAMETER TABLE.	EXPAND	7
C		EXPAND	8
C	INTEGER LINE(00),FILE,LPTR	EXPAND	9
C		EXPAND	10
C	GLOBAL VARIABLES	CLOCAL	1
C		CLOCAL	2
C		CLOCAL	3
C	INTEGER EDNFIL,GRDFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,PARAM,COMMA,	CLOCAL	4
S	SLASH,LPAREN,RPAREN,BLANK,AMP,E,ZERO,ONE,TWO,THREE,SIX,	CLOCAL	5
S	NONAME,DNTYPE,VALID,LEVEL,DOT,NULL,NAMEDS,	CLOCAL	6
S	MUDDOL,STAR,DOLLAR,HEADER,DIGIT,LETTER,MODATA,DASH	CLOCAL	7
S	LOCAL FATAL	CLOCAL	8
S	COMMON / CLOCAL / EDNFIL,GRDFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,	CLOCAL	9
S	HEADER,COMMA,SLASH,LPAREN,RPAREN,BLANK,AMP,E,	CLOCAL	10
S	DOT,DOLLAR,STAR,NULL,ZERO,ONE,TWO,THREE,SIX,	CLOCAL	11
S	MODATA,DASH,	CLOCAL	12
S	PARAM(10,35),NONAME(70,10),DNTYPE(70,15),	CLOCAL	13
S	VALID(70,30),ZEROS(15),DIGIT(10),LETTER(10),	CLOCAL	14
S	LEVEL,NAMEDS,MUDDOL,FATAL	CLOCAL	15
C		CLOCAL	16
C	PICK UP MACRO NUMBER	EXPAND	17
C		EXPAND	18
C	LPTR = 8	EXPAND	19
C	MACNO = NUMBER(LINE,LPTR)	EXPAND	20
C	IF (LEVEL.GT. 1) WRITE(6,3000) MACNO	EXPAND	21
C		EXPAND	22
C	ASSEMBLE TABLE OF ACTUAL PARAMETERS	EXPAND	23
C		EXPAND	24
C	FIRST BLANK OUT THE PARAMETER TABLE	EXPAND	25
C	DO 5 I=1,10	EXPAND	26
C	DO 5 J=1,30	EXPAND	27
C	PARAM(I,J) = BLANK	EXPAND	28
C	5 CONTINUE	EXPAND	29
C	NCH = 0	EXPAND	30
C	NPARAM = 1	EXPAND	31
C	10 CONTINUE	EXPAND	32
C	CHECK FOR END OF LAST PARAMETER	EXPAND	33
C	IF (LINE(LPTR).EQ. SLASH) GO TO 50	EXPAND	34
C	CHECK FOR END OF CURRENT PARAMETER	EXPAND	35
C	IF (LINE(LPTR).EQ. COMMA) GO TO 40	EXPAND	36
C	NCH = NCH+1	EXPAND	37
C	PARAM(NPARAM,NCH) = LINE(LPTR)	EXPAND	38
C	LPTR = LPTR+1	EXPAND	39
C	GO TO 10	EXPAND	40
C	40 CONTINUE	EXPAND	41
C	NPARAM = NPARAM+1	EXPAND	42
C	NCH = 0	EXPAND	43
C	LPTR = LPTR+1	EXPAND	44
C	GO TO 10	EXPAND	45
C	50 CONTINUE	EXPAND	46
C	IF (LEVEL.GT. 1) WRITE(6,3001) NPARAM,((PARAM(I,J),	EXPAND	47
C	S J=1,30),I=1,NPARAM)	EXPAND	48
C		EXPAND	49
C	SKIP RECORDS TO MACRO	EXPAND	50
C		EXPAND	51
C	FILE=MACFIL	EXPAND	52
C	OPEN MACFIL	EXPAND	53
C	CALL SKIP(MACNO,MACFIL)	EXPAND	54
C		EXPAND	55
C	VALIDATE MACRO NUMBER	EXPAND	56
C		EXPAND	57
C	READ(MACFIL,3002)NCHCHK	EXPAND	58
C	IF (MACNO.NE. NCHCHK) CALL ERREND(3,FILE)	EXPAND	59
C		EXPAND	60
C	READ FIRST LINE OF MACRO	EXPAND	61
C		EXPAND	62
C	CALL GETLN(FILE,LINE)	EXPAND	63
C	RETURN	EXPAND	64

C	EXPAND	60
0000 FORMAT(7X,17H EXPANDING MACRO ,15)	EXPAND	61
0001 FORMAT(7X,22H NUMBER OF PARAMETERS=,12,5X,9HTHEY ARE/	EXPAND	62
5 (12X,30,11)	EXPAND	63
0002 FORMAT(4T,13/)	EXPAND	64
C	EXPAND	65
END	EXPAND	66
SUBROUTINE COPYRC (IFILE,OFIL,PUTC,ENDC,LINE,NEEDLN)	COPYRC	1
C	COPYRC	2
C COPYRC MOVES CARDS FROM FILE IFILE TO FILE OFIL UNTIL THE	COPYRC	3
C CHARACTER ENDC IS FOUND IN COLUMN 1. ON OUTPUT THE COLUMN 1	COPYRC	4
C CHARACTER IS REPLACED BY THE CHARACTER PUTC. IF NEEDLN IS	COPYRC	5
C FALSE THE FIRST LINE TO BE COPIED ALREADY RESIDES IN THE	COPYRC	6
C ARRAY LINE.	COPYRC	7
C	COPYRC	8
INTEGER IFILE,OFIL,LINE(80),PUTC,ENDC	COPYRC	9
LOGICAL NEEDLN	COPYRC	10
C	GLOBAL	1
C GLOBAL VARIABLES	GLOBAL	2
C	GLOBAL	3
INTEGER EONFIL,GRFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,PARAM,COMMA,	GLOBAL	4
S SLASH,LPAREN,RPAREN,BLANK,AMP,E,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	5
S MODNAM,DNTYPE,VALID,LEVEL,DOT,NULL,NRMODES,	GLOBAL	6
S NUVCOL,STAR,DOLLAR,HEADER,DIGIT,LETTER,MODATA,DASH	GLOBAL	7
LOGICAL FATAL	GLOBAL	8
COMMON / GLOBAL / EONFIL,GRFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,	GLOBAL	9
S HEADER,COMMA,SLASH,LPAREN,RPAREN,BLANK,AMP,E,	GLOBAL	10
S DOT,DOLLAR,STAR,NULL,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	11
S MODATA,DASH,	GLOBAL	12
S PARAM(10,35),MODNAM(70,10),DNTYPE(70,15),	GLOBAL	13
S VALID(70,20),IZERDS(15),DIGIT(10),LETTER(10),	GLOBAL	14
S LEVEL,NRMODES,NUVCOL,FATAL	GLOBAL	15
C	GLOBAL	16
IF (NEEDLN) CALL GETLN(IFIL,LINE)	COPYRC	12
10 CONTINUE	COPYRC	13
IF (LINE(1) .EQ. ENDC) GO TO 30	COPYRC	14
IF (PUTC .NE. NULL) LINE(1) = PUTC	COPYRC	15
IF (LINE(2) .NE. DOT) GO TO 20	COPYRC	16
LINE(1) = DOT	COPYRC	17
LINE(2) = BLANK	COPYRC	18
20 CONTINUE	COPYRC	19
WRITE(OFIL,1000) (LINE(I),I=1,80)	COPYRC	20
CALL GETLN(IFIL,LINE)	COPYRC	21
GO TO 10	COPYRC	22
30 CONTINUE	COPYRC	23
RETURN	COPYRC	24
C	COPYRC	25
1000 FORMAT(30A1)	COPYRC	26
C	COPYRC	27
END	COPYRC	28
SUBROUTINE WRTMOD (MODULE,CODE,CLEN,PTR)	WRTMOD	1
C	WRTMOD	2
C WRTMOD GENERATES A MODULE SEGMENT (DIS, INDEX OR SOL) WHICH INVOKES	WRTMOD	3
C MODULE NUMBER MODULE. THE ENCODED BELLPACK PROGRAM CODE IS CHECKED	WRTMOD	4
C FOR THE PRESENCE OF MODULE PARAMETERS WHICH ARE ALSO WRITTEN OUT.	WRTMOD	5
C	WRTMOD	6
INTEGER MODULE,CODE(CLEN),PTR,CLEN,PSTART,PSTOP	WRTMOD	7
C	GLOBAL	1
C GLOBAL VARIABLES	GLOBAL	2
C	GLOBAL	3
INTEGER EONFIL,GRFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,PARAM,COMMA,	GLOBAL	4
S SLASH,LPAREN,RPAREN,BLANK,AMP,E,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	5
S MODNAM,DNTYPE,VALID,LEVEL,DOT,NULL,NRMODES,	GLOBAL	6
S NUVCOL,STAR,DOLLAR,HEADER,DIGIT,LETTER,MODATA,DASH	GLOBAL	7
LOGICAL FATAL	GLOBAL	8
COMMON / GLOBAL / EONFIL,GRFIL,OPTFIL,OUTFIL,MACFIL,PGMFIL,	GLOBAL	9
S HEADER,COMMA,SLASH,LPAREN,RPAREN,BLANK,AMP,E,	GLOBAL	10
S DOT,DOLLAR,STAR,NULL,ZERO,ONE,TWO,THREE,SIX,	GLOBAL	11
S MODATA,DASH,	GLOBAL	12
S PARAM(10,35),MODNAM(70,10),DNTYPE(70,15),	GLOBAL	13
S VALID(70,20),IZERDS(15),DIGIT(10),LETTER(10),	GLOBAL	14
S LEVEL,NRMODES,NUVCOL,FATAL	GLOBAL	15
C	GLOBAL	16
WRITE OUT MODULE NAME	WRTMOD	9
C	WRTMOD	10
WRITE(PTR,2000) (MODNAM(MODULE,K),K=1,10)	WRTMOD	11

```

C CHECK FOR MODULE PARAMETERS
C
C   PSTART = PTR-1
C   IF (CODE(PSTART) .NE. CODE(1)) GO TO 100
C
C   PARAMETERS ARE PRESENT
C
C   FIRST FIND SLASH
C   DO 10 I=PTR+1,10
C     PSTOP = I
C     IF (CODE(I) .EQ. SLASH) GO TO 20
C 10 CONTINUE
C   PARAMETERS ARE NOW IN CODE(PSTART+1) TO CODE(PSTOP-1)
C 20 CONTINUE
C   PSTART = PSTOP+1
C   PSTOP = PSTOP-1
C   IF (PSTART.GE. PSTOP) GO TO 100
C   WRITE(PUNCH,201) 'LARGE',CODE(I),I=PSTART,PSTOP),NPARAM
C   PTR = PSTOP+2
C
C 100 CONTINUE
C   RETURN
C
C 2000 FORMAT(1H,'LARG',10X,10A1)
C 2001 FORMAT(1H,'LARG',20X,5A1)
C
C END
C SUBROUTINE COMPAT(PTYPE,DIMMOD,NRTYPE,NK,NV,NZ,DISPAR,CODE,CLEN)
C
C COMPAT USES THE PROBLEM TYPE INFO (PTYPE) AND DISCRETIZATION MODULE
C INFO (DNTYPE) TO DETERMINE WHETHER MODULE DIMMOD IS COMPATIBLE
C WITH THE GIVEN PDE PROBLEM. THE NRTYPE (FROM 15) ITEMS ON THE ARRAY
C PTYPE AND IN EACH ROW OF THE TABLE DNTYPE HAVE THE FOLLOWING
C MEANINGS --
C
C      VALUE          PTYPE MEANING          DNTYPE MEANING
C      -----
C      0              ITEM NOT PRESENT        ITEM MUST NOT BE PRESENT
C      1              ALWAYS MATCHED          ALWAYS MATCHES
C      2              ITEM PRESENT            ITEM MUST BE PRESENT
C
C THE 14 ITEMS CURRENTLY CHECKED FOR COMPATIBILITY ARE
C
C   CONCERNING THE OPERATOR
C   1 TWO-DIMENSIONAL
C   2 THREE-DIMENSIONAL
C   3 PARABOLIC EQUATION
C   4 ELLIPTIC EQUATION
C   5 HYPERBOLIC EQUATION
C   6 POINTWISE DIFFERENTIALS
C   7 STIFF-MATRIX FORM
C   8 NONDIFFERENTIAL
C   9 UNCLASSIFIED
C
C   CONCERNING THE BOUNDARY CONDITIONS
C   10 DIRICHLET ONLY
C   11 MIXED DIRICHLET AND NEUMANN CONDITIONS
C   12 DIRICHLET AND NEUMANN
C   13 PERMEABILITY
C
C   CONCERNING THE GRID
C   14 UNSTRUCTURED
C   15 STRUCTURED
C
C OTHER CHECKS THAT DO NOT APPLY TO
C
C 1. FOR ALL CASES, THE PROBLEM DIMENSION AND THE GRID
C   DIMENSION MUST MATCH UP. (DIMMOD=2, DIM=3 OR 4).
C 2. FOR THE UNSTRUCTURED GRID, THE PROBLEM MODULE WE CHECK FOR
C   A. THE PROBLEM DIMENSION MUST BE GREATER THAN OR EQUAL TO THE
C   B. THE PROBLEM DIMENSION MUST BE GREATER THAN OR EQUAL TO THE
C   C. THE PROBLEM DIMENSION MUST BE GREATER THAN OR EQUAL TO THE

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00000000	12
00000001	10
00000002	14
00000003	6
00000004	16
00000005	17
00000006	18
00000007	10
00000008	14
00000009	11
0000000A	12
0000000B	10
0000000C	16
0000000D	15
0000000E	12
0000000F	10
00000010	14
00000011	17
00000012	13
00000013	12
00000014	14
00000015	16
00000016	10
00000017	11
00000018	13
00000019	12
0000001A	14
0000001B	16
0000001C	10
0000001D	11
0000001E	13
0000001F	14
00000020	16
00000021	10
00000022	11
00000023	13
00000024	12
00000025	14
00000026	16
00000027	10
00000028	11
00000029	13
0000002A	12
0000002B	14
0000002C	16
0000002D	10
0000002E	11
0000002F	13
00000030	12
00000031	14
00000032	16
00000033	10
00000034	11
00000035	13
00000036	12
00000037	14
00000038	16
00000039	10
0000003A	11
0000003B	13
0000003C	12
0000003D	14
0000003E	16
0000003F	10
00000040	11
00000041	13
00000042	12
00000043	14
00000044	16
00000045	10
00000046	11
00000047	13
00000048	12
00000049	14
0000004A	16
0000004B	10
0000004C	11
0000004D	13
0000004E	12
0000004F	14
00000050	16
00000051	10
00000052	11
00000053	13
00000054	12
00000055	14
00000056	16
00000057	10
00000058	11
00000059	13
0000005A	12
0000005B	14
0000005C	16
0000005D	10
0000005E	11
0000005F	13
00000060	12
00000061	14
00000062	16
00000063	10
00000064	11
00000065	13
00000066	12
00000067	14
00000068	16
00000069	10
0000006A	11
0000006B	13
0000006C	12
0000006D	14
0000006E	16
0000006F	10
00000070	11
00000071	13
00000072	12
00000073	14
00000074	16
00000075	10
00000076	11
00000077	13
00000078	12
00000079	14
0000007A	16
0000007B	10
0000007C	11
0000007D	13
0000007E	12
0000007F	14
00000080	16
00000081	10
00000082	11
00000083	13
00000084	12
00000085	14
00000086	16
00000087	10
00000088	11
00000089	13
0000008A	12
0000008B	14
0000008C	16
0000008D	10
0000008E	11
0000008F	13
00000090	12
00000091	14
00000092	16
00000093	10
00000094	11
00000095	13
00000096	12
00000097	14
00000098	16
00000099	10
0000009A	11
0000009B	13
0000009C	12
0000009D	14
0000009E	16
0000009F	10
000000A0	11
000000A1	13
000000A2	12
000000A3</	

C	GLOBAL VARIABLES	GLOBAL	2
C	NUMBER, COMMA, PERCENT, COLON, QUOTE, UNDERSCORE, POUND, AMP, E,	GLOBAL	3
C	ONE, TWO, THREE, SIX, SEVEN, EIGHT, NINE, TEN, ELEVEN, TWELVE,	GLOBAL	4
C	THIRTEEN, FOURTEEN, FIFTEEN, SIXTEEN, SEVENTEEN, EIGHTEEN,	GLOBAL	5
C	NINETEEN, TWENTY, TWENTYONE, TWENTYTWO, TWENTYTHREE,	GLOBAL	6
C	FOURTYFOUR, FORTYFIVE, FORTYSIX, FORTYSEVEN, FORTYEIGHT,	GLOBAL	7
C	FOURTYNINE, FIFTY, FIFTYONE, FIFTYTWO, FIFTYTHREE,	GLOBAL	8
C	FIFTYFOUR, FIFTYFIVE, FIFTYSIX, FIFTYSEVEN, FIFTYEIGHT,	GLOBAL	9
C	FIFTYNINE, SIXTY, SIXTYONE, SIXTYTWO, SIXTYTHREE,	GLOBAL	10
C	SIXTYFOUR, SIXTYFIVE, SIXTYSIX, SIXTYSEVEN, SIXTYEIGHT,	GLOBAL	11
C	SIXTYNINE, SEVENTY, SEVENTYONE, SEVENTYTWO, SEVENTYTHREE,	GLOBAL	12
C	SEVENTYFOUR, SEVENTYFIVE, SEVENTYSIX, SEVENTYSEVEN,	GLOBAL	13
C	SEVENTYNINE, EIGHTY, EIGHTYONE, EIGHTYTWO, EIGHTYTHREE,	GLOBAL	14
C	EIGHTYFOUR, EIGHTYFIVE, EIGHTYSIX, EIGHTYSEVEN,	GLOBAL	15
C	EIGHTYNINE, NINETY, NINETYONE, NINETYTWO, NINETYTHREE,	GLOBAL	16
C	NINETYFOUR, NINETYFIVE, NINETYSIX, NINETYSEVEN,	GLOBAL	17
C	ONEHUNDRED, ONEHUNDREDONE, ONEHUNDREDTWO, ONEHUNDREDTHREE,	GLOBAL	18
C	ONEHUNDREDFOUR, ONEHUNDREDFIVE, ONEHUNDREDSIX, ONEHUNDREDSIXTY,	GLOBAL	19
C	ONEHUNDREDSIXTYONE, ONEHUNDREDSIXTYTWO, ONEHUNDREDSIXTYTHREE,	GLOBAL	20
C	ONEHUNDREDSIXTYFOUR, ONEHUNDREDSIXTYFIVE, ONEHUNDREDSIXTYSIX,	GLOBAL	21
C	ONEHUNDREDSIXTYSEVEN, ONEHUNDREDSIXTYEIGHT, ONEHUNDREDSIXTYNINE,	GLOBAL	22
C	TWOHUNDRED, TWOHUNDREDONE, TWOHUNDREDTWO, TWOHUNDREDTHREE,	GLOBAL	23
C	TWOHUNDRETFOUR, TWOHUNDREDFIVE, TWOHUNDREDSIX, TWOHUNDREDSIXTY,	GLOBAL	24
C	TWOHUNDREDSIXTYONE, TWOHUNDREDSIXTYTWO, TWOHUNDREDSIXTYTHREE,	GLOBAL	25
C	TWOHUNDREDSIXTYFOUR, TWOHUNDREDSIXTYFIVE, TWOHUNDREDSIXTYSIX,	GLOBAL	26
C	TWOHUNDREDSIXTYSEVEN, TWOHUNDREDSIXTYEIGHT, TWOHUNDREDSIXTYNINE,	GLOBAL	27
C	THREEHUNDRED, THREEHUNDREDONE, THREEHUNDREDTWO, THREEHUNDREDTHREE,	GLOBAL	28
C	THREEHUNDRETFOUR, THREEHUNDREDFIVE, THREEHUNDREDSIX, THREEHUNDREDSIXTY,	GLOBAL	29
C	THREEHUNDREDSIXTYONE, THREEHUNDREDSIXTYTWO, THREEHUNDREDSIXTYTHREE,	GLOBAL	30
C	THREEHUNDREDSIXTYFOUR, THREEHUNDREDSIXTYFIVE, THREEHUNDREDSIXTYSIX,	GLOBAL	31
C	THREEHUNDREDSIXTYSEVEN, THREEHUNDREDSIXTYEIGHT, THREEHUNDREDSIXTYNINE,	GLOBAL	32
C	FOURHUNDRED, FOURHUNDREDONE, FOURHUNDREDTWO, FOURHUNDREDTHREE,	GLOBAL	33
C	FOURHUNDRETFOUR, FOURHUNDREDFIVE, FOURHUNDREDSIX, FOURHUNDREDSIXTY,	GLOBAL	34
C	FOURHUNDREDSIXTYONE, FOURHUNDREDSIXTYTWO, FOURHUNDREDSIXTYTHREE,	GLOBAL	35
C	FOURHUNDREDSIXTYFOUR, FOURHUNDREDSIXTYFIVE, FOURHUNDREDSIXTYSIX,	GLOBAL	36
C	FOURHUNDREDSIXTYSEVEN, FOURHUNDREDSIXTYEIGHT, FOURHUNDREDSIXTYNINE,	GLOBAL	37
C	FIVEHUNDRED, FIVEHUNDREDONE, FIVEHUNDREDTWO, FIVEHUNDREDTHREE,	GLOBAL	38
C	FIVEHUNDRETFOUR, FIVEHUNDREDFIVE, FIVEHUNDREDSIX, FIVEHUNDREDSIXTY,	GLOBAL	39
C	FIVEHUNDREDSIXTYONE, FIVEHUNDREDSIXTYTWO, FIVEHUNDREDSIXTYTHREE,	GLOBAL	40
C	FIVEHUNDREDSIXTYFOUR, FIVEHUNDREDSIXTYFIVE, FIVEHUNDREDSIXTYSIX,	GLOBAL	41
C	FIVEHUNDREDSIXTYSEVEN, FIVEHUNDREDSIXTYEIGHT, FIVEHUNDREDSIXTYNINE,	GLOBAL	42
C	SIXHUNDRED, SIXHUNDREDONE, SIXHUNDREDTWO, SIXHUNDREDTHREE,	GLOBAL	43
C	SIXHUNDRETFOUR, SIXHUNDREDFIVE, SIXHUNDREDSIX, SIXHUNDREDSIXTY,	GLOBAL	44
C	SIXHUNDREDSIXTYONE, SIXHUNDREDSIXTYTWO, SIXHUNDREDSIXTYTHREE,	GLOBAL	45
C	SIXHUNDREDSIXTYFOUR, SIXHUNDREDSIXTYFIVE, SIXHUNDREDSIXTYSIX,	GLOBAL	46
C	SIXHUNDREDSIXTYSEVEN, SIXHUNDREDSIXTYEIGHT, SIXHUNDREDSIXTYNINE,	GLOBAL	47
C	SEVENHUNDRED, SEVENHUNDREDONE, SEVENHUNDREDTWO, SEVENHUNDREDTHREE,	GLOBAL	48
C	SEVENHUNDRETFOUR, SEVENHUNDREDFIVE, SEVENHUNDREDSIX, SEVENHUNDREDSIXTY,	GLOBAL	49
C	SEVENHUNDREDSIXTYONE, SEVENHUNDREDSIXTYTWO, SEVENHUNDREDSIXTYTHREE,	GLOBAL	50
C	SEVENHUNDREDSIXTYFOUR, SEVENHUNDREDSIXTYFIVE, SEVENHUNDREDSIXTYSIX,	GLOBAL	51
C	SEVENHUNDREDSIXTYSEVEN, SEVENHUNDREDSIXTYEIGHT, SEVENHUNDREDSIXTYNINE,	GLOBAL	52
C	EIGHTHUNDRED, EIGHTHUNDREDONE, EIGHTHUNDREDTWO, EIGHTHUNDREDTHREE,	GLOBAL	53
C	EIGHTHUNDRETFOUR, EIGHTHUNDREDFIVE, EIGHTHUNDREDSIX, EIGHTHUNDREDSIXTY,	GLOBAL	54
C	EIGHTHUNDREDSIXTYONE, EIGHTHUNDREDSIXTYTWO, EIGHTHUNDREDSIXTYTHREE,	GLOBAL	55
C	EIGHTHUNDREDSIXTYFOUR, EIGHTHUNDREDSIXTYFIVE, EIGHTHUNDREDSIXTYSIX,	GLOBAL	56
C	EIGHTHUNDREDSIXTYSEVEN, EIGHTHUNDREDSIXTYEIGHT, EIGHTHUNDREDSIXTYNINE,	GLOBAL	57
C	NINEHUNDRED, NINEHUNDREDONE, NINEHUNDREDTWO, NINEHUNDREDTHREE,	GLOBAL	58
C	NINEHUNDRETFOUR, NINEHUNDREDFIVE, NINEHUNDREDSIX, NINEHUNDREDSIXTY,	GLOBAL	59
C	NINEHUNDREDSIXTYONE, NINEHUNDREDSIXTYTWO, NINEHUNDREDSIXTYTHREE,	GLOBAL	60
C	NINEHUNDREDSIXTYFOUR, NINEHUNDREDSIXTYFIVE, NINEHUNDREDSIXTYSIX,	GLOBAL	61
C	NINEHUNDREDSIXTYSEVEN, NINEHUNDREDSIXTYEIGHT, NINEHUNDREDSIXTYNINE,	GLOBAL	62
C	ONE THOUSAND, ONE THOUSAND ONE, ONE THOUSAND TWO, ONE THOUSAND THREE,	GLOBAL	63
C	ONE THOUSAND FOUR, ONE THOUSAND FIVE, ONE THOUSAND SIX, ONE THOUSAND SEVEN,	GLOBAL	64
C	ONE THOUSAND EIGHT, ONE THOUSAND NINE, ONE THOUSAND TEN, ONE THOUSAND ELEVEN,	GLOBAL	65
C	ONE THOUSAND TWELVE, ONE THOUSAND THIRTEEN, ONE THOUSAND FOURTEEN,	GLOBAL	66
C	ONE THOUSAND FIFTEEN, ONE THOUSAND SIXTEEN, ONE THOUSAND SEVENTEEN,	GLOBAL	67
C	ONE THOUSAND EIGHTEEN, ONE THOUSAND NINETEEN, ONE THOUSAND TWENTY,	GLOBAL	68
C	ONE THOUSAND TWENTYONE, ONE THOUSAND TWENTYTWO, ONE THOUSAND TWENTYTHREE,	GLOBAL	69
C	ONE THOUSAND TWENTYFOUR, ONE THOUSAND TWENTYFIVE, ONE THOUSAND TWENTYSIX,	GLOBAL	70
C	ONE THOUSAND TWENTYSEVEN, ONE THOUSAND TWENTYEIGHT, ONE THOUSAND TWENTYNINE,	GLOBAL	71
C	TWO THOUSAND, TWO THOUSAND ONE, TWO THOUSAND TWO, TWO THOUSAND THREE,	GLOBAL	72
C	TWO THOUSAND FOUR, TWO THOUSAND FIVE, TWO THOUSAND SIX, TWO THOUSAND SEVEN,	GLOBAL	73
C	TWO THOUSAND EIGHT, TWO THOUSAND NINE, TWO THOUSAND TEN, TWO THOUSAND ELEVEN,	GLOBAL	74
C	TWO THOUSAND TWELVE, TWO THOUSAND THIRTEEN, TWO THOUSAND FOURTEEN,	GLOBAL	75
C	TWO THOUSAND FIFTEEN, TWO THOUSAND SIXTEEN, TWO THOUSAND SEVENTEEN,	GLOBAL	76
C	TWO THOUSAND EIGHTEEN, TWO THOUSAND NINETEEN, TWO THOUSAND TWENTY,	GLOBAL	77
C	TWO THOUSAND TWENTYONE, TWO THOUSAND TWENTYTWO, TWO THOUSAND TWENTYTHREE,	GLOBAL	78
C	TWO THOUSAND TWENTYFOUR, TWO THOUSAND TWENTYFIVE, TWO THOUSAND TWENTYSIX,	GLOBAL	79
C	TWO THOUSAND TWENTYSEVEN, TWO THOUSAND TWENTYEIGHT, TWO THOUSAND TWENTYNINE,	GLOBAL	80
C	THREE THOUSAND, THREE THOUSAND ONE, THREE THOUSAND TWO, THREE THOUSAND THREE,	GLOBAL	81
C	THREE THOUSAND FOUR, THREE THOUSAND FIVE, THREE THOUSAND SIX, THREE THOUSAND SEVEN,	GLOBAL	82
C	THREE THOUSAND EIGHT, THREE THOUSAND NINE, THREE THOUSAND TEN, THREE THOUSAND ELEVEN,	GLOBAL	83
C	THREE THOUSAND TWELVE, THREE THOUSAND THIRTEEN, THREE THOUSAND FOURTEEN,	GLOBAL	84
C	THREE THOUSAND FIFTEEN, THREE THOUSAND SIXTEEN, THREE THOUSAND SEVENTEEN,	GLOBAL	85
C	THREE THOUSAND EIGHTEEN, THREE THOUSAND NINETEEN, THREE THOUSAND TWENTY,	GLOBAL	86
C	THREE THOUSAND TWENTYONE, THREE THOUSAND TWENTYTWO, THREE THOUSAND TWENTYTHREE,	GLOBAL	87
C	THREE THOUSAND TWENTYFOUR, THREE THOUSAND TWENTYFIVE, THREE THOUSAND TWENTYSIX,	GLOBAL	88
C	THREE THOUSAND TWENTYSEVEN, THREE THOUSAND TWENTYEIGHT, THREE THOUSAND TWENTYNINE,	GLOBAL	89
C	FOUR THOUSAND, FOUR THOUSAND ONE, FOUR THOUSAND TWO, FOUR THOUSAND THREE,	GLOBAL	90
C	FOUR THOUSAND FOUR, FOUR THOUSAND FIVE, FOUR THOUSAND SIX, FOUR THOUSAND SEVEN,	GLOBAL	91
C	FOUR THOUSAND EIGHT, FOUR THOUSAND NINE, FOUR THOUSAND TEN, FOUR THOUSAND ELEVEN,	GLOBAL	92
C	FOUR THOUSAND TWELVE, FOUR THOUSAND THIRTEEN, FOUR THOUSAND FOURTEEN,	GLOBAL	93
C	FOUR THOUSAND FIFTEEN, FOUR THOUSAND SIXTEEN, FOUR THOUSAND SEVENTEEN,	GLOBAL	94
C	FOUR THOUSAND EIGHTEEN, FOUR THOUSAND NINETEEN, FOUR THOUSAND TWENTY,	GLOBAL	95
C	FOUR THOUSAND TWENTYONE, FOUR THOUSAND TWENTYTWO, FOUR THOUSAND TWENTYTHREE,	GLOBAL	96
C	FOUR THOUSAND TWENTYFOUR, FOUR THOUSAND TWENTYFIVE, FOUR THOUSAND TWENTYSIX,	GLOBAL	97
C	FOUR THOUSAND TWENTYSEVEN, FOUR THOUSAND TWENTYEIGHT, FOUR THOUSAND TWENTYNINE,	GLOBAL	98
C	FIVE THOUSAND, FIVE THOUSAND ONE, FIVE THOUSAND TWO, FIVE THOUSAND THREE,	GLOBAL	99
C	FIVE THOUSAND FOUR, FIVE THOUSAND FIVE, FIVE THOUSAND SIX, FIVE THOUSAND SEVEN,	GLOBAL	100
C	FIVE THOUSAND EIGHT, FIVE THOUSAND NINE, FIVE THOUSAND TEN, FIVE THOUSAND ELEVEN,	GLOBAL	101
C	FIVE THOUSAND TWELVE, FIVE THOUSAND THIRTEEN, FIVE THOUSAND FOURTEEN,	GLOBAL	102
C	FIVE THOUSAND FIFTEEN, FIVE THOUSAND SIXTEEN, FIVE THOUSAND SEVENTEEN,	GLOBAL	103
C	FIVE THOUSAND EIGHTEEN, FIVE THOUSAND NINETEEN, FIVE THOUSAND TWENTY,	GLOBAL	104
C	FIVE THOUSAND TWENTYONE, FIVE THOUSAND TWENTYTWO, FIVE THOUSAND TWENTYTHREE,	GLOBAL	105
C	FIVE THOUSAND TWENTYFOUR, FIVE THOUSAND TWENTYFIVE, FIVE THOUSAND TWENTYSIX,	GLOBAL	106
C	FIVE THOUSAND TWENTYSEVEN, FIVE THOUSAND TWENTYEIGHT, FIVE THOUSAND TWENTYNINE,	GLOBAL	107
C	SIX THOUSAND, SIX THOUSAND ONE, SIX THOUSAND TWO, SIX THOUSAND THREE,	GLOBAL	108
C	SIX THOUSAND FOUR, SIX THOUSAND FIVE, SIX THOUSAND SIX, SIX THOUSAND SEVEN,	GLOBAL	109
C	SIX THOUSAND EIGHT, SIX THOUSAND NINE, SIX THOUSAND TEN, SIX THOUSAND ELEVEN,	GLOBAL	110
C	SIX THOUSAND TWELVE, SIX THOUSAND THIRTEEN, SIX THOUSAND FOURTEEN,	GLOBAL	111
C	SIX THOUSAND FIFTEEN, SIX THOUSAND SIXTEEN, SIX THOUSAND SEVENTEEN,	GLOBAL	112
C	SIX THOUSAND EIGHTEEN, SIX THOUSAND NINETEEN, SIX THOUSAND TWENTY,	GLOBAL	113
C	SIX THOUSAND TWENTYONE, SIX THOUSAND TWENTYTWO, SIX THOUSAND TWENTYTHREE,	GLOBAL	114
C	SIX THOUSAND TWENTYFOUR, SIX THOUSAND TWENTYFIVE, SIX THOUSAND TWENTYSIX,	GLOBAL	115
C	SIX THOUSAND TWENTYSEVEN, SIX THOUSAND TWENTYEIGHT, SIX THOUSAND TWENTYNINE,	GLOBAL	116
C	SEVEN THOUSAND, SEVEN THOUSAND ONE, SEVEN THOUSAND TWO, SEVEN THOUSAND THREE,	GLOBAL	117
C	SEVEN THOUSAND FOUR, SEVEN THOUSAND FIVE, SEVEN THOUSAND SIX, SEVEN THOUSAND SEVEN,	GLOBAL	118
C	SEVEN THOUSAND EIGHT, SEVEN THOUSAND NINE, SEVEN THOUSAND TEN, SEVEN THOUSAND ELEVEN,	GLOBAL	119
C	SEVEN THOUSAND TWELVE, SEVEN THOUSAND THIRTEEN, SEVEN THOUSAND FOURTEEN,	GLOBAL	120
C	SEVEN THOUSAND FIFTEEN, SEVEN THOUSAND SIXTEEN, SEVEN THOUSAND SEVENTEEN,	GLOBAL	121
C	SEVEN THOUSAND EIGHTEEN, SEVEN THOUSAND NINETEEN, SEVEN THOUSAND TWENTY,	GLOBAL	122
C	SEVEN THOUSAND TWENTYONE, SEVEN THOUSAND TWENTYTWO, SEVEN THOUSAND TWENTYTHREE,	GLOBAL	123
C	SEVEN THOUSAND TWENTYFOUR, SEVEN THOUSAND TWENTYFIVE, SEVEN THOUSAND TWENTYSIX,	GLOBAL	124
C	SEVEN THOUSAND TWENTYSEVEN, SEVEN THOUSAND TWENTYEIGHT, SEVEN THOUSAND TWENTYNINE,	GLOBAL	125
C	EIGHT THOUSAND, EIGHT THOUSAND ONE, EIGHT THOUSAND TWO, EIGHT THOUSAND THREE,	GLOBAL	126
C	EIGHT THOUSAND FOUR, EIGHT THOUSAND FIVE, EIGHT THOUSAND SIX, EIGHT THOUSAND SEVEN,	GLOBAL	127
C	EIGHT THOUSAND EIGHT, EIGHT THOUSAND NINE, EIGHT THOUSAND TEN, EIGHT THOUSAND ELEVEN,	GLOBAL	128
C	EIGHT THOUSAND TWELVE, EIGHT THOUSAND THIRTEEN, EIGHT THOUSAND FOURTEEN,	GLOBAL	129
C	EIGHT THOUSAND FIFTEEN, EIGHT THOUSAND SIXTEEN, EIGHT THOUSAND SEVENTEEN,	GLOBAL	130
C	EIGHT THOUSAND EIGHTEEN, EIGHT THOUSAND NINETEEN, EIGHT THOUSAND TWENTY,	GLOBAL	131
C	EIGHT THOUSAND TWENTYONE, EIGHT THOUSAND TWENTYTWO, EIGHT THOUSAND TWENTYTHREE,	GLOBAL	132
C	EIGHT THOUSAND TWENTYFOUR, EIGHT THOUSAND TWENTYFIVE, EIGHT THOUSAND TWENTYSIX,	GLOBAL	133
C	EIGHT THOUSAND TWENTYSEVEN, EIGHT THOUSAND TWENTYEIGHT, EIGHT THOUSAND TWENTYNINE,	GLOBAL	134
C	NINE THOUSAND, NINE THOUSAND ONE, NINE THOUSAND TWO, NINE THOUSAND THREE,	GLOBAL	135
C	NINE THOUSAND FOUR, NINE THOUSAND FIVE, NINE THOUSAND SIX, NINE THOUSAND SEVEN,	GLOBAL	136
C	NINE THOUSAND EIGHT, NINE THOUSAND NINE, NINE THOUSAND TEN, NINE THOUSAND ELEVEN,	GLOBAL	137
C	NINE THOUSAND TWELVE, NINE THOUSAND THIRTEEN, NINE THOUSAND FOURTEEN,	GLOBAL	138
C	NINE THOUSAND FIFTEEN, NINE THOUSAND SIXTEEN, NINE THOUSAND SEVENTEEN,	GLOBAL	139
C	NINE THOUSAND EIGHTEEN, NINE THOUSAND NINETEEN, NINE THOUSAND TWENTY,	GLOBAL	140
C	NINE THOUSAND TWENTYONE, NINE THOUSAND TWENTYTWO, NINE THOUSAND TWENTYTHREE,	GLOBAL	141
C	NINE THOUSAND TWENTYFOUR, NINE THOUSAND TWENTYFIVE, NINE THOUSAND TWENTYSIX,	GLOBAL	142
C	NINE THOUSAND TWENTYSEVEN, NINE THOUSAND TWENTYEIGHT, NINE THOUSAND TWENTYNINE,	GLOBAL	143
C	TEN THOUSAND, TEN THOUSAND ONE, TEN THOUSAND TWO, TEN THOUSAND THREE,	GLOBAL	144
C	TEN THOUSAND FOUR, TEN THOUSAND FIVE, TEN THOUSAND SIX, TEN THOUSAND SEVEN,	GLOBAL	145
C	TEN THOUSAND EIGHT, TEN THOUSAND NINE, TEN THOUSAND TEN, TEN THOUSAND ELEVEN,	GLOBAL	146
C	TEN THOUSAND TWELVE, TEN THOUSAND THIRTEEN, TEN THOUSAND FOURTEEN,	GLOBAL	147
C	TEN THOUSAND FIFTEEN, TEN THOUSAND SIXTEEN, TEN THOUSAND SEVENTEEN,	GLOBAL	148
C	TEN THOUSAND EIGHTEEN, TEN THOUSAND NINETEEN, TEN THOUSAND TWENTY,	GLOBAL	149
C	TEN THOUSAND TWENTYONE, TEN THOUSAND TWENTYTWO, TEN THOUSAND TWENTYTHREE,	GLOBAL	150
C	TEN THOUSAND TWENTYFOUR, TEN THOUSAND TWENTYFIVE, TEN THOUSAND TWENTYSIX,	GLOBAL	151
C	TEN THOUSAND TWENTYSEVEN, TEN THOUSAND TWENTYEIGHT, TEN THOUSAND TWENTYNINE,	GLOBAL	152
C	ELEVEN THOUSAND, ELEVEN THOUSAND ONE, ELEVEN THOUSAND TWO, ELEVEN THOUSAND THREE,	GLOBAL	153
C	ELEVEN THOUSAND FOUR, ELEVEN THOUSAND FIVE, ELEVEN THOUSAND SIX, ELEVEN THOUSAND SEVEN,	GLOBAL	154
C	ELEVEN THOUSAND EIGHT, ELEVEN THOUSAND NINE, ELEVEN THOUSAND TEN, ELEVEN THOUSAND ELEVEN,	GLOBAL	155
C	ELEVEN THOUSAND TWELVE, ELEVEN THOUSAND THIRTEEN, ELEVEN THOUSAND FOURTEEN,	GLOBAL	156
C	ELEVEN THOUSAND FIFTEEN, ELEVEN THOUSAND SIXTEEN, ELEVEN THOUSAND SEVENTEEN,	GLOBAL	157
C	ELEVEN THOUSAND EIGHTEEN, ELEVEN THOUSAND NINETEEN, ELEVEN THOUSAND TWENTY,	GLOBAL	158
C	ELEVEN THOUSAND TWENTYONE, ELEVEN THOUSAND TWENTYTWO, ELEVEN THOUSAND TWENTYTHREE,	GLOBAL	159
C	ELEVEN THOUSAND TWENTYFOUR, ELEVEN THOUSAND TWENTYFIVE, ELEVEN THOUSAND TWENTYSIX,	GLOBAL	160
C	ELEVEN THOUSAND TWENTYSEVEN, ELEVEN THOUSAND TWENTYEIGHT, ELEVEN THOUSAND TWENTYNINE,	GLOBAL	161
C	TWELVE THOUSAND, TWELVE THOUSAND ONE, TWELVE THOUSAND TWO, TWELVE THOUSAND THREE,	GLOBAL	162
C	TWELVE THOUSAND FOUR, TWELVE THOUSAND FIVE, TWELVE THOUSAND SIX, TWELVE THOUSAND SEVEN,	GLOBAL	163
C	TWELVE THOUSAND EIGHT, TWELVE THOUSAND NINE, TWELVE THOUSAND TEN, TWELVE THOUSAND ELEVEN,	GLOBAL	164
C	TWELVE THOUSAND TWELVE, TWELVE THOUSAND THIRTEEN, TWELVE THOUSAND FOURTEEN,	GLOBAL	165
C	TWELVE THOUSAND FIFTEEN, TWELVE THOUSAND SIXTEEN, TWELVE THOUSAND SEVENTEEN,	GLOBAL	166
C	TWELVE THOUSAND EIGHTEEN, TWELVE THOUSAND NINETEEN, TWELVE THOUSAND TWENTY,	GLOBAL	167
C	TWELVE THOUSAND TWENTYONE, TWELVE THOUSAND TWENTYTWO, TWELVE THOUSAND TWENTYTHREE,	GLOBAL	168
C	TWELVE THOUSAND TWENTYFOUR, TWELVE THOUSAND TWENTYFIVE, TWELVE THOUSAND TWENTYSIX,	GLOBAL	169
C	TWELVE THOUSAND TWENTYSEVEN, TWELVE THOUSAND TWENTYEIGHT, TWELVE THOUSAND TWENTYNINE,	GLOBAL	170

WRITE(6,2130)	ERREND	55
STOP	ERREND	57
C	ERREND	58
2000 FORMAT(//IX,44H***** FATAL ERROR PREVENTS ELLPACK PROGRAM ,	ERREND	59
5 10HGENERATION)	ERREND	60
2020 FORMAT(8X,10HCHARACTER ,A1,23H APPEARS IN ENCODED PROGRAM ,	ERREND	61
5 24HWHERE DIGIT IS EXPECTED)	ERREND	62
2030 FORMAT(8X,35HUNEXPECTED END ENCOUNTERED ON FILE ,I3)	ERREND	63
2040 FORMAT(8X,10HCHARACTER ,A1,23H APPEARS IN PROBLEM TYPE FIE,	ERREND	64
5 43HLD OF PROBLEM RECORD WHERE ONLY 0,1,2 ARE LEGAL)	ERREND	65
2050 FORMAT(8X,42HINVALID PROBLEM NUMBER SPECIFIED FOR FILE ,I3)	ERREND	66
2060 FORMAT(8X,25HINVALID PARAMETER NAME = ,A1)	ERREND	67
2070 FORMAT(8X,48HINVALID PARAMETER SET NUMBER SPECIFIED FOR FILE ,I3)	ERREND	68
2080 FORMAT(8X,40HINVALID MACRO NUMBER SPECIFIED FOR FILE ,I3)	ERREND	69
2090 FORMAT(8X,42HINVALID OPTIONS NUMBER SPECIFIED FOR FILE ,I3)	ERREND	70
2100 FORMAT(8X,39HINVALID GRID NUMBER SPECIFIED FOR FILE ,I3)	ERREND	71
2110 FORMAT(8X,49HINVALID OUTPUT SEGMENT NUMBER SPECIFIED FOR FILE ,I3)	ERREND	72
2120 FORMAT(8X,41HINVALID RECORD NUMBER SPECIFIED FOR FILE ,I3)	ERREND	73
2130 FORMAT(8X,48HNO PROBLEM NUMBERED SPECIFIED IN ENCODED PROGRAM)	ERREND	74
C	ERREND	75
END	ERREND	76
*PREFIX,\$	SKIP	1
IDENT SKIP	SKIP	2
*	SKIP	3
* AUTHOR: JOHN F. BROPHY	SKIP	4
* DEPARTMENT OF MATHEMATICS	SKIP	5
* PURDUE UNIVERSITY	SKIP	6
* NOVEMBER 1, 1979	SKIP	7
*	SKIP	8
* THIS CDC ASSEMBLY LANGUAGE (COMPASS) ROUTINE PROVIDES FOR	SKIP	9
* AUTOMATIC SKIPPING OF FILES AND RECORDS. THE CALLING SEQUENCES	SKIP	10
* ARE GIVEN BY:	SKIP	11
*	SKIP	12
* CALL SKIPF(NSKIPS,FILE), OR SKIPR(NSKIPS,FILE)	SKIP	13
*	SKIP	14
* WHERE NSKIPS IS THE NUMBER OF FILES OR RECORDS RESPECTIVELY	SKIP	15
* TO BE SKIPPED IN FILE. SEE THE DISCUSSION OF SKIPPING FILES	SKIP	16
* AND RECORDS IN THE COMMENTS IN GENPGM.	SKIP	17
*	SKIP	18
ENTRY SKIPR,SKIPF	SKIP	19
PS	SKIP	20
SB2 -B2	SKIP	21
RJ =XGETBA	SKIP	22
SA1 B1	SKIP	23
ZR X1,PDR	SKIP	24
SKIPF X2,X1,R	SKIP	25
RDR READ X2,R	SKIP	26
EO SKIPR	SKIP	27
SKIPF PS	SKIP	28
SB2 -B2	SKIP	29
RJ =XGETBA	SKIP	30
SA1 B1	SKIP	31
ZR X1,PDF	SKIP	32
SKIPFF X2,X1,R	SKIP	33
PDF READ X2,R	SKIP	34
EO SKIPF	SKIP	35
END	SKIP	36
*	SKIP	37
* THE FOLLOWING FORTRAN ROUTINES ARE PROVIDED AS SUBSTITUTES	SKIP	38
* FOR THE COMPASS ROUTINE SKIP FOR INSTALLATIONS WHERE AUTOMATIC	SKIP	39
* FILE AND RECORD SKIPPING CANNOT BE IMPLEMENTED.	SKIP	40
*	SKIP	41
* SUBROUTINE SKIPF(NSKIPS,FILE)	SKIP	42
*C	SKIP	43
*C THIS ROUTINE SKIPS NSKIPS FILES IN FILE BY SCANNING FOR THE	SKIP	44
*C END-OF-FILE MARKER 'EOF' IN A4 FORMAT STARTING IN COLUMN 1.	SKIP	45
*C	SKIP	46
*C INTEGER FILE,EOF,EOFCHEK	SKIP	47
*C DATA EOF/4H'EOF/	SKIP	48
*C NSKIPED=0	SKIP	49
*C	SKIP	50
*100 READ(FILE,300)EOFCHEK	SKIP	51
*C	SKIP	52
* IF (EOFCHEK .EQ. 4H\$) CALL ERREND(5,FILE)	SKIP	53
* IF (EOFCHEK .NE. EOF) GO TO 100	SKIP	54
* NSKIPED=NSKIPED+1	SKIP	55

* IF (NSKIPED .LT. NSKIPS) GO TO 100	SKIP	56
* RETURN	SKIP	57
*C	SKIP	58
*300 FORMAT(A4)	SKIP	59
*C	SKIP	60
* END	SKIP	61
* SUBROUTINE SKIPR(NSKIPS,FILE)	SKIP	62
*C	SKIP	63
*C THIS ROUTINE SKIPS NSKIPS RECORDS IN FILE BY SCANNING FOR THE	SKIP	64
*C END-OF-RECORD MARKER 'EOR IN A4 FORMAT STARTING IN COLUMN 1.	SKIP	65
*C	SKIP	66
*C INTEGER FILE,EOR,EORCHEK,EOF,EQNFIL	SKIP	67
*C DATA EOR,EOF,EQNFIL/4H'EOR, 4H'EOF,1/	SKIP	68
*C	SKIP	69
* NSKIPED=0	SKIP	70
* NNSKIPS=NSKIPS	SKIP	71
* IF (FILE .EQ. EQNFIL) NNSKIPS=NNSKIPS+1	SKIP	72
*C	SKIP	73
*100 READ(FILE,300)EORCHEK	SKIP	74
*C	SKIP	75
* IF (EORCHEK .EQ. 4H\$) CALL ERREND(12,FILE)	SKIP	76
* IF (EORCHEK .EQ. EOF) CALL ERREND(12,FILE)	SKIP	77
* IF (EORCHEK .NE. EOR) GO TO 100	SKIP	78
* NSKIPED=NSKIPED+1	SKIP	79
* IF (NSKIPED .LT. NNSKIPS) GO TO 100	SKIP	80
* RETURN	SKIP	81
*C	SKIP	82
*300 FORMAT(A4)	SKIP	83
*C	SKIP	84
* END	SKIP	85

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*  - - - - - P D E   P O P U L A T I O N   E Q U A T I O N   - - - - -
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*
*  F I L E
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*  - - - - -
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EQNFIL

EQNFIL CONTAINS THE INFORMATION NEEDED TO GENERATE THE EQUATION, BOUNDARY AND FORTRAN SEGMENTS OF AN ELLPACK PROGRAM.

EQNFIL IS DIVIDED UP INTO (SUB) FILES WHICH ARE IN TURN DIVIDED UP INTO RECORDS. THE FILES ARE NUMBERED 0, 1, 2,...ETC. AND THE RECORDS WITHIN EACH FILE ARE SIMILARLY NUMBERED 0, 1, 2,...ETC. THE END-OF-FILE AND END-OF-RECORD ARE DESIGNATED BY #EOF AND #EOR RESPECTIVELY ('EOF AND 'EOR RESPECTIVELY ON NON-CDC INSTALLATIONS).

FILE 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION OF EQNFIL. FILES 1, 2, 3,... CONTAIN THE INFORMATION NEEDED TO GENERATE THE ELLPACK PROGRAM CORRESPONDING TO PROBLEMS 1, 2, 3,... RESPECTIVELY OF THE ELLPACK PDE POPULATION. AS MENTIONED ABOVE, THE FILES ARE DIVIDED INTO RECORDS WHICH HAVE THE FOLLOWING FORMAT:

RECORD 0 CONTAINS THE ELLPACK PDE POPULATION PROBLEM NUMBER. RECORDS 1, 2,... MAY TAKE ONE OF THE FOLLOWING FORMATS:

ALTERNATIVE 1:

LINE 1: LINE 1 IS EITHER BLANK OR CONTAINS DESCRIPTIVE INFORMATION SOME OF WHICH BECOMES A COMMENT IN THE GENERATED ELLPACK PROGRAM. IF NON-BLANK, LINE 1 CONTAINS THE PARAMETER SET NUMBER IN I3 FORMAT STARTING IN COLUMN 16, FOLLOWED BY THE PARAMETERS OF THE PROBLEM IN FREE FORMAT STARTING IN COLUMN 19.

LINE 2: LINE 2 CONTAINS THE COMPLEXITY MEASURES OF VARIOUS PROBLEM FEATURES IN FREE FORMAT STARTING IN COLUMN 11. THIS INFORMATION BECOMES A COMMENT IN THE GENERATED ELLPACK PROGRAM.

LINE 3: LINE 3 CONTAINS THE PROBLEM TYPE INFORMATION STARTING IN COLUMN 11 WHICH IS USED TO TEST THE COMPATIBILITY OF THE PROBLEM WITH THE ELLPACK ROUTINES SELECTED IN THE ENCODED PROGRAM (SEE ROUTINE COMPAT). THIS INFORMATION BECOMES A COMMENT IN THE GENERATED ELLPACK PROGRAM.

COMPAT USES THE PROBLEM TYPE INFO (PTYPE) AND DISCRETIZATION MODULE INFO (DMTYPE) TO DETERMINE WHETHER MODULE DISMOD IS COMPATIBLE WITH THE GIVEN PDE PROBLEM. THE NRTYPE (NOW 15) ITEMS IN THE ARRAY PTYPE AND IN EACH ROW OF THE TABLE DMTYPE HAVE THE FOLLOWING MEANINGS:

VALUE	PTYPE MEANING	DMTYPE MEANING
0	ITEM NOT PRESENT	ITEM MUST NOT BE PRESENT
1	ALWAYS MATCHES	ALWAYS MATCHES
2	ITEM PRESENT	ITEM MUST BE PRESENT

THE 14 ITEMS CURRENTLY CHECKED FOR COMPATIBILITY ARE:

- CONCERNING THE OPERATOR
- 1 TWO DIMENSIONAL
 - 2 THREE DIMENSIONAL
 - 3 POISSON EQUATION
 - 4 LAPLACE EQUATION
 - 5 UX OR UY TERMS
 - 6 CONSTANT COEFFICIENTS
 - 7 SELF-ADJOINT FORM
 - 8 HOMOGENEOUS

9 UXY TERM

CONCERNING THE BOUNDARY CONDITIONS

- 10 DIRICHLET PROBLEM
- 11 SOME NORMAL DERIVATIVE CONDITIONS
- 12 SOME MIXED CONDITIONS
- 13 HOMOGENEOUS

CONCERNING THE GRID

- 14 HX=HY(=HZ)
- 15 UNIFORM GRID

REMAINING LINES: THE REMAINING LINES OF THE RECORD CONTAIN INFORMATION COPIED INTO THE EQUATION, BOUNDARY AND FORTRAN SEGMENTS OF THE GENERATED ELLPACK PROGRAM IN THE ABOVE ORDER. THE EQUATION, BOUNDARY AND FORTRAN CARDS ARE MARKED BY A 1, 2, OR 3 IN COLUMN 1 RESPECTIVELY. NOTE THAT FORTRAN CODE SHOULD BEGIN IN COLUMN 7 AS USUAL AND THAT A FORTRAN COMMENT CAN BE WRITTEN BY TYPING A C IN COLUMN 2. FOR PORTABILITY PURPOSES, THE END-OF-RECORD IS DETECTED BY THE PRESENCE OF A '-' (DASH) IN COLUMN 1.

ALTERNATIVE 2:

LINE 1: LINE 1 CONTAINS THE PARAMETER SET NUMBER IN I3 FORMAT STARTING IN COLUMN 16, FOLLOWED BY THE PARAMETERS OF THE PROBLEM IN FREE FORMAT STARTING IN COLUMN 19.

LINE 2: LINE 2 CONTAINS THE COMPLEXITY MEASURES OF VARIOUS PROBLEM FEATURES IN FREE FORMAT STARTING IN COLUMN 11. THIS INFORMATION BECOMES A COMMENT IN THE GENERATED ELLPACK PROGRAM.

LINE 3: LINE 3 IS OF THE FORM EXPAND N/N1,N2,...,NK/ STARTING IN COLUMN 1. THIS SPECIFIES THAT MACRO N (THE NTH RECORD IN MACFIL) SHOULD BE EXPANDED WITH ACTUAL PARAMETERS N1,N2,...,NK REPLACING THE DUMMIES &A,&B,&C,...ETC. THE PARAMETERS MAY CONTAIN ANY CHARACTERS EXCEPT A BLANK, COMMA OR SLASH AND MAY BE NO LONGER THAN 30 CHARACTERS.

RELATED FILES: GENPGM, MACFIL, OPTFIL, GRDFIL, OUTFIL AND MODATA

```

*EOR
*EOF
*****
* PROBLEM 1 *
*****
*EOR
*PARAMETER SET 1(A=0.0)
*      000.04      006.05      000.00      006.05
*      2000002002002
1      TWO DIMENSIONS $ SELF-ADJOINT
1      EXP(X*Y)UXXS + EXP(-X*Y)UYYS - 1./(1.+X+Y)US = F(X,Y)
2      DIRICHLET $ HOMOGENEOUS
2      X=0. , U=0.
2      X=1. , U=0.
2      Y=0. , U=0.
2      Y=1. , U=0.
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI
3      DATA PI/3.14159265353979/
3      PX = PI*X
3      PY = PI*Y
3      SPX = SIN(PX)
3      SPY = SIN(PY)
3      EXY = EXP(X*Y)
3      F = .75*(EXY*EXY*SPY**2.*Y*Y-PI*PI)*SPX*3.*PI*Y*COG(PX)
3      $ + PI*SPX*(COS(PY)-PI*SPY)-EXY*SPY*SPY/(1.+X*Y))
3      RETURN
3      END
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI
3      TRUE = .75*EXP(X*Y)*SIN(PI*X)*SIN(PI*Y)
3      RETURN

```

```

3      END
3      FUNCTION CDXU(X,Y)
3      CDXU = Y*EXP(X*Y)
3      RETURN
3      END
3      FUNCTION CDYU(X,Y)
3      CDYU = -X*EXP(-X*Y)
3      RETURN
3      END
--
*EOR
*PARAMETER SET 2(A=0.1)
*      000.04      006.05      000.00      006.05
EXPAND 1/0.1/
*EOR
*PARAMETER SET 3(A=1.0)
*      000.04      006.05      000.00      006.05
EXPAND 1/1.0/
*EOR
*PARAMETER SET 4(A=10.)
*      000.04      006.05      000.00      006.05
EXPAND 1/10./
-----
*EOR
*EOF
*****
* PROBLEM 2 *
*****
*EOR
*
*      000.04      000.00      004.05      010.02
*      2000200000020
1      TWO DIMENSIONS
1      UXX$ + (1.+Y*Y)UYY$ - UX$ - (1.+Y*Y)UY$ = F(X,Y)
2      MIXED
2      X=0. , MIXED = (1.)U + (1.)UX = 0.27*EXP(Y)
2      X=1. , MIXED = (1.)U + (-1.)UX = 0.
2      Y=0. , MIXED = (1.)U + (1.)UY = 0.27*EXP(X)
2      Y=1. , MIXED = (1.)U + (-1.)UY = 0.135*(ALOG(2.)-1.)*(X*X-X)**2
3      FUNCTION TRUE(X,Y)
3      TRUE = 0.135*(EXP(X+Y)+(X*X-X)**2*ALOG(1.+Y*Y))
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      F = 0.135*((-4.*X*X*X+18.*X*X-14.*X+2.)*ALOG(1.+Y*Y)
3      $ - 2.*((X*X-X)**2)*(Y*Y+Y**3+Y-1.)/(1.+Y*Y))
3      RETURN
3      END
-----
*EOR
*EOF
*****
* PROBLEM 3 *
*****
*EOR
*PARAMETER SET 1(A=1.5)
*      000.43      030.60      000.00      070.40
EXPAND 3/1.5/
*EOR
*PARAMETER SET 2(A=2.5)
*      000.35      030.50      000.00      060.20
EXPAND 3/2.5/
*EOR
*PARAMETER SET 3(A=3.5)
*      000.28      070.30      000.00      050.15
EXPAND 3/3.5/
*EOR
*PARAMETER SET 4(A=4.5)
*      000.23      055.20      000.00      040.20
EXPAND 3/4.5/
-----
*EOR
*EOF
*****
* PROBLEM 4 *
*****

```

```

*EOR
*PARAMETER SET 1(A=0.0)
* 000.02 004.00 000.00 006.00
* 2020021002002
1 TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1 UXX$ + UYY$ = 6.*X*Y*EXP(X+Y)*(X*Y+X+Y-3.)
2 DIRICHLET $ HOMOGENEOUS
2 X=0. , U=0.
2 X=1. , U=0.
2 Y=0. , U=0.
2 Y=1. , U=0.
3 FUNCTION TRUE(X,Y)
3 TRUE = 3.*EXP(X+Y)*X*Y*(1.-X)*(1.-Y)
3 RETURN
3 END

```

```

*EOR
*PARAMETER SET 2(A=0.1)
* 000.02 004.00 000.00 006.00
EXPAND 4/0.1/
*EOR
*PARAMETER SET 3(A=1.0)
* 000.02 004.00 000.00 006.00
EXPAND 4/1.0/
*EOR
*PARAMETER SET 4(A=10.)
* 000.02 004.00 000.00 006.00
EXPAND 4/10./

```

```

*EOR
*EOF
*****
* PROBLEM 5 *
*****
*EOR
*PARAMETER SET 1(A=0.0)
* 000.01 002.00 000.00 006.00
EXPAND 5/0./
*EOR
*PARAMETER SET 2(A=5.0)
* 000.01 002.00 000.00 006.00
EXPAND 5/5./
*EOR
*PARAMETER SET 3(A=8.0)
* 000.01 002.00 000.00 006.00
EXPAND 5/8./
*EOR
*PARAMETER SET 4(A=10.0)
* 000.03 010.00 000.00 006.00
EXPAND 5/10./
*EOR
*PARAMETER SET 5(A=20.0)
* 000.04 015.00 000.00 006.05
EXPAND 5/20./
*EOR
*PARAMETER SET 6(A=54.0)
* 000.05 030.00 000.00 006.00
EXPAND 5/54./
*EOR
*PARAMETER SET 7(A=100.0)
* 000.05 040.00 000.00 006.00
EXPAND 5/100./

```

```

*EOR
*EOF
*****
* PROBLEM 6 *
*****
*EOR
* 000.10 040.20 000.00 006.30
* 2020021002002
1 TWO DIMENSIONS
1 UXX$ + UYY$ = COEF(X,Y)U$ = F(X,Y)
2 DIRICHLET $ HOMOGENEOUS
2 X=0. , U=0.

```

```

2      X=1. , U=0.
2      Y=0. , U=0.
2      Y=1. , U=0.
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI, FOURPI
3      DATA PI, FOURPI /3.1415926535898,12.566370614359/
3      PHI = 4.*((X-0.5)**2 + (Y-0.5)**2)
3      T1 = 5.4 - COS(FOURPI*X)
3      T2 = SIN(PI*X)
3      T3 = Y**2 - Y
3      T4 = 5.4 - COS(FOURPI*Y)
3      T5 = 1./(1.+PHI**4) - 0.5
3      TRUE = -0.31 * T1 * T2 * T3 * T4 * T5
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI, FOURPI
3      CFPX = COS(FOURPI*X)
3      T1 = 5.4 - CFPX
3      T1X = FOURPI*SIN(FOURPI*X)
3      T1XX = FOURPI**2*CFPX
3      T2 = SIN(PI*X)
3      T2X = PI*COS(PI*X)
3      T2XX = -PI**2*T2
3      T3 = Y**2 - Y
3      T3Y = 2.*Y - 1.
3      T3YY = 2.
3      CFPY = COS(FOURPI*Y)
3      T4 = 5.4 - CFPY
3      T4Y = FOURPI*SIN(FOURPI*Y)
3      T4YY = FOURPI**2*CFPY
3      PHI = 4.*((X-0.5)**2 + (Y-0.5)**2)
3      PHI2 = PHI**2
3      PHI3 = PHI2*PHI
3      PHI4 = PHI3*PHI
3      PHIX = 8.*(X-0.5)
3      PHIXX = 8.
3      PHIY = 8.*(Y-0.5)
3      PHIYY = 8.
3      TMP = 1./(1.+PHI4)
3      TMP2 = TMP**2
3      TMP3 = TMP2*TMP
3      T5 = TMP - 0.5
3      T5X = -4.*PHI3*PHIX*TMP2
3      T5XX = 32.*(PHI3*PHIX)**2*TMP3 - 12.*PHI2*PHIX**2*TMP2
3      $ - 4.*PHI3*PHIXX*TMP2
3      T5Y = -4.*PHI3*PHIY*TMP2
3      T5YY = 32.*(PHI3*PHIY)**2*TMP3 - 12.*PHI2*PHIY**2*TMP2
3      $ - 4.*PHI3*PHIYY*TMP2
3      U = T1 * T2 * T3 * T4 * T5
3      UXX = T3 * T4 * ( T1XX*T2*T5 +
3      $ 2.*T1X*T2X*T5 +
3      $ 2.*T1X*T2*T5X +
3      $ T1*T2XX*T5 +
3      $ 2.*T1*T2X*T5X +
3      $ T1*T2*T5XX)
3      UYY = T1 * T2 * ( T3YY*T4*T5 +
3      $ 2.*T3Y*T4Y*T5 +
3      $ 2.*T3Y*T4*T5Y +
3      $ T3*T4YY*T5 +
3      $ 2.*T3*T4Y*T5Y +
3      $ T3*T4*T5YY)
3      F = -0.31 * ( UXX + UYY - COEFU(X,Y)*U )
3      RETURN
3      END
3      FUNCTION COEFU(X,Y)
3      COMMON /CONCOM/ PI, FOURPI
3      COEFU = 100. + COS(2.*PI*X) + SIN(3.*PI*Y)
3      RETURN
3      END

```

```

-----
*EOR
*EOF
*****
* PROBLEM 7 *
*****

```

```

*EOR
*
*      002.10      000.00      000.00      050.10
*      2020021002002
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXX$ + UYY$ = 1.
2      DIRICHLET $ HOMOGENEOUS
2      X=0. , U=0.
2      X=1. , U=0.
2      Y=0. , U=0.
2      Y=1. , U=0.
3      FUNCTION TRUE(X,Y)
3      DIMENSION XB(4), YB(4), AB(4), C(11)
3      DATA N/16/, NZB/4/, NA/2/,
3      $      XB(1),YB(1), XB(2),YB(2), XB(3),YB(3), XB(4),YB(4)
3      $      / 0., 0., 1., 0., 1., 1., 0., 1./,
3      $      AB / -2.356, -0.765, 0.765, 2.356/
3      DATA C
3      $      / .1469642607553E+00, .2000000125355E+01, .1000000062926E+01,
3      $      -.293366320763E-01, -.9430679389679E-03, .4338951975566E-05,
3      $      .2394115460351E-05, .3183099062144E+00, -.3183099062144E+00,
3      $      .3183099062144E+00, -.3183099062144E+00/
3      DATA PI/3.14159265358979/, TWOPI/5.23318530717359/
3      OABS(X,Y) = SQRT(X*X + Y*Y)
3      RCST = X - 0.5
3      RSNT = Y - 0.5
3      R = OABS(RCST, RSNT)
3      SUM = R*R/4.
3      L = 1
3      SUM = SUM + C(L)
3      RKCSKT = 1
3      RKSNKT = 0
3      DO 1 K=1,N
3      TEMP = RCST*RKCSKT - RSNT*RKSNKT
3      RKSNKT = RSNT*RKCSKT + RCST*RKSNKT
3      RKCSKT = TEMP
3      IF ((K.GT.2) .AND. (MOD(K,4).NE.0)) GO TO 1
3      L = L+1
3      SUM = SUM + C(L)*RKCSKT
3 1 CONTINUE
3      DO 2 I=1,NZB
3      ZR = X - XB(I)
3      ZI = Y - YB(I)
3      WR = OABS(ZR, ZI)
3      IF (WR.NE.0.) WR = ALOG(WR)
3      WI = OARG(ZR, ZI)
3      IF (WI.GT. AB(I)) WI = WI - TWOPI
3      TR = ZR*WR - ZI*WI
3      TI = ZR*WI + ZI*WR
3      L = L+1
3      SUM = SUM + C(L)*(ZR*TI + ZI*TR)
3 2 CONTINUE
3      TRUE = SUM
3      RETURN
3      END
3      REAL FUNCTION OARG(X, Y)
3      OARG = 0
3      IF ((X.NE.0.) .OR. (Y.NE.0.)) OARG = ATAN2(Y,X)
3      RETURN
3      END

```

```

-----
*EOR
*EOF
*****
* PROBLEM 3 *
*****
*EOR
*PARAMETER SET 1(A=0.1)
*      000.32      070.30      000.00      050.40
EXPAND 8/0.1/
*EOR
*PARAMETER SET 2(A=0.15)
*      000.33      030.40      000.00      050.50
EXPAND 8/0.15/
*EOR
*PARAMETER SET 3(A=0.35)

```

```

      000.38    030.40    000.00    060.50
EXPAND 8/0.35/
*
*PARAMETER SET 4(A=0.45)
      000.42    080.40    000.00    070.60
EXPAND 8/0.45/

```

```

*EOR
*EOF
*****
* PROBLEM 9 *
*****
*EOR
*PARAMETER SET 1(A=10.0)
      002.18    040.70    000.00    006.60
EXPAND 9/10./
*EOR
*PARAMETER SET 2(A=20.0)
      002.26    040.45    000.00    006.65
EXPAND 9/20./
*EOR
*PARAMETER SET 3(A=50.0)
      002.27    040.45    000.00    006.70
EXPAND 9/50./
*EOR
*PARAMETER SET 4(A=100.0)
      002.23    040.45    000.00    006.80
EXPAND 9/100./

```

```

*EOR
*EOF
*****
* PROBLEM 10 *
*****
*EOR
*PARAMETER SET 1(A=10.0, B=0.5)
      000.04    005.10    000.00    005.05
EXPAND 10/10...5/
*EOR
*PARAMETER SET 2(A=50.0, B=0.5)
      000.16    025.40    000.00    008.25
EXPAND 10/50...5/
*EOR
*PARAMETER SET 3(A=100.0, B=0.5)
      000.23    040.60    000.00    010.30
EXPAND 10/100...5/
*EOR
*PARAMETER SET 4(A=500.0, B=0.5)
      000.32    065.70    000.00    020.35
EXPAND 10/500...5/
*EOR
*PARAMETER SET 5(A=1000.0, B=0.5)
      000.33    080.75    000.00    035.40
EXPAND 10/1000...5/
*EOR
*PARAMETER SET 6(A=10.0, B=0.117)
      000.04    005.10    000.00    005.05
EXPAND 10/10...117/
*EOR
*PARAMETER SET 7(A=50.0, B=0.117)
      000.16    025.40    000.00    008.25
EXPAND 10/50...117/
*EOR
*PARAMETER SET 8(A=100.0, B=0.117)
      000.23    040.60    000.00    010.30
EXPAND 10/100...117/
*EOR
*PARAMETER SET 9(A=500.0, B=0.117)
      000.32    065.70    000.00    020.35
EXPAND 10/500...117/
*EOR
*PARAMETER SET 10(A=1000.0, B=0.117)
      000.33    080.75    000.00    035.40
EXPAND 10/1000...117/

```

```

*EOR

```

```

*EOF
*****
* PROBLEM 11 *
*****
*EOR
*PARAMETER SET 1(A=PI)
* 000.10 006.25 000.00 006.25
EXPAND 11/PI/
*EOR
*PARAMETER SET 2(A=2*PI)
* 000.14 006.35 000.00 006.35
EXPAND 11/2.*PI/
*EOR
*PARAMETER SET 3(A=3*PI)
* 000.15 006.40 000.00 006.40
EXPAND 11/3.*PI/
*EOR
*PARAMETER SET 4(A=5*PI)
* 000.22 006.60 000.00 006.60
EXPAND 11/5.*PI/
*EOR
*PARAMETER SET 5(A=10*PI)
* 000.27 006.75 000.00 006.75
EXPAND 11/10.*PI/

```

```

*EOR
*EOF
*****
* PROBLEM 12 *
*****
*EOR
*PARAMETER SET 1(A=PI, B=PI)
* 000.05 006.10 000.00 006.10
EXPAND 12/3.14159265358979,3.14159265358979/
*EOR
*PARAMETER SET 2(A=PI, B=10.0)
* 000.12 006.30 000.00 006.30
EXPAND 12/3.14159265358979,10./
*EOR
*PARAMETER SET 3(A=10.0, B=PI)
* 000.12 006.30 000.00 006.30
EXPAND 12/10.,3.14159265358979/
*EOR
*PARAMETER SET 4(A=20.0, B=PI)
* 000.22 006.60 000.00 006.60
EXPAND 12/20.,3.14159265358979/
*EOR
*PARAMETER SET 5(A=10.0, B=10.0)
* 000.12 006.30 000.00 006.30
EXPAND 12/10.,10./
*EOR
*PARAMETER SET 6(A=10.0, B=20.0)
* 000.22 006.60 000.00 006.60
EXPAND 12/10.,20./

```

```

*EOR
*EOF
*****
* PROBLEM 13 *
*****
*
* 000.48 090.90 000.00 080.25
* 2000002002000
1 TWO DIMENSIONS $ SELF-ADJOINT
1 COEF1(X,Y)UXXS + UYY$ = F(X,Y)
2 DIRICHLET
2 X=0. , U=TRUE(X,Y)
2 X=1. , U=TRUE(X,Y)
2 Y=0. , U=TRUE(X,Y)
2 Y=1. , U=TRUE(X,Y)
2 FUNCTION COEF1(X,Y)
3 COEF1 = 2.
3 IF ( X.LT..4 ) COEF1 =1.
3 RETURN
3 END

```

```

3     FUNCTION F(X,Y)
3     FX1 = X + .3
3     FX2 = .7 + .5*(X-.4) + (X-.4)**2/(1+X*X)
3     DYYG = (Y*Y-G.*Y+7.)*EXP(-Y)
3     IF (FX1 .GT. FX2) GO TO 1
3     F = DYYG*FX1
3     RETURN
3 1 DXXH = ((1.6*X+1.68)*(1+X*X)**2
3     $      -(.8*X*X+1.68*X-.8)*4.*X*(1.+X*X))
3     $      /(1.+X*X)**4
3     G = 1. + (Y-1.)*X**2*EXP(-Y)
3     F = COEF1(X,Y)*DXXH*G + FX2*DYYG
3     END
3     RETURN
3     END
3     FUNCTION TRUE(X,Y)
3     FX2 = .7 + .5*(X-.4) + (X-.4)**2/(1+X*X)
3     TRUE = AMIN1(X+.3,FX2)*(1.+(Y-1.)*X**2*EXP(-Y))
3     RETURN
3     END
3     FUNCTION CDXU(X,Y)
3     CDXU = 0.
3     RETURN
3     END
3     FUNCTION CDYU(X,Y)
3     CDYU = 0.
3     RETURN
3     END

```

```

-----
*EOR
*EOF
*****
* PROBLEM 14 *
*****
*EOR
*PARAMETER SET 1(A=0.01)
*      000.28      045.05      060.05      045.05
EXPAND 14/0.01/
*EOR
*PARAMETER SET 2(A=0.1)
*      000.34      060.05      070.05      060.05
EXPAND 14/0.1/
*EOR
*PARAMETER SET 3(A=1.0)
*      000.39      065.10      075.10      065.10
EXPAND 14/1.0/

```

```

-----
*EOR
*EOF
*****
* PROBLEM 15 *
*****
*EOR
*PARAMETER SET 1(A=0.2, B=1.5, C=0.1)
*      000.28      055.00      000.00      070.00
EXPAND 15/.2,1.5,0.1/
*EOR
*PARAMETER SET 2(A=1.0, B=2.5, C=0.1)
*      000.17      050.00      000.00      050.00
EXPAND 15/1.,2.5,0.1/
*EOR
*PARAMETER SET 3(A=0.2, B=1.5, C=0.04)
*      000.27      090.00      000.00      070.00
EXPAND 15/.2,1.5,0.04/
*EOR
*PARAMETER SET 4(A=0.2, B=2.5, C=0.04)
*      000.15      040.00      000.00      050.00
EXPAND 15/.2,2.5,0.04/

```

```

-----
*EOR
*EOF
*****
* PROBLEM 16 *
*****
*EOR
*PARAMETER SET 1(B=1.)

```

```

*      007.10      010.03      000.00      015.30
EXPAND 16/1.1./
'EOR
*PARAMETER SET 2(B=10.)
*      007.05      010.03      000.00      010.15
EXPAND 16/2.10./

```

```

-----
'EOR
'EOR
*****
* PROBLEM 17 *
*****
'EOR
*PARAMETER SET 1(A=1.0, B=2.0)
*      000.08      002.20      000.00      010.15
EXPAND 17/1.2./
'EOR
*PARAMETER SET 2(A=5.0, B=3.0)
*      000.20      010.50      000.00      020.40
EXPAND 17/5.3./
'EOR
*PARAMETER SET 3(A=8.0, B=5.0)
*      000.45      040.30      000.00      080.70
EXPAND 17/8.5./

```

```

-----
'EOR
'EOR
*****
* PROBLEM 18 *
*****
'EOR
*PARAMETER SET 1(A=1.0, B=2.0)
*      000.07      010.10      000.00      010.10
EXPAND 18/1.2./
'EOR
*PARAMETER SET 2(A=5.0, B=3.0)
*      000.11      010.20      000.00      020.15
EXPAND 18/5.3./
'EOR
*PARAMETER SET 3(A=8.0, B=5.0)
*      000.32      010.70      000.00      070.40
EXPAND 18/8.5./

```

```

-----
'EOR
'EOR
*****
* PROBLEM 19 *
*****
'EOR
*PARAMETER SET 1(A=0.15)
*      006.15      070.10      000.00      006.05
EXPAND 19/0.15/
'EOR
*PARAMETER SET 2(A=0.25)
*      006.17      030.10      000.00      006.05
EXPAND 19/0.25/

```

```

-----
'EOR
'EOR
*****
* PROBLEM 20 *
*****
'EOR
*PARAMETER SET 1(A=0.0)
*      007.23      040.60      000.00      010.30
EXPAND 20/0./
'EOR
*PARAMETER SET 2(A=10.)
*      007.23      040.60      000.00      010.30
EXPAND 20/10./

```

```

-----
'EOR
'EOR
*****
* PROBLEM 21 *
*****

```

OR

```

005.03 010.20 000.00 005.10
200000002000
TWO DIMENSIONS
A(X,Y)UXX$ + B(X,Y)UXY$ + C(X,Y)UYYS = F(X,Y)
DIRICHLET
X=0. , U=TRUE(X,Y)
X=1. , U=TRUE(X,Y)
Y=0. , U=TRUE(X,Y)
Y=1. , U=TRUE(X,Y)
FUNCTION A(X,Y)
A = 1. + TRUEX(X,Y)**2
RETURN
END
FUNCTION B(X,Y)
B = -2.*TRUEX(X,Y)*TRUEY(X,Y)
RETURN
END
FUNCTION C(X,Y)
C = 1. + TRUEY(X,Y)**2
RETURN
END
FUNCTION TRUEX(X,Y)
TRUEX = EXP(X*Y)
RETURN
END
FUNCTION TRUEY(X,Y)
TRUEY = EXP(X*Y)
RETURN
END
FUNCTION F(X,Y)
TUXX = EXP(X*Y)
TUXY = TUXX
TUYX = TUXY
TUYX = TUXY
F = A(X,Y)*TUXX + B(X,Y)*TUXY + C(X,Y)*TUYX
RETURN
END
FUNCTION TRUE(X,Y)
TRUE = EXP(X*Y)
RETURN
END

```

*EOR
*EOF

* PROBLEM 22 *

OR

```

003.31 090.85 000.00 004.05
2000200002000
TWO DIMENSIONS
U(X,Y)UXX$ + U(X,Y)UYYS + W(X,Y)UXS +
W(X,Y)UYS = F(X,Y)
DIRICHLET
X=0. , U=TRUE(X,Y)
X=1. , U=TRUE(X,Y)
Y=0. , U=TRUE(X,Y)
Y=1. , U=TRUE(X,Y)
FUNCTION W(X,Y)
FUNCTION /CONDDIV C1,C2
DATA C1, C2 / 17.06, 3.62/
F1 = (X*X-1.)*(Y*Y-1.)
W1 = 2.*X*(Y*Y-1.)
W2 = (X*X-1.)*2.*Y
W = C1*W1 + C2*W2*(X*X+Y*Y) + C2*F1*2.*X
W = C1*W1 + C2*W2*(X*X+Y*Y) + C2*F1*2.*Y
W = UTX(U*UX + U*UY)
W = 2075.
IF (C1.GT. .0025) W = 19.44A + 233.
RETURN
END
FUNCTION F(X,Y)
FUNCTION /CONDDIV C1,C2
DATA C1, C2 / 17.06, 3.62/
F1 = (X*X-1.)*(Y*Y-1.)

```

```

3      DXF1 = 2.*X*(Y*Y-1.)
3      DYF1 = (X*X-1.)*2.*Y
3      UX = C1*DXF1 + C2*DXF1*(X*X+Y*Y) + C2*F1*2.*X
3      UY = C1*DYF1 + C2*DYF1*(X*X+Y*Y) + C2*F1*2.*Y
3      DXXF1 = 2.*(Y*Y-1.)
3      DXYF1 = 4.*X*Y
3      UXX = C1*DXXF1 + C2*DXXF1*(X*X+Y*Y) + C2*DXF1*2.*X +
3      $      C2*DXF1*2.*X + C2*F1*2.
3      UYX = C1*DXYF1 + C2*DXYF1*(X*X+Y*Y) + C2*DYF1*2.*X +
3      $      C2*DYF1*2.*Y
3      A = SQRT(UX*UX + UY*UY)
3      WX = 0.
3      IF (A.GT. .0025) WX = -19.4*(UX*UXX + UY*UYX)/A**3
3      RETURN
3      END
3      FUNCTION WY(X,Y)
3      WY = WX(Y,X)
3      RETURN
3      END
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ C1,C2
3      F1 = (X*X-1.)*(Y*Y-1.)
3      TRUE = C1*F1 + C2*F1*(X*X+Y*Y)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ C1,C2
3      F1 = (X*X-1.)*(Y*Y-1.)
3      DXF1 = 2.*X*(Y*Y-1.)
3      DYF1 = (X*X-1.)*2.*Y
3      UX = C1*DXF1 + C2*DXF1*(X*X+Y*Y) + C2*F1*2.*X
3      UY = C1*DYF1 + C2*DYF1*(X*X+Y*Y) + C2*F1*2.*Y
3      DXXF1 = 2.*(Y*Y-1.)
3      DYYF1 = (X*X-1.)*2.
3      UXX = C1*DXXF1 + C2*DXXF1*(X*X+Y*Y) + C2*DXF1*2.*X +
3      $      C2*DXF1*2.*X + C2*F1*2.
3      UYY = C1*DYYF1 + C2*DYYF1*(X*X+Y*Y) + C2*DYF1*2.*Y +
3      $      C2*DYF1*2.*Y + C2*F1*2.
3      F = W(X,Y)*(UXX+UYY) + WX(X,Y)*UX + WY(X,Y)*UY
3      RETURN
3      END

```

```

-----
*EOR
*EOF
*****
* PROBLEM 23 *
*****
*EOR
*PARAMETER SET 1(A=387.75, B=50.0, C=1, D=0.10)
*      009.47  050.70  020.00  070.60
EXPAND 23/387.75,50.,1,0.10/
*EOR
*PARAMETER SET 2(A=554.5, B=0.554, C=1, D=0.10)
*      009.50  070.80  020.00  070.60
EXPAND 23/554.5,.554,1,0.10/
*EOR
*PARAMETER SET 3(A=387.75, B=50.0, C=2, D=0.15)
*      009.52  030.80  020.00  070.60
EXPAND 23/387.75,50.,2,0.15/
*EOR
*PARAMETER SET 4(A=554.5, B=0.554, C=2, D=0.15)
*      009.52  030.80  020.00  070.60
EXPAND 23/554.5,.554,2,0.15/
*EOR
*PARAMETER SET 5(A=387.75, B=50.0, C=3, D=0.20)
*      009.53  085.80  020.00  070.60
EXPAND 23/387.75,50.,3,0.20/
*EOR
*PARAMETER SET 6(A=554.5, B=0.554, C=3, D=0.20)
*      009.53  085.85  020.00  070.60
EXPAND 23/554.5,.554,3,0.20/
-----
*EOR
*EOF
*****
* PROBLEM 24 *

```

```

*****
*EOR
*PARAMETER SET 1(A=0.25, B=100., C=-0.10)
* 007.13 015.10 005.00 015.30
EXPAND 24/0.25,100.,-0.10,1/
*EOR
*PARAMETER SET 2(A=0.25, B=1000., C=-0.10)
* 007.09 015.10 005.00 010.15
EXPAND 24/0.25,1000.,-0.10,2/
*EOR
*PARAMETER SET 3(A=0.50, B=1., C=-0.01)
* 007.06 015.10 005.00 005.00
EXPAND 24/0.50,1.,-0.01,3/
*EOR
*PARAMETER SET 4(A=0.50, B=10., C=-0.10)
* 007.07 015.10 005.00 010.00
EXPAND 24/0.50,10.,-0.10,4/
*EOR
*PARAMETER SET 5(A=1.00, B=1., C=-0.10)
* 007.05 015.10 005.00 000.00
EXPAND 24/1.00,1.,-0.10,5/
*EOR
*PARAMETER SET 6(A=1.00, B=10., C=-0.10)
* 007.07 015.10 005.00 010.00
EXPAND 24/1.00,10.,-0.10,6/
*EOR
*PARAMETER SET 7(A=1.00, B=100., C=-1.00)
* 007.14 015.10 005.00 015.37
EXPAND 24/1.00,100.,-1.00,7/
*EOR
*PARAMETER SET 8(A=1.00, B=1000., C=-1.00)
* 007.10 015.10 005.00 010.20
EXPAND 24/1.00,1000.,-1.00,8/

```

```

*EOR
*EOF
*****
* PROBLEM 25 *
*****
*EOR
*PARAMETER SET 1(A=1.5)
* 000.19 065.40 000.00 006.05
EXPAND 25/1.5/
*EOR
*PARAMETER SET 2(A=2.5)
* 000.14 055.20 000.00 006.05
EXPAND 25/2.5/
*EOR
*PARAMETER SET 3(A=3.5)
* 000.12 045.15 000.00 006.05
EXPAND 25/3.5/
*EOR
*PARAMETER SET 4(A=4.5)
* 000.11 035.20 000.00 006.05
EXPAND 25/4.5/

```

```

*EOR
*EOF
*****
* PROBLEM 26 *
*****
*EOR
*PARAMETER SET 1(A=1)
* 007.03 010.00 000.00 005.02
EXPAND 26/1.,1/
*EOR
*PARAMETER SET 2(A=5)
* 007.04 010.00 000.00 010.02
EXPAND 26/5.,2/
*EOR
*PARAMETER SET 3(A=10)
* 003.04 010.00 000.00 013.02
EXPAND 26/10.,3/

```

```

*EOR
*EOF

```

```
*****
* PROBLEM 27 *
*****
'EC2
```

```
*
*      007.13      015.05      000.00      020.40
*      2000200002002
1      TWO DIMENSIONS
1      UNXS + (1.1)UYY + (2.1)UX + E(X,Y)UY = -100.
2      DIRICHLET $ HOMOGENEOUS
3      X=.1 , U=0.
3      X=1. , U=0.
3      Y=.1 , U=0.
3      Y=1. , U=0.
3      FUNCTION TRUE(X,Y)
3      REAL DERUSL(6), GRID(20), TABLE(20,20),
3      $      T1B1(100), T1B2(100), T1B3(100), T1B4(100)
3      EQUIVALENCE (TABLE(1, 1) , T1B1(1)),
3      $      (TABLE(1, 6) , T1B2(1)),
3      $      (TABLE(1,11) , T1B3(1)),
3      $      (TABLE(1,16) , T1B4(1))
3      DATA NGRID, NGRID*20, 20/
3      DATA GRID/0.100000, 0.1473334, 0.1947338, 0.2421053,
3      $0.2894737, 0.3368421, 0.3842105, 0.4315739, 0.4789474,
3      $0.5263153, 0.5736842, 0.6210526, 0.6684211, 0.7157835,
3      $0.7631579, 0.8105263, 0.8578943, 0.9052632, 0.9526316,
3      $1.0000000/
```

```
3C      APPROXIMATE SOLUTION OF PROBLEM USING
3C      5-POINT STAR (20 X 20 GRID)
```

```
3      DATA T1B1/ .000000, .000000, .000000, .000000, .000000, .000000,
3      $ .000000, .000000, .000000, .000000, .000000, .000000,
3      $ .000000, .000000, .000000, .000000, .000000, .881855, 1.596811,
3      $ 2.331137, 3.083675, 3.848034, 4.576355, 5.244113, 5.821652,
3      $ 6.280833, 6.535470, 6.741719, 6.892443, 6.447540, 5.974205,
3      $ 5.267140, 4.318752, 3.124975, 1.623172, .000000, .000000,
3      $ .212529, .334810, .561946, .745076, .928383, 1.104687,
3      $ 1.256651, 1.407139, 1.519353, 1.533358, 1.634250, 1.625968,
3      $ 1.567710, 1.455309, 1.237426, 1.060324, .774514, .427498,
3      $ .000000, .000000, .552663, 1.000754, 1.461024, 1.936419,
3      $ 2.411748, 2.863264, 3.286824, 3.643625, 3.936538, 4.133688,
3      $ 4.225089, 4.197475, 4.039403, 3.741501, 3.295544, 2.695630,
3      $ 1.948547, 1.045257, .000000, .000000, .473224, .856904,
3      $ 1.251265, 1.658857, 2.066712, 2.453312, 2.813739, 3.130717,
3      $ 3.379433, 3.550301, 3.631853, 3.611042, 3.473352, 3.225649,
3      $ 2.846377, 2.333002, 1.691793, .912354, .000000/
```

```
3      DATA T1B2/ .000000, .464137, .840562, 1.227614, 1.627875,
3      $ 2.122534, 2.414235, 2.762364, 3.076216, 3.322010, 3.492081,
3      $ 3.573500, 3.555061, 3.426403, 3.179479, 2.827439, 2.305741,
3      $ 1.671219, .893387, .000000, .000000, .455331, .825554,
3      $ 1.205033, 1.573304, 1.931256, 2.274329, 2.724141, 3.026327,
3      $ 3.272163, 3.411903, 3.524009, 3.503159, 3.234363, 3.143234,
3      $ 2.777809, 2.533302, 1.653372, .875335, .000000, .000000,
3      $ .445506, .203307, 1.173974, 1.534331, 1.951395, 2.324591,
3      $ 2.668757, 2.937350, 3.210426, 3.379329, 3.434340, 3.452336,
3      $ 3.333006, 3.033227, 2.742003, 2.253430, 1.633713, .806756,
3      $ .000000, .000000, .432193, .732752, 1.144207, 1.516247,
3      $ 1.836254, 2.230543, 2.537361, 2.822075, 3.100595, 3.290491,
3      $ 3.335145, 3.270007, 3.267202, 3.042015, 2.695453, 2.221455,
3      $ 1.615767, .875512, .000000, .000000, .415416, .758404,
3      $ 1.101502, 1.422205, 1.423492, 2.170265, 2.505541, 2.704171,
3      $ 3.020300, 3.123443, 3.265331, 3.211077, 3.134342, 2.967656,
3      $ 2.634321, 2.175000, 1.505775, .831003, .000000/
```

```
3      DATA T1B3/ .000000, .234736, .714031, 1.046437, 1.351534,
3      $ 1.727123, 2.041348, 2.372279, 2.671735, 2.911431, 3.006551,
3      $ 3.113311, 2.185007, 3.071040, 2.776028, 2.537743, 2.114035,
3      $ 1.316053, .000000, .000000, .000000, .215313, .063877,
3      $ .000000, 1.000000, 1.000000, 1.000000, 1.000000, 2.775181, 2.521753,
3      $ 2.704171, 2.314054, 2.000000, 3.012733, 2.800584, 2.751741,
3      $ 2.432377, 2.311054, 1.432735, 2.277834, .000000, .000000,
3      $ .312321, .110013, .000000, 1.204433, 1.502717, 1.800544,
3      $ 2.000000, 2.000000, 2.000000, 2.710515, 2.500000, 2.827084,
```

```

3 $ 2.762054, 2.600729, 2.332121, 1.945103, 1.432518, .786696,
3 $ .000000, .000000, .306205, .554949, .812334, 1.086018,
3 $ 1.363342, 1.636951, 1.833933, 2.126706, 2.324089, 2.475758,
3 $ 2.571278, 2.600023, 2.551104, 2.413323, 2.175292, 1.825479,
3 $ 1.352757, .747003, .000000, .000000, .267185, .483919,
3 $ .710355, .949965, 1.124503, 1.436371, 1.625473, 1.876015,
3 $ 2.056026, 2.197396, 2.220763, 2.226271, 2.293903, 2.182323,
3 $ 1.979744, 1.673420, 1.245394, .636174, .000000/
3C
3 DATA T1B4/ .000000, .223254, .494271, .594571, .795868,
3 $ 1.002731, 1.203281, 1.405290, 1.586414, 1.744195, 1.870977,
3 $ 1.953768, 1.999052, 1.932549, 1.823909, 1.735264, 1.481378,
3 $ 1.118459, .530463, .000000, .000000, .174435, .315761,
3 $ .465007, .623554, .787267, .950392, 1.103899, 1.255644,
3 $ 1.385363, 1.492081, 1.569477, 1.610632, 1.607997, 1.552498,
3 $ 1.433466, 1.237622, .948177, .544009, .000000, .000000,
3 $ .120825, .218604, .322393, .433139, .548090, .663693,
3 $ .776212, .831823, .976502, 1.056454, 1.116997, 1.153396,
3 $ 1.160107, 1.130432, 1.055126, .925341, .723818, .426737,
3 $ .000000, .000000, .062593, .113172, .167151, .225042,
3 $ .285452, .346593, .406606, .463546, .515437, .560198,
3 $ .595592, .619121, .627831, .612299, .565695, .523407,
3 $ .420924, .253423, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000/
3C
3C INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3 CALL QUADRD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NGRDD, NGRDD, DERUSL)
3C
3 TRUE = DERUSL(6)
3C
3 RETURN
3 END
3 FUNCTION E(X,Y)
3 E = 1./((TAN(Y)**3*X**2)
3 RETURN
3 END

```

```

*EOR
*EOF
*****
* PROBLEM 28 *
*****
*EOR
*PARAMETER SET 1(A=1.)
* .008.03 .000.00 .005.00 .007.03
EXPAND 28/1.,1/
*EOR
*PARAMETER SET 2(A=10.)
* .003.05 .000.00 .005.00 .010.15
EXPAND 28/10.,2/
*EOR
*PARAMETER SET 3(A=100.)
* .003.06 .000.00 .005.00 .010.22
EXPAND 28/100.,3/

```

```

*EOR
*EOF
*****
* PROBLEM 29 *
*****
*EOR
*PARAMETER SET 1(A=-3.)
* .008.18 .090.05 .000.02 .010.02
EXPAND 29/-3.,1/
*EOR
*PARAMETER SET 2(A=-1.)
* .003.18 .090.05 .000.00 .010.00
EXPAND 29/-1.,2/
*EOR
*PARAMETER SET 3(A=1.)
* .003.19 .090.05 .000.00 .010.10
EXPAND 29/1.,3/
*EOR

```

```

*PARAMETER SET 4(A=3.)
*      008.21      090.05      000.00      010.20
EXPAND 29/3..4/
*EOR
*PARAMETER SET 5(A=5.)
*      008.20      090.05      000.00      010.15
EXPAND 29/5..5/

```

```

-----
*EOR
*EOF
*****
* PROBLEM 30 *
*****
*EOR
*PARAMETER SET 1(A=1.0, B=8.0, C=-1.0)
*      000.16      010.40      000.00      010.35
EXPAND 30/1..8.,-1./
*EOR
*PARAMETER SET 2(A=1.0, B=2.0, C=0.5)
*      000.06      006.10      000.00      006.15
EXPAND 30/1..2.,5./
*EOR
*PARAMETER SET 3(A=23.0, B=2.0, C=1.0)
*      000.19      030.30      000.00      030.25
EXPAND 30/23..2.,1./
*EOR
*PARAMETER SET 4(A=10.0, B=11.0, C=0.0)
*      000.13      010.30      000.00      015.25
EXPAND 30/10..11..0./
*EOR
*PARAMETER SET 5(A=100.0, B=2.0, C=2.0)
*      000.19      030.30      000.00      030.25
EXPAND 30/100..2.,2./
*EOR
*PARAMETER SET 6(A=10.0, B=4.0, C=1.0)
*      000.13      010.30      000.00      015.25
EXPAND 30/10..4.,1./
*EOR
*PARAMETER SET 7(A=4.0, B=5.0, C=-0.5)
*      000.10      006.25      000.00      010.20
EXPAND 30/4..5.,-0.5/
*EOR
*PARAMETER SET 8(A=3.0, B=6.0, C=2.0)
*      000.10      006.25      000.00      006.25
EXPAND 30/3..6.,2./
*EOR
*PARAMETER SET 9(A=0.5, B=3.0, C=10.0)
*      000.09      006.20      000.00      006.20
EXPAND 30/.5.3.,10./

```

```

-----
*EOR
*EOF
*****
* PROBLEM 31 *
*****
*EOR
*
*      009.04      002.00      004.08      006.05
*      2020021000020
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXX$ + UYY$ = -1.
2      MIXED
2      X=-1. , MIXED = (1.)U + (-1.)UX = TRUE(X,Y) - DUX(X,Y)
2      X= 1. , MIXED = (1.)U + ( 1.)UX = TRUE(X,Y) + DUX(X,Y)
2      Y=-1. , MIXED = (1.)U + (-1.)UY = TRUE(X,Y) - DUY(X,Y)
2      Y= 1. , MIXED = (1.)U + ( 1.)UY = TRUE(X,Y) + DUY(X,Y)
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ A0,A2,A4,A6
3      DATA A0,A2,A4,A6 / .821564,-.0144,.0000493,-.00000064/
3      X2 = X*X
3      X4 = X2*X2
3      X6 = X4*X2
3      X8 = X6*X2
3      X10 = X8*X2
3      X12 = X10*X2
3      Y2 = Y*Y

```

```

3      Y4 = Y2*Y2
3      Y6 = Y4*Y2
3      Y8 = Y6*Y2
3      Y10 = Y8*Y2
3      Y12 = Y10*Y2
3      TRUE = -.25*(X2+Y2) + A0 + A2*(X4-6.*X2*Y2+Y4)
3      $      + A4*(X8-28.*X6*Y2+70.*X4*Y4-28.*X2*Y6+Y8)
3      $      + A6*(X12-66.*X10*Y2+495.*X8*Y4-324.*X6*Y6+
3      $      495.*X4*Y8-66.*X2*Y10+Y12)
3      RETURN
3      END
3      FUNCTION DUX(X,Y)
3      COMMON /CONCOM/ A0,A2,A4,A6
3      X2 = X*X
3      X3 = X*X2
3      X5 = X3*X2
3      X7 = X5*X2
3      X9 = X7*X2
3      X11 = X9*X2
3      Y2 = Y*Y
3      Y4 = Y2*Y2
3      Y6 = Y4*Y2
3      Y8 = Y6*Y2
3      Y10 = Y8*Y2
3      DUX = -.5*X + A2*(4.*X3-12.*X*Y2) +
3      $      A4*(8.*X7-168.*X5*Y2+280.*X3*Y4-56.*X*Y6) +
3      $      A6*(12.*X11-660.*X9*Y2+3960.*X7*Y4-5544.*X5*Y6+
3      $      1980.*X3*Y8-132.*X*Y10)
3      RETURN
3      END
3      FUNCTION DUY(X,Y)
3      DUY = DUX(Y,X)
3      RETURN
3      END

```

*EOR

*EOF

* PROBLEM 32 *

*EOR

```

*
*      009.07      010.05      000.00      010.15
*      2000200002002
1      TWO DIMENSIONS
1      UXX$ + UYY$ + 3./(5.-Y)UY$ = F(X,Y)
2      DIRICHLET $ HOMOGENEOUS
2      X=-.5 , U=0.
2      X= .5 , U=0.
2      Y=-1. , U=0.
2      Y= 1. , U=0.
3      FUNCTION TRUE(X,Y)
3      DATA A,B /.0010185,.0004838/
3      TRUE = (1.-Y*Y)*(1.-4.*X*X)*(5.-Y)**3*(A+B*Y)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      DATA A,B /.0010185,.0004838/
3      Z = A-A*Y**2+B*Y-B*Y**3
3      Q = 1.-4.*X**2
3      T = 5.-Y
3      T2 = T*T
3      T3 = T2*T
3      UXX = -8.*Z*T3
3      UY = Q*((B-2.*A*Y-3.*B*Y**2)*T3 -3.*Z*T2)
3      UYY = Q*((-2.*A-6.*B*Y)*T3 - 6.*(B-2.*A*Y-3.*B*Y**2)*T2
3      $      + 6.*Z*T)
3      F = UXX + UYY + 3./(5.-Y)*UY
3      RETURN
3      END

```

*EOR

*EOF

* PROBLEM 33 *

```

*EOR
*
*      008.11      006.20      000.10      006.25
*      2020021002000
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXX$ + UYY$ = F(X,Y)
2      DIRICHLET
2      X= 0. , U=TRUE(X,Y)
2      X= 1. , U=TRUE(X,Y)
2      Y=-1. , U=TRUE(X,Y)
2      Y= 1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      S133 = SQRT(133.)
3      K1 = SQRT(14.+S133)
3      K2 = SQRT(14.-S133)
3      A = (-7.+S133)/(2.*S133)
3      B = (-7.-S133)*A/16.
3      EK1X = EXP(K1*X)
3      EK2X = EXP(K2*X)
3      EDIFF = EK1X - EK2X
3      F1 = A*EDIFF + EK2X
3      F2 = B*EDIFF
3      Y21 = 1.-Y*Y
3      TPUE = Y21*(F1 + Y21*F2)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      S133 = SQRT(133.)
3      K1 = SQRT(14.+S133)
3      K2 = SQRT(14.-S133)
3      A = (-7.+S133)/(2.*S133)
3      B = (-7.-S133)*A/16.
3      EK1X = EXP(K1*X)
3      EK2X = EXP(K2*X)
3      EDIFF = EK1X-EK2X
3      F1 = A*EDIFF + EK2X
3      F2 = B*EDIFF
3      Y21 = 1.-Y*Y
3      DEK1X = K1*K1*EK1X
3      DEK2X = K2*K2*EK2X
3      DEDIFF = DEK1X - DEK2X
3      DDF1 = A*DEDIFF + DEK2X
3      DDF2 = B*DEDIFF
3      UXX = Y21*(DDF1 + Y21*DDF2)
3      UYY = -2.*(F1 + 2.*(1.-3.*Y*Y)*F2)
3      F = UXX + UYY
3      RETURN
3      END

```

```

-----
*EOR
*EOF
*****
* PPOBLEM 34 *
*****
*EOP
*
*      008.03      002.01      000.01      006.05
*      2020021002000
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXX$ + UYY$ = -1.
2      DIRICHLET
2      X=-1. , U=TRUE(X,Y)
2      X= 1. , U=TRUE(X,Y)
2      Y=-1. , U=TRUE(X,Y)
2      Y= 1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      X2 = X*X
3      X4 = X2*X2
3      X6 = X4*X2
3      X8 = X6*X2
3      Y2 = Y*Y
3      Y4 = Y2*Y2
3      Y6 = Y4*Y2
3      Y8 = Y6*Y2
3      TPUE = 0.235776 - .25*(X2+Y2) +
3      $      (-14476.*(X4-6.*(X2*Y2+Y4) +

```

```

5      $      429.*(X3-23.*X6*Y2+70.*X4*Y4-28.*X2*Y6+Y8))/319424.
6      RETURN
7      END
-----
*EOP
*EOP
*****
* PROBLEM 35 *
*****
*EOP
*PARAMETER SET 1(A=0.0)
*      009.11      002.00      000.10      006.50
*      2022021202000
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      LAPLACE
1      UXX$ + UYY$ = 0.
2      DIRICHLET
2      X=-1. , U=TRUE(X,Y)
2      X= 1. , U=TRUE(X,Y)
2      Y=-1. , U=TRUE(X,Y)
2      Y= 1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      X2 = X*X
3      X4 = X2*X2
3      X6 = X4*X2
3      X8 = X6*X2
3      Y2 = Y*Y
3      Y4 = Y2*Y2
3      Y6 = Y4*Y2
3      Y8 = Y6*Y2
3      U1 = X4 - 6.*X2*Y2 + Y4
3      U2 = X8 - 23.*X6*Y2 + 70.*X4*Y4 - 28.*X2*Y6 + Y8
3      TRUE = 1.1765 - .1801*U1 + .006*U2
3      RETURN
3      END
-
*EOP
*PARAMETER SET 2(A=0.1)
*      009.11      000.00      000.10      006.50
EXPAND 35/0.1/
*EOP
*PARAMETER SET 3(A=1.0)
*      009.11      000.00      000.10      006.50
EXPAND 35/1.0/
*EOP
*PARAMETER SET 4(A=10.)
*      009.11      000.00      000.10      006.50
EXPAND 35/10./
-----
*EOP
*EOP
*****
* PROBLEM 36 *
*****
*EOP
*PARAMETER SET 1(A=0.0, B=0.0)
*      003.23      098.50      000.00      006.05
EXPAND 36/0.0,0.0/
*EOP
*PARAMETER SET 2(A=0.1, B=-0.5)
*      006.23      090.25      000.00      010.15
EXPAND 36/0.1,-0.5/
*EOP
*PARAMETER SET 3(A=0.0, B=1.0)
*      007.43      100.45      000.00      100.50
EXPAND 36/0.0,1.0/
*EOP
*PARAMETER SET 4(A=0.5, B=0.0)
*      003.23      090.25      000.00      005.00
EXPAND 36/0.5,0.0/
-----
*EOP
*EOP
*****
* PROBLEM 37 *
*****

```

```

*EOR
*
*      008.07      010.20      000.00      002.10
*      2000000022000
1      TWO DIMENSIONS
1      A(X,Y)UXX$ + B(X,Y)UXY$ + C(X,Y)UYYS = F(X,Y)
2      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION A(X,Y)
3      A = 1. + TRUEX(X,Y)**2
3      RETURN
3      END
3      FUNCTION B(X,Y)
3      B = -2.*TRUEX(X,Y)*TRUEY(X,Y)
3      RETURN
3      END
3      FUNCTION C(X,Y)
3      C = 1. + TRUEY(X,Y)**2
3      RETURN
3      END
3      FUNCTION TRUEX(X,Y)
3      TRUEX = (2.*(X-3.*Y) + (X-3.*Y)**2)*EXP(X-Y)
3      RETURN
3      END
3      FUNCTION TRUEY(X,Y)
3      TRUEY = (-6.*(X-3.*Y) - (X-3.*Y)**2)*EXP(X-Y)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      EXMY= EXP(X-Y)
3      XM3Y= X-3.*Y
3      UXX = (2. + 4.*XM3Y + XM3Y**2)*EXMY
3      UXY = (-6. - 8.*XM3Y - XM3Y**2)*EXMY
3      UYY = (18. + 12.*XM3Y + XM3Y**2)*EXMY
3      F = A(X,Y)*UXX+B(X,Y)*UXY+C(X,Y)*UYY
3      RETURN
3      END
3      FUNCTION TRUE(X,Y)
3      TRUE = (X-3.*Y)**2*EXP(X-Y)
3      RETURN
3      END

```

```

*EOR
*EOF
*****
* PROBLEM 38 *
*****
*EOR
*PARAMETER SET 1(A=1.0)
*      000.09      000.00      000.20      008.25
EXPAND 38/1.0/
*EOR
*PARAMETER SET 2(A=3.0)
*      000.13      000.00      000.30      010.40
EXPAND 38/3.0/
*EOR
*PARAMETER SET 3(A=7.0)
*      000.26      000.00      000.60      015.80
EXPAND 38/7.0/

```

```

*EOR
*EOF
*****
* PROBLEM 39 *
*****
*EOR
*PARAMETER SET 1(B=0.50, H(X)=1/X)
*      005.23      090.10      000.00      010.25
EXPAND 33/1.0.50/
*EOR
*PARAMETER SET 2(B=1.00, H(X)=1/X)
*      005.22      090.10      000.00      010.20
EXPAND 33/2.1.00/

```

```

*EOR
*PARAMETER SET 3(B=0.25, H(X)=EXP(X))
* 005.05 010.02 000.00 010.10
EXPAND 39/3,0.25/
*EOR
*PARAMETER SET 4(B=0.50, H(X)=EXP(X))
* 005.05 010.02 000.00 010.10
EXPAND 39/4,0.50/
*EOR
*PARAMETER SET 5(B=1.00, H(X)=EXP(X))
* 005.05 010.02 000.00 010.10
EXPAND 39/5,1.00/

```

```

*EOR
*EOF

```

```

*****
* PROBLEM 40 *
*****

```

```

*EOR
*PARAMETER SET 1(A=0.5, B=0.5)
* 000.10 010.08 010.08 015.10
EXPAND 40/0.5,0.5/
*EOR
*PARAMETER SET 2(A=0.15, B=0.85)
* 000.13 010.08 025.10 015.10
EXPAND 40/0.15,0.85/
*EOR
*PARAMETER SET 3(A=0.85, B=0.15)
* 000.09 010.08 005.08 015.10
EXPAND 40/0.85,0.15/

```

```

*EOR
*EOF

```

```

*****
* PROBLEM 41 *
*****

```

```

*EOR
*PARAMETER SET 1(A=-10.0, B=5)
* 000.02 002.02 000.00 006.04
EXPAND 41/-10.0,5/
*EOR
*PARAMETER SET 2(A=1.0, B=10)
* 000.02 002.02 000.00 006.04
EXPAND 41/1.0,10/
*EOR
*PARAMETER SET 3(A=-10.0, B=25)
* 000.02 002.02 000.00 006.04
EXPAND 41/-10.0,25/

```

```

*EOR
*EOF

```

```

*****
* PROBLEM 42 *
*****

```

```

*EOR
*PARAMETER SET 1(A=0.0, B=1.0, C=1.0)
* 000.04 000.00 000.02 010.10
EXPAND 42/0.0,1.0,1.0/
*EOR
*PARAMETER SET 2(A=-1.0, B=2.0, C=2.0)
* 000.05 000.00 000.05 010.15
EXPAND 42/-1.0,2.0,2.0/
*EOR
*PARAMETER SET 3(A=-1.0, B=2.0, C=5.0)
* 000.08 000.00 000.10 010.30
EXPAND 42/-1.0,2.0,5.0/

```

```

*EOR
*EOF

```

```

*****
* PROBLEM 43 *
*****

```

```

*EOR
*
* 000.02 000.00 000.00 005.04
2000220200020

```

```

1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1      UXX$ + UYY$ + UX$ = 0.
2      MIXED
2      X=0. ,           U=0.
2      X=3.14159265358979 , MIXED = (1.)U + (-1.)UY = G(Y)
2      Y=0. ,           U=0.
2      Y=3.14159265358979 , U=0.
3      FUNCTION TRUE(X,Y)
3      DATA PI, S502/3.14159265358979, 1.11803398875/
3      TRUE = EXP((PI-X)/2.)*SINH(S502*X)*SIN(Y)/SINH(S502*PI)
3      RETURN
3      END
3      FUNCTION SINH(X)
3      EXPX = EXP(X)
3      SINH = 0.5*(EXPX-1./EXPX)
3      RETURN
3      END
3      FUNCTION G(Y)
3      G = SIN(Y) - COS(Y)
3      RETURN
3      END

```

```

'EOR

```

```

'EOF

```

```

*****

```

```

* PROBLEM 44 *

```

```

*****

```

```

'EOR

```

```

*PARAMETER SET 1(A=1.425, B=1, C=.50, D=2)
*      008.03      010.03      000.00      005.02
EXPAND 44/1.425,1,.50,2,1/

```

```

'EOR

```

```

*PARAMETER SET 2(A=10.0, B=1, C=.50, D=2)
*      008.03      010.03      000.00      005.02
EXPAND 44/10.0,1,.50,2,2/

```

```

'EOR

```

```

*PARAMETER SET 3(A=1.425, B=2, C=.04, D=25)
*      008.02      010.03      000.00      000.00
EXPAND 44/1.425,2,.04,25,3/

```

```

'EOR

```

```

*PARAMETER SET 4(A=1.425, B=2, C=.50, D=2)
*      008.02      010.03      000.00      000.00
EXPAND 44/1.425,2,.50,2,4/

```

```

'EOR

```

```

'EOF

```

```

*****

```

```

* PROBLEM 45 *

```

```

*****

```

```

'EOR

```

```

*PARAMETER SET 1(A=2, B=1)
*      008.03      008.03      005.00      000.00
EXPAND 45/2.,1,1/

```

```

'EOR

```

```

*PARAMETER SET 2(A=1000, B=1)
*      008.14      008.03      005.00      010.60
EXPAND 45/1000.,1,2/

```

```

'EOR

```

```

*PARAMETER SET 3(A=2, B=2)
*      008.03      008.03      005.00      000.00
EXPAND 45/2.,2,3/

```

```

'EOR

```

```

'EOF

```

```

*****

```

```

* PROBLEM 46 *

```

```

*****

```

```

'EOR

```

```

*PARAMETER SET 1(A=1., B=2.)
*      008.05      000.00      000.00      010.20
EXPAND 46/1.,2.,1/

```

```

'EOR

```

```

*PARAMETER SET 2(A=4., B=2.)
*      008.06      000.00      000.00      010.25
EXPAND 46/4.,2.,2/

```

```

'EOR

```

```

*PARAMETER SET 3(A=1., B=10.)
* 008.07 010.00 000.00 010.30
EXPAND 46 4.,10.,3/
*EOF
*PARAMETER SET 4(A=3., B=2.)
* 003.00 000.00 000.00 010.37
EXPAND 46 3.,2.,4/

```

```

*EOF
*EOF
*****
* PROBLEM 47 *
*****
*EOF
*PARAMETER SET 1(A=3.0)
* 000.44 090.60 000.10 070.35
EXPAND 47/3./
*EOF
*PARAMETER SET 2(A=5.0)
* 000.34 080.50 000.00 060.15
EXPAND 47/5./
*EOF
*PARAMETER SET 3(A=7.0)
* 000.27 070.30 000.00 050.10
EXPAND 47/7./

```

```

*EOF
*EOF
*****
* PROBLEM 48 *
*****
*EOF
*PARAMETER SET 1(A=2, B=.04, C=1)
* 008.03 010.03 000.00 005.02
EXPAND 48/2,.04,1,1/
*EOF
*PARAMETER SET 2(A=25, B=.04, C=1)
* 003.04 010.03 000.00 005.04
EXPAND 48/25,0.04,1,2/
*EOF
*PARAMETER SET 3(A=2, B=.04, C=2)
* 008.04 010.03 000.00 005.04
EXPAND 48/2,.04,2,3/
*EOF
*PARAMETER SET 4(A=25, B=.04, C=2)
* 003.04 010.03 000.00 005.04
EXPAND 48/25,.04,2,4/
*EOF
*PARAMETER SET 5(A=2, B=.50, C=2)
* 008.04 010.03 000.00 005.04
EXPAND 48/2,.50,2,5/

```

```

*EOF
*EOF
*****
* PROBLEM 49 *
*****
*EOF
*PARAMETER SET 1(A=1, B=.50, C=2)
* 003.04 010.03 000.00 005.04
EXPAND 49/1,.50,2,1/
*EOF
*PARAMETER SET 2(A=1, B=.50, C=25)
* 003.14 010.03 000.00 020.50
EXPAND 49/1,.50,25,2/
*EOF
*PARAMETER SET 3(A=2, B=.04, C=2)
* 008.02 010.03 000.00 000.00
EXPAND 49/2,.04,2,3/
*EOF
*PARAMETER SET 4(A=2, B=.50, C=2)
* 008.02 010.03 000.00 000.00
EXPAND 49/2,.50,2,4/

```

```

*EOF
*EOF

```

```

*****
* PROBLEM 50 *
*****
*EOR
*
*      000.06      000.00      000.00      010.25
*      2022021202000
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1      POISSON $ LAPLACE
1      UXX$ + UYY$ = 0.
2      DIRICHLET
2      X=0. ,          U=SIN(3.14159265358979*Y)
2      X=3.14159265358979 , U=0.
2      Y=0. ,          U=0.75*SIN(X)-SIN(3.*X)
2      Y=1. ,          U=0.
3      FUNCTION TRUE(X,Y)
3      DATA PI/3.14159265358979/
3      T1 = 3.*SINH(1.-Y)*SIN(X)/(4.*SINH(1.))
3      T2 = SINH(3.*(1.-Y))*SIN(3.*X)/SINH(3.)
3      T3 = SINH(PI*(PI-X))*SIN(PI*Y)/SINH(PI*PI)
3      TRUE = T1 - T2 + T3
3      RETURN
3      END
3      FUNCTION SINH(X)
3      EXPX = EXP(X)
3      SINH = 0.5*(EXPX-1./EXPX)
3      RETURN
3      END

```

```

*EOR
*EOF
*****
* PROBLEM 51 *
*****
*EOR
*PARAMETER SET 1(A=0.3)
*      009.38      100.05      090.05      010.15
EXPAND 51/0.3,1/
*EOR
*PARAMETER SET 2(A=0.5)
*      009.37      100.05      090.05      010.10
EXPAND 51/0.5,2/
*EOR
*PARAMETER SET 3(A=0.6)
*      009.36      100.05      090.05      010.05
EXPAND 51/0.6,3/
*EOR
*PARAMETER SET 4(A=0.7)
*      009.35      100.05      090.05      010.05
EXPAND 51/0.7,4/

```

```

*EOR
*EOF
*****
* PROBLEM 52 *
*****
*EOR
*PARAMETER SET 1(A=2.)
*      008.06      010.05      005.00      010.05
EXPAND 52/2.,1/
*EOR
*PARAMETER SET 2(A=4.)
*      008.07      010.07      005.00      015.07
EXPAND 52/4.,2/
*EOR
*PARAMETER SET 3(A=49.)
*      008.15      010.25      005.00      015.35
EXPAND 52/49.,3/

```

```

*EOR
*EOF
*****
* PROBLEM 53 *
*****
*EOR
*PARAMETER SET 1(A=30.0, B=20.0)

```

```

*      000.19      000.00      000.00      005.30
EXPAND 53/10.,10./
*FOR
*PARAMETER SET 2(A=10.0, B=PI)
*      000.12      006.30      000.00      006.30
EXPAND 53/10.,3.14159265353979/
*FOR
*PARAMETER SET 3(A=10.0, B=10.0)
*      000.12      006.30      000.00      006.30
EXPAND 53/10.,10./
*FOR
*PARAMETER SET 4(A=20.0, B=10.0)
*      000.27      006.75      000.00      006.75
EXPAND 53/30.,10./

```

```

*FOR
*EOF
*****
* PROBLEM 54 *
*****
*FOR
*PARAMETER SET 1(A=0.5)
*      000.09      010.05      000.10      010.20
EXPAND 54/.5/
*FOR
*PARAMETER SET 2(A=0.9)
*      000.17      010.20      000.25      015.30
EXPAND 54/0.9/

```

```

*FOR
*EOF
*****
* PROBLEM 55 *
*****
*FOR
*PARAMETER SET 1(A=1., B=3., C=1)
*      008.13      000.00      005.20      020.35
EXPAND 55/1.,3.,1.1/
*FOR
*PARAMETER SET 2(A=3., B=2., C=1)
*      008.12      000.00      005.20      013.35
EXPAND 55/3.,2.,1.2/
*FOR
*PARAMETER SET 3(A=1., B=3., C=2)
*      008.15      000.00      005.20      027.40
EXPAND 55/1.,3.,2.3/
*FOR
*PARAMETER SET 4(A=6., B=2., C=2)
*      008.07      000.00      005.20      005.10
EXPAND 55/6.,2.,2.4/

```

```

*FOR
*EOF
*****
* PROBLEM 56 *
*****
*FOR
*PARAMETER SET 1(A=0, B=1)
*      050.53      100.80      030.35      050.25
EXPAND 56/0.1/
*FOR
*PARAMETER SET 2(A=0, B=4)
*      050.58      100.80      030.45      050.40
EXPAND 56/0.4/
*FOR
*PARAMETER SET 3(A=3, B=1)
*      050.53      100.80      030.35      050.25
EXPAND 56/3.1/
*FOR
*PARAMETER SET 4(A=3, B=4)
*      050.53      100.80      030.45      050.40
EXPAND 56/3.4/
*FOR
*PARAMETER SET 5(A=3, B=8)
*      050.53      100.80      030.45      050.45
EXPAND 56/3.8/

```

\$
ECR
ECF

```
*****
*
* ELLPACK PDE POPULATION MACRO FILE
*
* *****
```

MACFIL

MACFIL CONTAINS THE INFORMATION NEEDED TO FULFILL THE MACRO CALLS ORIGINATING IN EOPFIL.

MACFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,... ETC. THE END-OF-RECORD IS DESIGNATED BY *EOR (*EOR ON NON-CDC INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION OF MACFIL. RECORDS 1, 2, 3... CONTAIN THE INFORMATION NEEDED TO GENERATE THE ELLPACK PROGRAMS CORRESPONDING TO PROBLEMS 1, 2, 3... OF THE ELLPACK PDE POPULATION. ALTHOUGH SOME OF THE PROBLEMS ARE NOT PARAMETERIZED AND HENCE HAVE NO MACRO CALLS, YET, THERE ARE BURNY RECORDS FOR THESE PROBLEMS ON MACFIL SO THAT THE PROBLEM AND MACRO NUMBERS MAY BE IN A ONE-TO-ONE CORRESPONDENCE. RECORDS 1, 2, 3... HAVE THE FOLLOWING FORMAT:

LINE 1-3: LINES 1 THROUGH 3 CONTAIN THE MACRO NUMBER.

LINE 4: LINE 4 CONTAINS THE PROBLEM TYPE INFORMATION STARTING IN COLUMN 11 WHICH IS USED TO TEST THE COMPATIBILITY OF THE PROBLEM WITH THE ELLPACK ROUTINES SELECTED IN THE ENCODED PROGRAM (SEE ROUTINE COMPAT). THIS INFORMATION BECOMES A COMMENT IN THE GENERATED ELLPACK PROGRAM.

COMPAT USES THE PROBLEM TYPE INFO (PTYPE) AND DISCRETIZATION MODULE INFO (DMTYPE) TO DETERMINE WHETHER MODULE DISMOD IS COMPATIBLE WITH THE GIVEN PDE PROBLEM. THE NRTYPE (NOW 15) ITEMS IN THE ARRAY PTYPE AND IN EACH ROW OF THE TABLE DMTYPE HAVE THE FOLLOWING MEANINGS:

VALUE	PTYPE MEANING	DMTYPE MEANING
0	ITEM NOT PRESENT	ITEM MUST NOT BE PRESENT
1	ALWAYS MATCHES	ALWAYS MATCHES
2	ITEM PRESENT	ITEM MUST BE PRESENT

THE 14 ITEMS CURRENTLY CHECKED FOR COMPATIBILITY ARE:

CONCERNING THE OPERATOR

- 1 TWO DIMENSIONAL
- 2 THREE DIMENSIONAL
- 3 POLYGON EQUATION
- 4 LAPLACE EQUATION
- 5 UX OR UY TERMS
- 6 CONSTANT COEFFICIENTS
- 7 SELF-ADJOINT FORM
- 8 NONDETERMINISTIC
- 9 UNKNOWN

CONCERNING THE BOUNDARY CONDITIONS

- 10 DIRICHLET PROBLEM
- 11 ONE-SIDED PERIODELIC CONDITIONS
- 12 COMBINED CONDITIONS
- 13 UNKNOWN

CONCERNING THE GRID

- 14 UNIFORM GRID
- 15 UNKNOWN GRID

REMARKS LINE 1: THE REMAINING LINES OF THE RECORD CONTAIN THE MACRO CODES AND THE DISMOD, BOUNDARY, AND FORTRAN SEGMENTS OF THE GENERATED ELLPACK PROGRAM IN THE ABOVE ORDER. ALL MACRO CODES AND MACRO SEGMENTS ARE PRECEDED BY A 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 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1840. 1841. 1842. 1843. 1844. 1845. 1846. 1847. 1848. 1849. 1850. 1851. 1852. 1853. 1854. 1855. 1856. 1857. 1858. 1859. 1860. 1861. 1862. 1863. 1864. 1865. 1866. 1867. 1868. 1869. 1870. 1871. 1872. 1873. 1874. 1875. 1876. 1877. 1878. 1879. 1880. 1881. 1882. 1883. 1884. 1885. 1886. 1887. 1888. 1889. 1890. 1891. 1892. 1893. 1894. 1895. 1896. 1897. 1898. 1899. 1900. 1901. 1902. 1903. 1904. 1905. 1906. 1907. 1908. 1909. 1910. 1911. 1912. 1913. 1914. 1915. 1916. 1917. 1918. 1919. 1920. 1921. 1922. 1923. 1924. 1925. 1926. 1927. 1928. 1929. 1930. 1931. 1932. 1933. 1934. 1935. 1936. 1937. 1938. 1939. 1940. 1941. 1942. 1943. 1944. 1945. 1946. 1947. 1948. 1949. 1950. 1951. 1952. 1953. 1954. 1955. 1956. 1957. 1958. 1959. 1960. 1961. 1962. 1963. 1964. 1965. 1966. 1967. 1968. 1969. 1970. 1971. 1972. 1973. 1974. 1975. 1976. 1977. 1978. 1979. 1980. 1981. 1982. 1983. 1984. 1985. 1986. 1987. 1988. 1989. 1990. 1991. 1992. 1993. 1994. 1995. 1996. 1997. 1998. 1999. 2000. 2001. 2002. 2003. 2

WRITTEN BY TYPING A C IN COLUMN 2. FOR PORTABILITY PURPOSES,
THE END-OF-RECORD IS DETECTED BY THE PRESENCE OF A '-' (DASH)
IN COLUMN 1.

RELATED FILES: GENPGM, EONFIL, OPTFIL, GRDFIL, OUTFIL AND MODATA

```

-----
*EOR
*****
* MACRO 1 *
*****
*      20000020000020
1      TWO DIMENSIONS $ SELF-ADJOINT
1      EXP(X*Y)UXX$ + EXP(-X*Y)UYYS - 1./(1.+X+Y)U$ = F(X,Y)
2      MIXED
2      X=0. , MIXED = (1.)U + (-(&A))UX = GX0(Y)
2      X=1. , MIXED = (1.)U + ( &A )UX = GX1(Y)
2      Y=0. , MIXED = (1.)U + (-(&A))UY = GY0(X)
2      Y=1. , MIXED = (1.)U + ( &A )UY = GY1(X)
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI
3      DATA PI/3.14159265358979/
3      TRUE = .75*EXP(X*Y)*SIN(PI*X)*SIN(PI*Y)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI
3      PX = PI*X
3      PY = PI*Y
3      SPX = SIN(PX)
3      SPY = SIN(PY)
3      EXY = EXP(X*Y)
3      F = .75*(EXY*EXY*SPY*((2.*Y*Y-PI*PI)*SPX+3.*PI*Y*COS(PX)))+
3      $ PI*SPX*(X*COS(PY)-PI*SPY)-EXY*SPX*SPY/(1.+X+Y))
3      RETURN
3      END
3      FUNCTION GX0(Y)
3      COMMON /CONCOM/ PI
3      GX0 = -( &A )*PI*.75*SIN(PI*Y)
3      RETURN
3      END
3      FUNCTION GX1(Y)
3      COMMON /CONCOM/ PI
3      GX1 = -( &A )*PI*.75*EXP(Y)*SIN(PI*Y)
3      RETURN
3      END
3      FUNCTION GY0(X)
3      COMMON /CONCOM/ PI
3      GY0 = -( &A )*PI*.75*SIN(PI*X)
3      RETURN
3      END
3      FUNCTION GY1(X)
3      COMMON /CONCOM/ PI
3      GY1 = -( &A )*PI*.75*EXP(X)*SIN(PI*X)
3      RETURN
3      END
3      FUNCTION CDXU(X,Y)
3      CDXU = Y*EXP(X*Y)
3      RETURN
3      END
3      FUNCTION CDYU(X,Y)
3      CDYU = -X*EXP(-X*Y)
3      RETURN
3      END

```

```

-----
*EOR
*****
* MACRO 2 *
*****

```

```

-----
*EOR
*****
* MACRO 3 *
*****
*      2020021002002
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON

```

```

1      UXXS + UYYS = F(X,Y)
2      DIRICHLET $ HOMOGENEOUS
3      X=0. , U=0.
4      X=1. , U=0.
5      Y=0. , U=0.
6      Y=1. , U=0.
7      FUNCTION TRUE(X,Y)
8      COMMON /CONCOM/ C,CAA1,AM2,INITL
9      DATA INITL/1/
10     IF (INITL.EQ. 0) GO TO 10
11     C = 1./((&A)**((&A)/(1.-(&A))))
12     S -(&A)**(1./(1.-(&A))))**2
13     CAA1 = C*(&A)*((&A)-1.)
14     AM2 = &A-2.
15     INITL = 0
16 10 CONTINUE
17     TRUE = C*(X**(&A)-X)*(Y**(&A)-Y)
18     RETURN
19     END
20     FUNCTION F(X,Y)
21     COMMON /CONCOM/ C,CAA1,AM2,INITL
22     IF (INITL.EQ. 0) GO TO 10
23     C = 1./((&A)**((&A)/(1.-(&A))))
24     S -(&A)**(1./(1.-(&A))))**2
25     CAA1 = C*(&A)*((&A)-1.)
26     AM2 = &A-2.
27     INITL = 0
28 10 CONTINUE
29     IF ( X.EQ.0. .OR. Y.EQ.0. ) GO TO 20
30     F = CAA1*(X**AM2*(Y**(&A)-Y) +
31     S Y**AM2*(X**(&A)-X) )
32     RETURN
33 20 F = 0.
34     RETURN
35     END
-----
*EOR
*****
* MACRO 4 *
*****
*      2020021000020
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
2      UXXS + UYYS = 6.*X*Y*EXP(X+Y)*(X*Y+X+Y-3.)
3      MIXED
4      X=0. , MIXED = (1.)U + (-(&A)*(Y-Y*Y))UX = G(Y)
5      X=1. , U=0.
6      Y=0. , U=0.
7      Y=1. , U=0.
8      FUNCTION TRUE(X,Y)
9      TRUE = 3.*EXP(X+Y)*X*Y*(1.-X)*(1.-Y)
10     RETURN
11     END
12     FUNCTION G(Y)
13     TEMP = (Y-Y*Y)**2
14     G = -(&A)*TEMP*3.*EXP(Y)
15     RETURN
16     END
-----
*EOR
*****
* MACRO 5 *
*****
*      2000021002002
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS
2      4.UXXS + UYYS - (&A)US = F(X,Y)
3      DIRICHLET $ HOMOGENEOUS
4      X=0. , U=0.
5      X=1. , U=0.
6      Y=0. , U=0.
7      Y=1. , U=0.
8      FUNCTION TRUE(X,Y)
9      COMMON /CONCOM/ TWOPI
10     DATA TWOPI/6.28316530717953/
11     TRUE = 2.*X*(X-1.)*(COS(TWOPI*Y)-1.)
12     RETURN
13     END

```

```

3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ TWOPI
3      CTPY = COS(TWOPI*Y)
3      F = 2.*X*(X-1.)*(1.-(CTPY)-TWOPI*TWOPI*CTPY)
3      + 16.*(CTPY-1.)
3      RETURN
3      END
-----
*EOR
*****
* MACRO 6 *
*****
-----
*EOR
*****
* MACRO 7 *
*****
-----
*EOR
*****
* MACRO 8 *
*****
*      2020021002000
1      TWO DIMENSIONS & CONSTANT COEFFICIENTS & POISSON
1      UXXX + UYYY = D2P(X)*P(Y)+P(X)*D2P(Y)
3      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TRUE = P(X)*P(Y)
3      RETURN
3      END
3      FUNCTION P(X)
3      COMMON /CONCOM/ A,B
3      DATA A, B/1., 0./
3      X1 = &A
3      X2 = 1. - (&A)
3      IF (X .LT. X1) GO TO 1
3      IF (X .GT. X2) GO TO 2
3      DPHI = 3 - A
3      DX = X2 - X1
3      P = A + DPHI*(X-X1)**3/(DX**3)-3.*DPHI*(X-X1)**3*(X-X2)
3      + DX**4 + 3.*DPHI*(X-X1)**3*(X-X2)**2/DX**5
3      RETURN
3      1 P = A
3      RETURN
3      2 P = B
3      RETURN
3      END
3      FUNCTION D2P(X)
3      COMMON /CONCOM/ A,B
3      X1 = &A
3      X2 = 1. - (&A)
3      IF (X .LT. X1) GO TO 1
3      IF (X .GT. X2) GO TO 1
3      DPHI = 3 - A
3      DX = X2 - X1
3      C3 = DPHI/DX**3
3      C4 = -3.*DPHI/DX**4
3      C5 = 6.*DPHI/DX**5
3      D2P = 6.*C3*(X-X1)*6.*C4*(X-X1)*(X-X2)+
3      + 6.*C4*(X-X1)**2*6.*C5*(X-X1)*(X-X2)**2+
3      + 12.*C5*(X-X1)**2*(X-X2)*2.*C5*(X-X1)**3
3      RETURN
3      1 D2P = 0.
3      RETURN
3      END
-----
*EOR
*****
* MACRO 9 *
*****
*      2000020002000
1      TWO DIMENSIONS & CONSTANT COEFFICIENTS

```

```

1      UXXS + UYYS = 100.05 = .5*(GA**2-100.)*COSH(&A*Y)/COSH(&A)
2      DIRICHLET
3      X=0. , U=TRUE(X,Y)
4      X=1. , U=TRUE(X,Y)
5      Y=0. , U=TRUE(X,Y)
6      Y=1. , U=TRUE(X,Y)
7      FUNCTION TRUE(X,Y)
8      TPLE = .5*(COSH(10.*Y)/COSH(10.)+COSH(&A*Y)/COSH(&A))
9      RETURN
10     END
11     FUNCTION COSH(Z)
12     EXPZ = EXP(Z)
13     COSH = 0.5*(EXPZ+1./EXPZ)
14     RETURN
15     END

```

*EOR

* MACRO 10 *

```

*      2020021002002
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXXS + UYYS = F(X,Y)
2      DIRICHLET $ HOMOGENEOUS
2      X=0. , U=0.
2      X=1. , U=0.
2      Y=0. , U=0.
2      Y=1. , U=0.
3      FUNCTION TRUE(X,Y)
3      U = &A*((X-.5)**2+(Y-(.5))**2)
3      TRUE = EXP(U)*X*(X-1.)*Y*(Y-1.)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      TEMP = EXP(-&A*((X-.5)**2+(Y-(.5))**2))
3      UXX = TEMP*Y*(Y-1.)*(-2.*&A*(X-.5)*
3      $      (-2.*&A*X**3+3.*&A*X**2+(2.-&A)*X-1.))+
3      $      (-6.*&A*X**2+6.*&A*X+(2.-&A)))
3      UYY = TEMP*X*(X-1.)*(-2.*&A*(Y-.5)*
3      $      (-2.*&A*Y**3+2.*&A*(1.+&B)*Y**2+
3      $      2.*(1.-&A*&B)*Y-1.))+(-6.*&A*Y**2+
3      $      4.*&A*(1.+&B)*Y+2.*(1.-&A*&B)))
3      F = UXX + UYY
3      RETURN
3      END

```

*EOR

* MACRO 11 *

```

*      2020021002000
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1      UXXS + UYYS = F(X,Y)
2      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI
3      DATA PI/3.14159265358979/
3      TEMP = X*Y**2.
3      TEMP4 = TEMP**4
3      TPLE = SIN(GA*TEMP4*TEMP/(1.+TEMP4))
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI
3      H = X*Y**2.
3      P = GA**5
3      S = 1./PI**4
3      U = P/S
3      PI = 3.14159
3      PI = 5.70144
3      PI = 37.70863
3      S = 1./PI**4

```

```

3     SXX = 12 *W**2
3     S2 = S*S
3     S3 = S2*S
3     UX = (S*RX-R*SX)/S2
3     UXX = (S2*RX-R*S*SXX-2.*S*SX*RX+2.*R*SX**2)/S3
3     CAU = COS(AU)
3     SAU = SIN(AU)
3     UXX = (&A)*(CAU*UXX-(&A)*SAU*UX*UX)
3     F = 2.0*UXX
3     RETURN
3     END

```

*EOR

* MACRO 12 *

```

*      2000200002000
1      TWO DIMENSIONS
1      UXX$ + UYY$ + (1.+SIN(&A*X))UX$
1      - COS(&A*Y)U$ = F(X,Y)
2      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TRUE = COS(&B*Y)+SIN(&B*(X-Y))
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      BXMY = &B*(X-Y)
3      UX = &B*COS(BXMY)
3      B2 = (&B)*(&B)
3      UXX = -B2*SIN(BXMY)
3      U = COS(&B*Y)+SIN(BXMY)
3      UYY = -B2*U
3      F = UXX + UYY + (1.+SIN(&A*X))*UX
3      - COS(&A*Y)*U
3      RETURN
3      END

```

*EOR

* MACRO 13 *

*EOR

* MACRO 14 *

```

*      2000220002000
1      CONSTANT COEFFICIENTS
1      UXX$ + 2.UYY$ + 3.UX$ - 4.UY$ - U$ = F(X,Y)
2      DIRICHLET
2      X=0. , U=Y
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=0.
2      Y=1. , U=1. - 0.8*(&A) + (&A)*ABS(X-0.8)
3      FUNCTION TRUE(X,Y)
3      TRUE = Y*(1.-.8*(&A)**(2.-Y)+(&A)*ABS(X-.8)**(2.-Y)) +
3      $ X*Y*EXP(-X*Y)
3      $ *(Y-1.)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      Q = (2.-Y)*ALOG(ABS(X-.8))
3      P = 1.-.8*(&A)**(2.-Y) + (&A)*EXP(Q)
3      DXQ = (2.-Y)*G(X)/ABS(X-.8)
3      DXQ = -(2.-Y)*G(X)**2/(X-.8)**2
3      DYQ = -ALOG(ABS(X-.8))
3      DYYQ = 0.
3      DXP = &A*DXQ*EXP(Q)
3      DXXP = (&A)*DXQ*EXP(Q)+(&A)*DXQ**2*EXP(Q)
3      DYP = .8*ALOG(&A)*EXP((2.-Y)*ALOG(&A)) +
3      $ (&A)*DYQ*EXP(Q)
3      DYYP = -.8*ALOG(&A)**2*EXP((2.-Y)*ALOG(&A))+

```

```

3      S      &A*DYYO=EXP(0)+&A*DYO**2*EXP(0)
3      U = Y*P + X*EXP(-X*Y)*(Y*Y-Y)
3      UX = Y*DXXP + (1.-X*Y)*(Y*Y-Y)*EXP(-X*Y)
3      UXX = Y*DXXP-Y*(Y*Y-Y)*EXP(-X*Y)*(2.-X*Y)
3      UY = P + Y*DYP + X*EXP(-X*Y)*(2.*Y-1.-X*Y*(Y-1.))
3      UYY = 2.*DYP + Y*DYYP + X*EXP(-X*Y)*(2.-4.*X*Y+2.*X+
3      (X*Y)**2-X*X*Y)
3      F = UXX + 2.*UYY + 3.*UX -4.*UY - U
3      RETURN
3      END
3      FUNCTION G(Y)
3      G = 1.
3      IF ( Y .LE. .8 ) G = -1.
3      RETURN
3      END

```

!EOR

* MACRO 15 *

```

*      2000200002000
1      TWO DIMENSIONS
1      UXXS + UYYS + (&A)/(Y+(&C))UY$ = F(X,Y)
2      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TRUE = (Y**(&B) + COS(X*Y*Y)-1.)*X*X*(X-1.):**2
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      F1 = Y**&B + COS(X*Y*Y) - 1.
3      DXF1 = -Y*Y*SIN(X*Y*Y)
3      DXXF1 = -Y**4*COS(X*Y*Y)
3      F2 = X*X*(X-1.)*(X-1.)
3      DXF2 = 4.*X**3 - 6.*X*X + 2.*X
3      DXXF2 = 12.*X*X - 12.*X + 2.
3      UX = DXF1*F2 + F1*DXF2
3      UXX = DXXF1*F2 + DXF1*DXXF2 + DXF1*DXF2 + F1*DXXF2
3      DYF1 = &B*Y**(&B-1.)-2.0*X*Y*SIN(X*Y*Y)
3      DYYF1 = &B*(&B-1.)*Y**(&B-2.))-2.0*X*SIN(X*Y*Y)-
3      (2.0*X*Y)**2*COS(X*Y*Y)
3      S      UY = DYF1*F2
3      UYY = DYYF1*F2
3      F = UXX + UYY + (&A)/(Y+(&C))*UY
3      RETURN
3      END

```

!EOR

* MACRO 16 *

```

*      2000200002002
1      TWO DIMENSIONS
1      UXXS + UYYS + (500./(250.*Y-1.))UY$ = -1./&B**2
2      DIRICHLET $ HOMOGENEOUS
2      X=0. , U=0.
2      X=&B , U=0.
2      Y=0. , U=0.
2      Y=&B , U=0.
3      FUNCTION TRUE(X,Y)

```

```

3C      *****
3C      *
3C      *      MACRO 16 PARAMETERS      *
3C      *
3C      *****
3C      *
3C      *      A   I   B
3C      *      ---I---
3C      *      1   I   1
3C      *      *   I
3C      *      10  I   2
3C      *

```


0	000000	000000	000000	000000	000000	000000
1	000001	000001	000001	000001	000001	000001
2	000002	000002	000002	000002	000002	000002
3	000003	000003	000003	000003	000003	000003
4	000004	000004	000004	000004	000004	000004
5	000005	000005	000005	000005	000005	000005
6	000006	000006	000006	000006	000006	000006
7	000007	000007	000007	000007	000007	000007
8	000008	000008	000008	000008	000008	000008
9	000009	000009	000009	000009	000009	000009
10	000010	000010	000010	000010	000010	000010
11	000011	000011	000011	000011	000011	000011
12	000012	000012	000012	000012	000012	000012
13	000013	000013	000013	000013	000013	000013
14	000014	000014	000014	000014	000014	000014
15	000015	000015	000015	000015	000015	000015
16	000016	000016	000016	000016	000016	000016
17	000017	000017	000017	000017	000017	000017
18	000018	000018	000018	000018	000018	000018
19	000019	000019	000019	000019	000019	000019
20	000020	000020	000020	000020	000020	000020
21	000021	000021	000021	000021	000021	000021
22	000022	000022	000022	000022	000022	000022
23	000023	000023	000023	000023	000023	000023
24	000024	000024	000024	000024	000024	000024
25	000025	000025	000025	000025	000025	000025
26	000026	000026	000026	000026	000026	000026
27	000027	000027	000027	000027	000027	000027
28	000028	000028	000028	000028	000028	000028
29	000029	000029	000029	000029	000029	000029
30	000030	000030	000030	000030	000030	000030
31	000031	000031	000031	000031	000031	000031
32	000032	000032	000032	000032	000032	000032
33	000033	000033	000033	000033	000033	000033
34	000034	000034	000034	000034	000034	000034
35	000035	000035	000035	000035	000035	000035
36	000036	000036	000036	000036	000036	000036
37	000037	000037	000037	000037	000037	000037
38	000038	000038	000038	000038	000038	000038
39	000039	000039	000039	000039	000039	000039
40	000040	000040	000040	000040	000040	000040
41	000041	000041	000041	000041	000041	000041
42	000042	000042	000042	000042	000042	000042
43	000043	000043	000043	000043	000043	000043
44	000044	000044	000044	000044	000044	000044
45	000045	000045	000045	000045	000045	000045
46	000046	000046	000046	000046	000046	000046
47	000047	000047	000047	000047	000047	000047
48	000048	000048	000048	000048	000048	000048
49	000049	000049	000049	000049	000049	000049
50	000050	000050	000050	000050	000050	000050
51	000051	000051	000051	000051	000051	000051
52	000052	000052	000052			

```

3 $ .039452, .033203, .035241, .033474, .029760, .024867,
3 $ .018546, .010412, .000000, .000000, .008743, .015339,
3 $ .020326, .024124, .026938, .029070, .030554, .031494,
3 $ .031955, .031955, .031494, .030554, .029070, .026968,
3 $ .024124, .020326, .015339, .008743, .000000, .000000,
3 $ .006701, .011414, .014841, .017417, .019320, .020716,
3 $ .021698, .022318, .022623, .022623, .022318, .021698,
3 $ .020716, .019320, .017417, .014841, .011414, .006701,
3 $ .000000, .000000, .004005, .006463, .008163, .009448,
3 $ .010383, .011066, .011545, .011846, .011994, .011994,
3 $ .011846, .011545, .011066, .010383, .009448, .008163,
3 $ .006463, .004005, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000/

```

```

3C
3C INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3 CALL QUADRD(X,Y, TABLE, GRID&A, GRID&A, NGRID, NGRID, NGRDD, NGRDD,
3 $ DERUSL)
3C
3 TRUE = DERUSL(6)
3C
3 RETURN
3 END

```

```

*EOR
*****
* MACRO 17 *
*****
* 2020021002000
1 TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ POISSON
1 UXX$ + UYY$ = F(X,Y)
2 X=0. , U=TRUE(X,Y)
2 X=1. , U=TRUE(X,Y)
2 Y=0. , U=TRUE(X,Y)
2 Y=1. , U=TRUE(X,Y)
3 FUNCTION TRUE (X,Y)
3 COMMON /CONCOM/ A,B
3 DATA A,B /&A,&B/
3 BX3 = (B*X)**3
3 TRUE = SIN(X-Y+.5) + EXP(-Y*Y-(A*BX3/(1.+BX3))**2)
3 RETURN
3 END
3 FUNCTION F (X,Y)
3 COMMON /CONCOM/ A,B
3 BX = (B*X)**3
3 DDH = 6.*X*B**3
3 DH = DDH*X/2.
3 H = 1. + DH*X/3.
3 G = A*(H-1.)
3 DG = A*DH
3 FE = G/H
3 DDG = A*DDH
3 DFE = DG/H - G*DH/(H**2)
3 DDFE = (H*DDG - 2.*DG*DH - G*DDH + 2.*G*DH*DH/H)/H**2
3 S = FE*FE
3 DS = 2.*FE*DFE
3 DDS = 2.*(FE*DDFE + DFE*DFE)
3 SINXY = SIN(X-Y+.5)
3 EE = EXP(-Y*Y-S)
3 UXX = -SINXY - EE*(DDS-DS*DS)
3 UYY = -SINXY - EE*2.*(1.-2.*Y*Y)
3 F = UXX + UYY
3 RETURN
3 END

```

```

*EOR
*****
* MACRO 18 *
*****
* 2000200002000
1 TWO DIMENSIONS
1 UXX$ + (1.+X*Y)UYY$ + COS(X)UX$ - EXP(-X)UY$ + 3.U$ = F(X,Y)
2 DIRICHLET
2 X=0. , U=TRUE(X,Y)

```

```

2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ A,B
3      DATA A,B /&A,&B/
3      BX3 = (B*X)**3
3      TRUE = EXP(-Y*Y-(A*BX3/(1.+BX3))**2)+SIN(X-Y+.5)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ A,B
3      BX = (B*X)**3
3      DDH = 6.*X*B**3
3      DH = DDH*X/2.
3      H = 1. + DH*X/3.
3      G = A*(H-1.)
3      DG = A*DH
3      DDG = A*DDH
3      FE = G/H
3      DFE = DG/H - G*DH/(H**2)
3      DDFE = (H*DDG - 2.*DG*DH - G*DDH + 2.*G*DH*DH/H)/H**2
3      S = FE*FE
3      DS = 2.*FE*DFE
3      DDS = 2.*(FE*DDFE + DFE*DFE)
3      SINXY = SIN(X-Y+.5)
3      EE = EXP(-Y*Y-S)
3      UXX = -SINXY - EE*(DDS-DS*DS)
3      UYY = -SINXY - EE*2.*(1.-2.*Y*Y)
3      UX = -2.*DFE*FE*EE + COS(X-Y+.5)
3      UY = -2.*Y*EE - COS(X-Y+.5)
3      U = TRUE(X,Y)
3      F = UXX + (1.+X*Y)*UYY + COS(X)*UX-EXP(-X)*UY+3.*U
3      RETURN
3      END

```

```

-----
* 192
* *****
* PRO 19 *
* *****
*      2000002000202
1      TWO DIMENSIONS $ SELF-ADJOINT
1      W(X,Y)UXX$ + W(X,Y)UYY$ = F(X,Y)
2      HOMOGENEOUS
2      X=0.5 , UX=0.
2      X=1.0 , U =0.
2      Y=0.5 , UY=0.
2      Y=1.0 , U =0.
3      FUNCTION W(X,Y)
3      COMMON /CONCOM/ PI
3      DATA PI/3.14159265358979/
3      W = ((PI*COS(PI*X)*SIN(PI*Y))**2 +
3      S (PI*SIN(PI*X)*COS(PI*Y))**2)**&A
3      RETURN
3      END
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI
3      TRUE = SIN(PI*X)*SIN(PI*Y)
3      RETURN
3      END
3      FUNCTION CDXU(X,Y)
3      COMMON /CONCOM/ PI
3      CDXU = (&A)*W(X,Y)**(1.-1./(&A))*PI*PI*SIN(2.*PI*X)*
3      S COS(2.*PI*Y)
3      RETURN
3      END
3      FUNCTION CDYU(X,Y)
3      COMMON /CONCOM/ PI
3      CDYU = CDXU(Y,X)
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI
3      PI2 = PI * PI
3      SINPIX = SIN(PI*X)
3      SINPIY = SIN(PI*Y)

```

```

3   COSPIX = COS(PI*X)
3   COSPIY = COS(PI*Y)
3   TU = SINPIX*SINPIY
3   TUX = PI*SINPIY*SINPIY
3   TUX = -PI*TU
3   TUY = PI*SINPIX*COSPIY
3   TUY = -PI*TU
3   F = U(X,Y)*(TUX + TUY) + CDUX(X,Y)*TUX + CDUY(X,Y)*TUY
3   RETURN
3   END

```

*EOR

* MACRO 20 *

```

*       2000000002000
1       TWO DIMENSIONS
1       UWS = UYS = EXP(TRUE(X,Y))U$ = F(X,Y)
2       DIRICHLET
2       X=0.0 , U=TRUE(X,Y)
2       X=0.5 , U=TRUE(X,Y)
2       Y=0.0 , U=TRUE(X,Y)
2       Y=0.75 , U=TRUE(X,Y)
3       FUNCTION TRUE(X,Y)
3       TRUE = 10.*PHI(X)*PHI(Y) + (&A)
3       RETURN
3       END
3       FUNCTION F(X,Y)
3       U = 10.*PHI(X)*PHI(Y) + (&A)
3       W = EXP(U)
3       UXX = 10.*DDPHI(X)*PHI(Y)
3       UYY = 10.*PHI(X)*DDPHI(Y)
3       F = UXX + UYY - UWU
3       RETURN
3       END
3       FUNCTION PHI(Z)
3       PHI = (Z-1.)*Z*EXP(-100.*(Z-.5)**2)
3       RETURN
3       END
3       FUNCTION DDPHI(Z)
3       DH = -200.*(Z-.5)
3       DG = 2.*Z-1.
3       H = (Z-.5)*DH/2.
3       G = Z*(Z-1.)
3       DDPHI = (-200.*G + 2.*DH*DG + DH*DH*G + 2.)*EXP(H)
3       RETURN
3       END

```

*EOR

* MACRO 21 *

*EOR

* MACRO 22 *

*EOR

* MACRO 23 *

```

*       2000200000200
1       TWO DIMENSIONS
1       USC(X,Y)UWS + USC(X,Y)UYS + DXUSC(X,Y)UXS +
1       DXUSC(X,Y)UYS = F(X,Y)
2       X=0. , U=0.
2       X=1. , U=0.
2       Y=0. , U=TRUE(X,Y)
2       Y=1. , U=TRUE(X,Y)
3       FUNCTION TRUE(X,Y)
3       COSPIX = COS(PI*X)
3       COSPIY = COS(PI*Y)
3       PHI = PI/3.14159265359
3       TRUE = COS(PI*X)*COS(PI*Y)
3       RETURN
3       END

```

[illegible]

```

3      END
3      FUNCTION DXW3(X,Y)
3      COMMON /CONCOM/ PI
3      UX = -PI*SIN(PI*X)*(P(Y)+1.)
3      UY = COS(PI*X)*D1P(Y)
3      H = SQRT(UX*UX + UY*UY)
3      UXX = -PI*PI*COS(PI*X)*(P(Y)+1.)
3      UXY = -PI*SIN(PI*X)*D1P(Y)
3      HX = (UX*UX+UY*UY)/H
3      DXW3 = (&A)*(&B)*SECH((&B)*H)**2*HX/H
3      S      -(&A)*TANH((&B)*H)*HX/H**2
3      RETURN
3      END
3      FUNCTION DYW3(X,Y)
3      COMMON /CONCOM/ PI
3      UX = -PI*SIN(PI*X)*(P(Y)+1.)
3      UY = COS(PI*X)*D1P(Y)
3      H = SQRT(UX*UX + UY*UY)
3      UYY = COS(PI*X)*D2P(Y)
3      UXY = -PI*SIN(PI*X)*D1P(Y)
3      HY = (UX*UY+UY*UYY)/H
3      S      *EXP(H/((&A)+(&B)*H))
3      DYW3 = (&A)*(&B)*SECH((&B)*H)**2*HY/H
3      S      -(&A)*TANH((&B)*H)*HY/H**2
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      COMMON /CONCOM/ PI
3      UX = -PI*SIN(PI*X)*(P(Y)+1.)
3      UXX = -PI*PI*COS(PI*X)*(P(Y)+1.)
3      UY = COS(PI*X)*D1P(Y)
3      UYY = COS(PI*X)*D2P(Y)
3      F = MAC(X,Y)*(UXX+UYY)+DXW&C(X,Y)*UX+DYW&C(X,Y)*UY
3      RETURN
3      END
3      FUNCTION P(X)
3      DATA A, B, C /1.0, 0.0, &D/
3      X1 = .5 - C
3      X2 = .5 + C
3      IF (X .LT. X1) GO TO 1
3      IF (X .GT. X2) GO TO 2
3      DPHI = B - A
3      DX = X2 - X1
3      P = A + DPHI*(X-X1)**3/(DX**3)-3.*DPHI*(X-X1)**3*(X-X2)
3      S      /DX**4 + 6.*DPHI*(X-X1)**3*(X-X2)**2/DX**5
3      RETURN
3      1 P = A
3      RETURN
3      2 P = B
3      RETURN
3      END
3      FUNCTION D1P(X)
3      DATA A, B, C /1.0, 0.0, &D/
3      X1 = .5 - C
3      X2 = .5 + C
3      IF (X .LT. X1) GO TO 1
3      IF (X .GT. X2) GO TO 1
3      DPHI = B - A
3      DX = X2 - X1
3      D1P = 3.*DPHI*(X-X1)**2/(DX**3)-9.*DPHI*(X-X1)**2*(X-X2)
3      S      /DX**4 +18.*DPHI*(X-X1)**2*(X-X2)**2/DX**5
3      S      -3.*DPHI*(X-X1)**3/DX**4
3      S      +12.*DPHI*(X-X1)**3*(X-X2)/DX**5
3      RETURN
3      1 D1P = 0.
3      RETURN
3      END
3      FUNCTION D2P(X)
3      DATA A, B, C /1.0, 0.0, &D/
3      X1 = .5 - C
3      X2 = .5 + C
3      IF (X .LT. X1) GO TO 1
3      IF (X .GT. X2) GO TO 1
3      DPHI = B - A
3      DX = X2 - X1
3      C3 = DPHI/DX**3

```

```

3      C4 = -3.*DPHI/DX**4
3      C5 = 6.*DPHI/DX**5
3      D2P = 6.*C3*(X-X1)+6.*C4*(X-X1)*(X-X2)+
3      $      6.*C4*(X-X1)**2+6.*C5*(X-X1)*(X-X2)**2+
3      $      12.*C5*(X-X1)**2*(X-X2)
3      $      +      2.*C5*(X-X1)**3
3      RETURN
3      1 D2P = 0.
3      RETURN
3      END
-----
*EOR
*****
* MACRO 24 *
*****
*      2000200000022
1      TWO DIMENSIONS
1      UXX$ + UYY$ + W(X,Y)UX$ = F(X,Y)
2      MIXED $ HOMOGENEOUS
2      X=0.1 , MIXED = (&B)U + (1.)UX + (1.)UY = 0.
2      X=1.0 , MIXED = (&B)U + (1.)UX + (1.)UY = 0.
2      Y=0.1 , MIXED = (&B)U + (1.)UX + (1.)UY = 0.
2      Y=1.0 , MIXED = (&B)U + (1.)UX + (1.)UY = 0.
3      FUNCTION TRUE(X,Y)
3C
3C *****
3C *
3C *
3C *      MACRO 24 PARAMETERS
3C *
3C *****
3C *
3C *      A      I      B      I      C      I      D
3C *      ---I---I---I---I---I---I---
3C *      0.25 I      100 I      -0.10 I      1
3C *      I      I      I      I
3C *      0.25 I      1000 I      -0.10 I      2
3C *      I      I      I      I
3C *      0.50 I      1 I      -0.01 I      3
3C *      I      I      I      I
3C *      0.50 I      10 I      -0.10 I      4
3C *      I      I      I      I
3C *      1.00 I      1 I      -0.10 I      5
3C *      I      I      I      I
3C *      1.00 I      10 I      -0.10 I      6
3C *      I      I      I      I
3C *      1.00 I      100 I      -1.00 I      7
3C *      I      I      I      I
3C *      1.00 I      1000 I      -1.00 I      8
3C *
3C *****
3C
3      REAL DERUSL(6), GRID(20), TABLE(20,20),
3      $      T1B1(100), T1B2(100), T1B3(100), T1B4(100),
3      $      T2B1(100), T2B2(100), T2B3(100), T2B4(100),
3      $      T3B1(100), T3B2(100), T3B3(100), T3B4(100),
3      $      T4B1(100), T4B2(100), T4B3(100), T4B4(100),
3      $      T5B1(100), T5B2(100), T5B3(100), T5B4(100),
3      $      T6B1(100), T6B2(100), T6B3(100), T6B4(100),
3      $      T7B1(100), T7B2(100), T7B3(100), T7B4(100),
3      $      T8B1(100), T8B2(100), T8B3(100), T8B4(100)
3      EQUIVALENCE (TABLE(1, 1), T&DB1(1)),
3      $      (TABLE(1, 6), T&DB2(1)),
3      $      (TABLE(1, 11), T&DB3(1)),
3      $      (TABLE(1, 16), T&DB4(1))
3      DATA NGRID, NGRDD/20, 20/
3      DATA GRID/0.1000000, 0.1473584, 0.1947368, 0.2421053,
3      $0.2894737, 0.3368421, 0.3842105, 0.4315789, 0.4789474,
3      $0.5263158, 0.5736842, 0.6210526, 0.6684211, 0.7157895,
3      $0.7631579, 0.8105263, 0.8578948, 0.9052632, 0.9526316,
3      $1.0000000/
3C
3C APPROXIMATE SOLUTION OF PROBLEM USING
3C P3-C1 COLLOCATION (8 X 8 GRID)
3C
3      DATA T1B1/ 5.947140, -1.985312, -1.841555, -.643261, -.367066,
3      $ -1.275830, -.190552, -.135905, -.104104, -.079619, -.062147,

```


3	3.515533	3.515533	2.100000	1.100000	1.100000	-.224795
3	3.515533	3.515533	2.100000	1.100000	1.100000	.074850
3	3.515533	3.515533	2.100000	1.100000	1.100000	.206112
3	3.515533	3.515533	2.100000	1.100000	1.100000	.028195
3	3.515533	3.515533	2.100000	1.100000	1.100000	1.614179
3	3.515533	3.515533	2.100000	1.100000	1.100000	.373727
3	3.515533	3.515533	2.100000	1.100000	1.100000	.087116
3	3.515533	3.515533	2.100000	1.100000	1.100000	2.630706
3	3.515533	3.515533	2.100000	1.100000	1.100000	.619323
3	3.515533	3.515533	2.100000	1.100000	1.100000	.163779
3	3.515533	3.515533	2.100000	1.100000	1.100000	
3	DATA T222	-1.100000	2.073944	2.380035	1.783290	1.480917
3	3.515533	3.515533	2.100000	1.100000	1.100000	.402125
3	3.515533	3.515533	2.100000	1.100000	1.100000	.091411
3	3.515533	3.515533	2.100000	1.100000	1.100000	2.055954
3	3.515533	3.515533	2.100000	1.100000	1.100000	.588502
3	3.515533	3.515533	2.100000	1.100000	1.100000	.161816
3	3.515533	3.515533	2.100000	1.100000	1.100000	-.074921
3	3.515533	3.515533	2.100000	1.100000	1.100000	.808216
3	3.515533	3.515533	2.100000	1.100000	1.100000	.249129
3	3.515533	3.515533	2.100000	1.100000	1.100000	.026516
3	3.515533	3.515533	2.100000	1.100000	1.100000	1.037326
3	3.515533	3.515533	2.100000	1.100000	1.100000	.348715
3	3.515533	3.515533	2.100000	1.100000	1.100000	.078259
3	3.515533	3.515533	2.100000	1.100000	1.100000	1.287842
3	3.515533	3.515533	2.100000	1.100000	1.100000	.451155
3	3.515533	3.515533	2.100000	1.100000	1.100000	.134649
3	3.515533	3.515533	2.100000	1.100000	1.100000	
3	DATA T223	-1.100000	1.157950	1.093350	.337760	.794484
3	3.515533	3.515533	2.100000	1.100000	1.100000	.268000
3	3.515533	3.515533	2.100000	1.100000	1.100000	.006987
3	3.515533	3.515533	2.100000	1.100000	1.100000	.638900
3	3.515533	3.515533	2.100000	1.100000	1.100000	.366933
3	3.515533	3.515533	2.100000	1.100000	1.100000	.110732
3	3.515533	3.515533	2.100000	1.100000	1.100000	-.033318
3	3.515533	3.515533	2.100000	1.100000	1.100000	.442323
3	3.515533	3.515533	2.100000	1.100000	1.100000	.153903
3	3.515533	3.515533	2.100000	1.100000	1.100000	.018310
3	3.515533	3.515533	2.100000	1.100000	1.100000	.510408
3	3.515533	3.515533	2.100000	1.100000	1.100000	.193312
3	3.515533	3.515533	2.100000	1.100000	1.100000	.048775
3	3.515533	3.515533	2.100000	1.100000	1.100000	.583693
3	3.515533	3.515533	2.100000	1.100000	1.100000	.231927
3	3.515533	3.515533	2.100000	1.100000	1.100000	.071613
3	3.515533	3.515533	2.100000	1.100000	1.100000	
3	DATA T224	-1.100000	.530350	.490835	.334416	.349311
3	3.515533	3.515533	2.100000	1.100000	1.100000	.132241
3	3.515533	3.515533	2.100000	1.100000	1.100000	.031972
3	3.515533	3.515533	2.100000	1.100000	1.100000	.384559
3	3.515533	3.515533	2.100000	1.100000	1.100000	.140312
3	3.515533	3.515533	2.100000	1.100000	1.100000	.044875
3	3.515533	3.515533	2.100000	1.100000	1.100000	-.013019
3	3.515533	3.515533	2.100000	1.100000	1.100000	.135284
3	3.515533	3.515533	2.100000	1.100000	1.100000	.046703
3	3.515533	3.515533	2.100000	1.100000	1.100000	.000079
3	3.515533	3.515533	2.100000	1.100000	1.100000	.100047
3	3.515533	3.515533	2.100000	1.100000	1.100000	.055405
3	3.515533	3.515533	2.100000	1.100000	1.100000	.000702
3	3.515533	3.515533	2.100000	1.100000	1.100000	.003713
3	3.515533	3.515533	2.100000	1.100000	1.100000	.001086
3	3.515533	3.515533	2.100000	1.100000	1.100000	.000335
3	3.515533	3.515533	2.100000	1.100000	1.100000	
3	DATA T225	3.100000	5.000000	5.000000	5.000000	5.757216
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.102871
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.624572
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.664113
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.351068
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.110431
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.649127
3	3.515533	3.515533	2.100000	1.100000	1.100000	5.227086
3	3.515533	3.515533	2.100000	1.100000	1.100000	4.599083
3	3.515533	3.515533	2.100000	1.100000	1.100000	4.757131

3	\$	4.709017,	5.279072,	5.255042,	5.123515,	5.139446,	5.086925,
3	\$	5.445185,	5.112532,	4.973527,	4.944502,	4.911714,	4.877390,
3	\$	4.812724,	4.807724,	4.771075,	4.734270,	4.693202,	4.656661,
3	\$	4.617319,	4.576123,	4.534030,	4.493706,	4.452240,	4.410555,
3	\$	4.214550,	4.177537,	4.143545,	4.112430,	4.081305,	4.050049,
3	\$	4.020203,	4.033291,	4.050056,	4.063325,	4.076229,	4.088929,
3	\$	4.091113,	4.104431,	4.117503,	4.130519,	4.143463,	4.156335,
3C	DATA T3B2/	4.309702,	4.787270,	4.749067,	4.703533,	4.677064,	
3	\$	4.347602,	4.319420,	4.291534,	4.263552,	4.235432,	4.206419,
3	\$	4.476671,	4.445121,	4.414351,	4.383733,	4.353448,	4.323228,
3	\$	4.277054,	4.253331,	4.2301431,	4.207234,	4.184603,	4.162293,
3	\$	4.513307,	4.483690,	4.453553,	4.423081,	4.392342,	4.361418,
3	\$	4.375015,	4.342723,	4.310503,	4.278268,	4.245782,	4.213559,
3	\$	4.184713,	4.150943,	4.117543,	4.084551,	4.051304,	4.017801,
3	\$	4.063333,	4.034322,	4.0027911,	3.970433,	3.938176,	3.905903,
3	\$	4.237172,	4.212653,	4.188504,	4.164583,	4.140827,	4.117233,
3	\$	4.025533,	4.007044,	3.988032,	3.968508,	3.948513,	3.928063,
3	\$	3.803072,	3.781943,	3.760652,	3.739276,	3.717812,	3.696261,
3	\$	4.119763,	4.090763,	4.070349,	4.049325,	4.027537,	4.004816,
3	\$	3.031191,	3.055315,	3.030359,	3.005223,	2.979819,	2.954089,
3	\$	3.311037,	3.281513,	3.251725,	3.221714,	3.191481,	3.160915,
3	\$	3.033277,	3.055573,	3.047210,	3.023309,	3.011333,	3.001520,
3	\$	3.872493,	3.851005,	3.829279,	3.806423,	3.781433,	3.756458,
3	\$	3.720707,	3.700825,	3.672144,	3.640623,	3.607451,	
3C	DATA T3B3/	3.877033,	3.853012,	3.823948,	3.782205,	3.806255,	
3	\$	3.791149,	3.774335,	3.757511,	3.730733,	3.721834,	3.702265,
3	\$	3.681835,	3.660546,	3.637648,	3.612971,	3.583754,	3.561755,
3	\$	3.554039,	3.504234,	3.472624,	3.417270,	3.693190,	3.682543,
3	\$	3.667730,	3.653633,	3.639273,	3.624933,	3.608698,	3.593554,
3	\$	3.577019,	3.559065,	3.540186,	3.520423,	3.499083,	3.476846,
3	\$	3.453141,	3.427792,	3.401390,	3.372998,	3.342801,	3.311981,
3	\$	3.510072,	3.522833,	3.519818,	3.507435,	3.494097,	3.481631,
3	\$	3.467638,	3.452553,	3.438020,	3.421183,	3.403670,	3.385748,
3	\$	3.385473,	3.345030,	3.322346,	3.293567,	3.274129,	3.246930,
3	\$	3.217744,	3.416369,	3.401356,	3.382281,	3.375647,	3.365409,
3	\$	3.353359,	3.342176,	3.329652,	3.318277,	3.302416,	3.287298,
3	\$	3.271273,	3.254354,	3.235003,	3.216396,	3.195974,	3.173656,
3	\$	3.151123,	3.124622,	3.097189,	3.273321,	3.260527,	3.249165,
3	\$	3.233031,	3.223113,	3.213415,	3.202230,	3.198810,	3.184355,
3	\$	3.172160,	3.153105,	3.143348,	3.128763,	3.110840,	3.093186,
3	\$	3.073970,	3.052822,	3.031203,	3.007057,	2.980859,	
3C	DATA T3B4/	3.135695,	3.124831,	3.114472,	3.105507,	3.096761,	
3	\$	3.037111,	3.073031,	3.067706,	3.056363,	3.045365,	3.032543,
3	\$	3.019063,	3.005129,	2.993235,	2.973095,	2.955378,	2.935807,
3	\$	2.915729,	2.893150,	2.863483,	3.001409,	2.962223,	2.983625,
3	\$	2.975611,	2.957704,	2.933510,	2.950949,	2.941769,	2.931920,
3	\$	2.921449,	2.910116,	2.897937,	2.884962,	2.870906,	2.855858,
3	\$	2.833324,	2.822049,	2.803101,	2.782411,	2.753750,	2.870533,
3	\$	2.854035,	2.855863,	2.850000,	2.843287,	2.835493,	2.826379,
3	\$	2.820014,	2.810683,	2.801938,	2.791358,	2.780291,	2.768559,
3	\$	2.755773,	2.742130,	2.727762,	2.711345,	2.694304,	2.675485,
3	\$	2.654323,	2.741534,	2.733331,	2.732740,	2.727044,	2.721161,
3	\$	2.714401,	2.707630,	2.700452,	2.692271,	2.684229,	2.674873,
3	\$	2.664000,	2.654833,	2.643020,	2.630655,	2.617759,	2.603157,
3	\$	2.607953,	2.570344,	2.551876,	2.613552,	2.614955,	2.611756,
3	\$	2.573012,	2.531710,	2.533016,	2.533309,	2.533371,	2.576355,
3	\$	2.503315,	2.530704,	2.551972,	2.542378,	2.532431,	2.521557,
3	\$	2.503313,	2.497112,	2.483354,	2.468395,	2.451939,	
3C	DATA T4B1/	3.462363,	5.949113,	3.823557,	2.655458,	1.787509,	
3	\$	1.112302,	.636356,	.354194,	.122357,	-.020320,	-.118090,
3	\$	-.170702,	-.163930,	-.193255,	-.190123,	-.173379,	-.154116,
3	\$	-.132877,	-.112365,	-.093603,	.6273022,	4.974931,	3.467265,
3	\$	2.412137,	1.671142,	1.114009,	.719227,	.431290,	.223331,
3	\$	.035165,	-.011455,	-.071247,	-.102534,	-.120311,	-.122214,
3	\$	-.116703,	-.103703,	-.094734,	-.082179,	-.070075,	5.254363,
3	\$	4.003050,	2.307626,	2.049790,	1.455449,	1.012945,	.685674,
3	\$	.032590,	.265370,	.130122,	.050123,	-.009016,	-.045599,
3	\$	-.073771,	-.076482,	-.078246,	-.075441,	-.063493,	-.060654,
3	\$	-.072715,	4.065623,	3.731723,	2.340216,	1.633251,	1.226008,
3	\$	-.072715,	.622426,	.422854,	.277028,	.164369,	.086210,
3	\$	.031033,	-.005133,	-.023423,	-.042553,	-.045713,	-.050008,
3	\$	-.072513,	-.042456,	-.033237,	3.254741,	2.514095,	1.883125,

3	\$	1.337790,	1.032040,	.774278,	.557291,	.394351,	.274560,
3	\$	.177033,	.103025,	.058256,	.032129,	-.001353,	-.016732,
3	\$	-.025687,	-.030193,	-.030504,	-.028569,	-.027228,	
3C							
3	DATA T4B2	2.593943,	2.009574,	1.532591,	1.165126,	.866150,	
3	\$	.072014,	.590301,	.235287,	.232713,	.131492,	.120320,
3	\$	.374727,	.041207,	.017535,	.001525,	-.003915,	-.015094,
3	\$	-.010097,	-.019052,	-.018535,	2.131632,	1.521307,	1.252566,
3	\$	.937253,	.744130,	.579330,	.423337,	.329934,	.246277,
3	\$	.175223,	.123335,	.033918,	.052230,	.030369,	.014920,
3	\$	.003751,	-.003606,	-.007053,	-.010533,	-.011700,	1.760963,
3	\$	1.331937,	1.037033,	.311281,	.633320,	.501019,	.387253,
3	\$	.297823,	.223019,	.162617,	.123619,	.033376,	.060429,
3	\$	.039313,	.024350,	.012553,	.004333,	-.000353,	-.004021,
3	\$	-.006340,	1.471182,	1.111853,	.358726,	.639011,	.546940,
3	\$	.435005,	.343316,	.269473,	.209175,	.160106,	.120714,
3	\$	.039352,	.064583,	.045371,	.030827,	.019473,	.011222,
3	\$	.005136,	.000851,	-.002203,	1.246170,	.927230,	.730609,
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3	\$	.147301,	.114540,	.087670,	.055238,	.043195,	.034473,
3	\$	.023753,	.015523,	.002332,	.004595,	.000940,	
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3	\$	.320137,	.255026,	.214745,	.173041,	.137093,	.108274,
3	\$	.004355,	.004031,	.002731,	.023320,	.026508,	.018554,
3	\$	.012252,	.007282,	.003286,	.912142,	.678341,	.534373,
3	\$	.032141,	.350746,	.237740,	.235253,	.192003,	.156322,
3	\$	.125710,	.100300,	.030223,	.052914,	.043353,	.037286,
3	\$	.027874,	.020203,	.014107,	.009025,	.003339,	.787726,
3	\$	.573636,	.459172,	.372755,	.303222,	.251453,	.206537,
3	\$	.170173,	.140563,	.114070,	.032371,	.074931,	.059589,
3	\$	.047253,	.033775,	.023115,	.021085,	.015155,	.010246,
3	\$	.006123,	.632460,	.503903,	.393338,	.324200,	.265349,
3	\$	.220172,	.182553,	.151500,	.125705,	.103494,	.084988,
3	\$	.069331,	.056000,	.044910,	.035534,	.027673,	.021114,
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3	\$	.056543,	.045434,	.038105,	.030303,	.024562,	.019346,
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3	\$	.210020,	.172243,	.143432,	.120033,	.100777,	.084773,
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3	\$	.006502,	.333703,	.242500,	.187335,	.145522,	.120728,
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3	\$	.015062,	.010676,	.003535,	.008705,	.005137,	
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3	\$	7.123331,	7.051554,	6.973523,	6.900154,	6.820404,	6.755034,
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3	\$	6.375537,	6.317350,	6.232131,	6.153035,	6.100553,	6.058210,
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3	\$	6.625724,	6.547651,	6.460333,	6.420135,	6.333306,	6.308724,
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3C DATA T513 5.312436, 5.261511, 5.242029, 5.205347, 5.175824,
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[illegible]

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3	\$	.532803,	.460009,	.371952,	.332093,	.230297,	.235467,
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3	DATA T7B3/	-.350910,	.006361,	.629629,	.531917,	.490521,	
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3	\$	.111750,	.142093,	.115614,	.091553,	.069812,	.050319,
3	\$	.032336,	.017294,	.003043,	-.310461,	.512176,	.544195,
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3	\$	.213375,	.165102,	.156250,	.128932,	.104154,	.081415,
3	\$	.060737,	.042352,	.026370,	.013146,	.002432,	-.267980,
3	\$	.486775,	.481230,	.402237,	.390235,	.340470,	.299551,
3	\$	.262069,	.227716,	.194944,	.165914,	.139075,	.113825,
3	\$	.090679,	.069231,	.049314,	.031832,	.017202,	.006984,
3	\$	.001404,	-.231414,	.382950,	.409303,	.353590,	.329285,
3	\$	.215425,	.261437,	.229137,	.193389,	.170817,	.144947,
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3	\$	.091606,	.076119,	.060939,	.045539,	.029387,	.011614,
3	\$	-.003974,	-.037323,	-.078535,	-.099355,	-.022593,	-.114640,
3	\$	.185826,	.134444,	.144734,	.132090,	.116396,	.100996,
3	\$	.087590,	.075464,	.052939,	.051259,	.040568,	.028478,
3	\$	.015359,	.000628,	-.017080,	-.042533,	-.138151,	-.282689,
3	\$	-.030995,	-.035839,	.128752,	.114429,	.084707,	.076481,
3	\$	.056482,	.057101,	.049136,	.042006,	.034644,	.028103,
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3	\$	-.172769,	-.522002,	-.193543,	-.035473,	.021226,	.023300,
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3	\$	.006341,	.005053,	.004104,	.002340,	.001152,	.001070,
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3	\$	-.003944,	-.002445,	-.001976,	-.001597,	-.001280,	-.001003,
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3	\$	.047003,	.034555,	.023744,	.015776,	.000364,	-.140881,
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3	\$	.110735,	.033333,	.033337,	.052101,	.035503,	.019780,
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3	\$	.000407,	.066103,	.044243,	.022378,	.000460,	

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3	\$	.230950,	.183264,	.152133,	.121942,	.093292,	.068169,
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3	\$	1.021300,	.043233,	.725771,	.533206,	.494532,	.410266,
3	\$	.033150,	.270303,	.230906,	.163963,	.153128,	.121826,
3	\$	.000773,	.069439,	.044836,	.022349,	.000453,	-.047854,
3	\$	1.021303,	1.143440,	.904638,	.784630,	.665122,	.557806,
3	\$	.002256,	.331765,	.320348,	.271891,	.225531,	.185356,
3	\$	.150567,	.119337,	.083335,	.067251,	.044014,	.021898,
3	\$	.000449,	-.040344,	1.003753,	.953373,	.800024,	.705811,
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3 $ .067825, .047618, .029623, .014036, .000280, -.021797,
3 $ .578200, .559233, .471265, .428024, .379095, .331020,
3 $ .283192, .249820, .213563, .181836, .152738, .125503,
3 $ .100940, .077790, .056495, .037645, .021343, .008958,
3 $ .000155, -.018770, .480933, .475238, .406673, .370138,
3 $ .328115, .287828, .251099, .217590, .186567, .158614,
3 $ .132653, .103286, .085488, .063739, .043229, .024854,
3 $ .009312, .000340, -.000069, -.016065, .420251, .408238,
3 $ .344744, .313372, .277315, .243416, .212405, .184399,
3 $ .157668, .133718, .111141, .089303, .063671, .048071,
3 $ .027627, .008697, -.006648, -.012317, -.000461/

```

```

3C
3 DATA T8B4/ -.013563, .356172, .340725, .284037, .257076,
3 $ .227350, .193706, .173215, .150157, .127881, .107910,
3 $ .083771, .063761, .051311, .032011, .010900, -.010686,
3 $ -.030504, -.035025, -.001270, -.011102, .276859, .267244,
3 $ .222391, .199815, .175645, .152231, .133165, .114727,
3 $ .097603, .081535, .065938, .050515, .034431, .017094,
3 $ -.002308, -.023346, -.067240, -.079523, -.002858, -.008629,
3 $ .227875, .201050, .156672, .139058, .121411, .104551,
3 $ .090364, .077929, .065074, .054000, .042863, .030980,
3 $ .018915, .004595, -.011847, -.033173, -.126577, -.268991,
3 $ -.012511, -.005571, .139287, .114633, .084124, .073844,
3 $ .063553, .054263, .045549, .039978, .032833, .026890,
3 $ .020740, .013935, .006983, -.002251, -.017543, -.011510,
3 $ -.163935, -.520170, -.027095, -.000299, .003324, .002658,
3 $ .001880, .001623, .001377, .001170, .000993, .000837,
3 $ .000691, .000551, .000413, .000247, .000093, -.000117,
3 $ -.000745, .000224, -.006217, -.024134, -.002506/

```

```

3C
3C INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3 CALL QUADRD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NCRDD, NCRDD, DERUSL)
3C
3 TRUE = DERUSL(6)
3C
3 RETURN
3 END
3 FUNCTION W(X,Y)
3 DATA PI/3.141592656/
3 T = &A*PI*Y
3 W = 3.*T*COS(T*X)/SIN(T*X)
3 RETURN
3 END
3 FUNCTION F(X,Y)
3 DATA PI/3.141592656/
3 T = &A*PI*Y
3 F = &C*T*COS(T*X)/SIN(T*X)**3
3 RETURN
3 END

```

'EOR

```

*****
* MACRO 25 *
*****

```

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* 2000200002002
1 TWO DIMENSIONS
1 (-X**&A)UXXS - (Y**&A)UYYS - (&A*X**(&A-1.))UXS -
1. (&A*Y**(&A-1.))UYS + ((X*Y)**&A)US = F(X,Y)
2 DIRICHLET $ HOMOGENEOUS
2 X=0. , U=0.
2 X=1. , U=0.
2 Y=0. , U=0.
2 Y=1. , U=0.

```


U

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) 21) 22) 23) 24) 25) 26) 27) 28) 29) 30) 31) 32) 33) 34) 35) 36) 37) 38) 39) 40) 41) 42) 43) 44) 45) 46) 47) 48) 49) 50) 51) 52) 53) 54) 55) 56) 57) 58) 59) 60) 61) 62) 63) 64) 65) 66) 67) 68) 69) 70) 71) 72) 73) 74) 75) 76) 77) 78) 79) 80) 81) 82) 83) 84) 85) 86) 87) 88) 89) 90) 91) 92) 93) 94) 95) 96) 97) 98) 99) 100) 101) 102) 103) 104) 105) 106) 107) 108) 109) 110) 111) 112) 113) 114) 115) 116) 117) 118) 119) 120) 121) 122) 123) 124) 125) 126) 127) 128) 129) 130) 131) 132) 133) 134) 135) 136) 137) 138) 139) 140) 141) 142) 143) 144) 145) 146) 147) 148) 149) 150) 151) 152) 153) 154) 155) 156) 157) 158) 159) 160) 161) 162) 163) 164) 165) 166) 167) 168) 169) 170) 171) 172) 173) 174) 175) 176) 177) 178) 179) 180) 181) 182) 183) 184) 185) 186) 187) 188) 189) 190) 191) 192) 193) 194) 195) 196) 197) 198) 199) 200) 201) 202) 203) 204) 205) 206) 207) 208) 209) 210) 211) 212) 213) 214) 215) 216) 217) 218) 219) 220) 221) 222) 223) 224) 225) 226) 227) 228) 229) 230) 231) 232) 233) 234) 235) 236) 237) 238) 239) 240) 241) 242) 243) 244) 245) 246) 247) 248) 249) 250) 251) 252) 253) 254) 255) 256) 257) 258) 259) 260) 261) 262) 263) 264) 265) 266) 267) 268) 269) 270) 271) 272) 273) 274) 275) 276) 277) 278) 279) 280) 281) 282) 283) 284) 285) 286) 287) 288) 289) 290) 291) 292) 293) 294) 295) 296) 297) 298) 299) 300) 301) 302) 303) 304) 305) 306) 307) 308) 309) 310) 311) 312) 313) 314) 315) 316) 317) 318) 319) 320) 321) 322) 323) 324) 325) 326) 327) 328) 329) 330) 331) 332) 333) 334) 335) 336) 337) 338) 339) 340) 341) 342) 343) 344) 345) 346) 347) 348) 349) 350) 351) 352) 353) 354) 355) 356) 357) 358) 359) 360) 361) 362) 363) 364) 365) 366) 367) 368) 369) 370) 371) 372) 373) 374) 375) 376) 377) 378) 379) 380) 381) 382) 383) 384) 385) 386) 387) 388) 389) 390) 391) 392) 393) 394) 395) 396) 397) 398) 399) 400) 401) 402) 403) 404) 405) 406) 407) 408) 409) 410) 411) 412) 413) 414) 415) 416) 417) 418) 419) 420) 421) 422) 423) 424) 425) 426) 427) 428) 429) 430) 431) 432) 433) 434) 435) 436) 437) 438) 439) 440) 441) 442) 443) 444) 445) 446) 447) 448) 449) 450) 451) 452) 453) 454) 455) 456) 457) 458) 459) 460) 461) 462) 463) 464) 465) 466) 467) 468) 469) 470) 471) 472) 473) 474) 475) 476) 477) 478) 479) 480) 481) 482) 483) 484) 485) 486) 487) 488) 489) 490) 491) 492) 493) 494) 495) 496) 497) 498) 499) 500) 501) 502) 503) 504) 505) 506) 507) 508) 509) 510) 511) 512) 513) 514) 515) 516) 517) 518) 519) 520) 521) 522) 523) 524) 525) 526) 527) 528) 529) 530) 531) 532) 533) 534) 535) 536) 537) 538) 539) 540) 541) 542) 543) 544) 545) 546) 547) 548) 549) 550) 551) 552) 553) 554) 555) 556) 557) 558) 559) 560) 561) 562) 563) 564) 565) 566) 567) 568) 569) 570) 571) 572) 573) 574) 575) 576) 577) 578) 579) 580) 581) 582) 583) 584) 585) 586) 587) 588) 589) 590) 591) 592) 593) 594) 595) 596) 597) 598) 599) 600) 601) 602) 603) 604) 605) 606) 607) 608) 609) 610) 611) 612) 613) 614) 615) 616) 617) 618) 619) 620) 621) 622) 623) 624) 625) 626) 627) 628) 629) 630) 631) 632) 633) 634) 635) 636) 637) 638) 639) 640) 641) 642) 643) 644) 645) 646) 647) 648) 649) 650) 651) 652) 653) 654) 655) 656) 657) 658) 659) 660) 661) 662) 663) 664) 665) 666) 667) 668) 669) 670) 671) 672) 673) 674) 675) 676) 677) 678) 679) 680) 681) 682) 683) 684) 685) 686) 687) 688) 689) 690) 691) 692) 693) 694) 695) 696) 697) 698) 699) 700) 701) 702) 703) 704) 705) 706) 707) 708) 709) 710) 711) 712) 713) 714) 715) 716) 717) 718) 719) 720) 721) 722) 723) 724) 725) 726) 727) 728) 729) 730) 731) 732) 733) 734) 735) 736) 737) 738) 739) 740) 741) 742) 743) 744) 745) 746) 747) 748) 749) 750) 751) 752) 753) 754) 755) 756) 757) 758) 759) 760) 761) 762) 763) 764) 765) 766) 767) 768) 769) 770) 771) 772) 773) 774) 775) 776) 777) 778) 779) 780) 781) 782) 783) 784) 785) 786) 787) 788) 789) 790) 791) 792) 793) 794) 795) 796) 797) 798) 799) 800) 801) 802) 803) 804) 805) 806) 807) 808) 809) 810) 811) 812) 813) 814) 815) 816) 817) 818) 819) 820) 821) 822) 823) 824) 825) 826) 827) 828) 829) 830) 831) 832) 833) 834) 835) 836) 837) 838) 839) 840)

Figure 1

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3 $ .127521, .093047, .074440, .055859, .041610, .030429,
3 $ .021013, .014742, .009126, .004323, .000000, .000000,
3 $ .255322, .094604, .507648, .232131, .502014, .441152,
3 $ .333613, .235623, .233567, .130624, .137691, .103813,
3 $ .077267, .056473, .040114, .027141, .016590, .007756,
3 $ .000000, .000000, .235009, .515025, .653481, .693679,
3 $ .683031, .589513, .497784, .403300, .320122, .240260,
3 $ .199431, .143953, .107223, .078416, .055504, .037472,
3 $ .027723, .010462, .000000, .000000, .327257, .594199,
3 $ .783535, .812100, .733379, .722581, .597871, .488376,
3 $ .389334, .304079, .233482, .176946, .132044, .096533,
3 $ .063385, .045970, .027761, .012719, .000000/

2C
3 DATA T3B2/ .000000, .356408, .649089, .832755, .897181,
3 $ .671521, .736342, .673323, .553563, .443463, .347646,
3 $ .267723, .203343, .151932, .111112, .078370, .052794,
3 $ .031790, .014504, .000000, .000000, .376737, .687549,
3 $ .835147, .957941, .935233, .848535, .730092, .602415,
3 $ .484331, .380883, .294030, .223721, .167338, .122430,
3 $ .063661, .058095, .034913, .015038, .000000, .000000,
3 $ .390453, .713511, .920844, .993654, .979355, .891822,
3 $ .769750, .637142, .513591, .404843, .313096, .238555,
3 $ .176587, .130709, .092514, .061978, .037209, .016902,
3 $ .000000, .000000, .338228, .729526, .942756, 1.025437,
3 $ 1.006835, .918904, .794843, .653279, .552496, .420307,
3 $ .325452, .248203, .185921, .133116, .085333, .064516,
3 $ .033706, .017565, .000000, .000000, .402883, .737259,
3 $ .533417, 1.038004, 1.020257, .822162, .807155, .670167,
3 $ .541764, .427941, .331563, .252381, .189557, .138799,
3 $ .093238, .063777, .039450, .017894, .000000/

2C
3 DATA T3B3/ .000000, .402828, .737259, .953417, 1.038004,
3 $ 1.020257, .932162, .807155, .670167, .541764, .427941,
3 $ .331563, .252381, .189557, .138799, .093238, .063777,
3 $ .039450, .017894, .000000, .000000, .383228, .729526,
3 $ .942756, 1.025437, 1.006835, .918904, .794843, .659279,
3 $ .532496, .420307, .325452, .248203, .185921, .136116,
3 $ .096339, .064516, .038706, .017565, .000000, .000000,
3 $ .390453, .713511, .920844, .993654, .979355, .891822,
3 $ .769750, .637142, .513591, .404843, .313096, .238555,
3 $ .176587, .130709, .092514, .061978, .037209, .016902,
3 $ .000000, .000000, .376737, .687549, .835147, .957941,
3 $ .935233, .848535, .730092, .602415, .484331, .380883,
3 $ .294030, .223721, .167338, .122430, .093661, .058095,
3 $ .034913, .015038, .000000, .000000, .355408, .649059,
3 $ .832755, .897181, .971521, .733942, .673323, .553568,
3 $ .443463, .347646, .267723, .203343, .151932, .111112,
3 $ .078370, .052794, .031790, .014504, .000000/

3C
3 DATA T3B4/ .000000, .327257, .594199, .753535, .812100,
3 $ .783379, .702561, .527871, .402276, .353334, .304079,
3 $ .233482, .176946, .132044, .093503, .063635, .045970,
3 $ .027761, .012719, .000000, .000000, .265009, .515325,
3 $ .653481, .693679, .683031, .589513, .497784, .403800,
3 $ .320122, .240260, .190431, .143953, .107223, .078416,
3 $ .055504, .037472, .027223, .010462, .000000, .000000,
3 $ .225332, .494604, .507648, .232131, .502014, .441152,
3 $ .333613, .235623, .233567, .130624, .137691, .103813,
3 $ .077267, .056473, .040114, .027141, .016590, .007756,
3 $ .000000, .000000, .133763, .242535, .300166, .309204,
3 $ .266664, .243177, .204959, .163207, .127521, .098047,
3 $ .074440, .055859, .041610, .030429, .021638, .014742,
3 $ .009126, .004323, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000/

3C
3C INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3 CALL QUADRD(X,Y, TABLE, GRIDAB, GRIDAB, NGRID, NGRID, NGRDD, NGRDD,
3 $ DERUSL)
3C
3C TRUE = DERUSL(6)
3C
3C RETURN
3C
3 END

```


| | | | | | | |
|---|---------|---------|---------|---------|---------|---------|
| 7 | -150203 | -150203 | -150212 | -150251 | -150229 | -151472 |
| 8 | -150201 | -150201 | -150254 | -150257 | -150593 | -088567 |
| 9 | -150207 | -150201 | -150200 | -150107 | -042949 | -087887 |
| 0 | -150207 | -150230 | -150204 | -150365 | -165237 | -163563 |
| 1 | -150200 | -150232 | -144027 | -123701 | -127526 | -116542 |
| 2 | -150200 | -150231 | -150473 | -150566 | -000024 | -000093 |
| 3 | -150200 | -150233 | -121743 | -144294 | -153312 | -165287 |
| 4 | -150200 | -150233 | -150255 | -142378 | -133774 | -125190 |
| 5 | -150203 | -150249 | -003104 | -077556 | -053265 | -032930 |
| 6 | -000316 | -000472 | -061239 | -092991 | -123233 | -145212 |
| 7 | -150551 | -160303 | -150639 | -149772 | -133228 | -119047 |
| 8 | -150600 | -101763 | -003424 | -084065 | -073394 | -060457 |
| 9 | -050501 | -005293 | -000333 | -000036 | -051238 | -091967 |
| 0 | -122753 | -143575 | -155029 | -152365 | -152156 | -133228 |
| 1 | -167540 | -003593 | -061210 | -074228 | -067024 | -059065 |
| 2 | -053346 | -040183 | -028346 | -015610 | -000806 | |

| | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|
| DATA 12237 | -.000052, | -.050636, | -.090696, | -.120678, | -.140850, |
| 5 | -.151472, | -.152242, | -.142678, | -.119047, | -.083599, |
| 5 | -.075672, | -.065153, | -.052155, | -.054503, | -.045939, |
| 5 | -.025111, | -.013357, | .000020, | -.000053, | -.049519, |
| 5 | -.117273, | -.138223, | -.145501, | -.144827, | -.133774, |
| 5 | -.031210, | -.075672, | -.070241, | -.064254, | -.057700, |
| 5 | -.042493, | -.033559, | -.023554, | -.012376, | .000005, |
| 5 | -.047072, | -.085213, | -.112551, | -.130168, | -.133231, |
| 5 | -.125190, | -.101763, | -.074228, | -.039153, | -.054254, |
| 5 | -.052793, | -.046170, | -.033315, | -.030619, | -.021474, |
| 5 | -.090104, | -.000074, | -.045360, | -.080333, | -.105441, |
| 5 | -.120770, | -.127526, | -.116073, | -.093424, | -.067024, |
| 5 | -.057704, | -.052759, | -.047408, | -.041462, | -.034869, |
| 5 | -.019333, | -.010185, | -.000008, | -.000085, | -.042715, |
| 5 | -.073545, | -.112947, | -.118377, | -.116542, | -.105540, |
| 5 | -.050005, | -.053593, | -.050495, | -.046170, | -.041462, |
| 5 | -.030143, | -.024182, | -.017033, | -.003015, | -.000011/ |

| | | | | | |
|------------|-----------|-----------|-----------|-----------|-----------|
| DATA T2714 | -.000106, | -.038827, | -.067888, | -.086260, | -.100705, |
| 5 | -.105625, | -.103193, | -.093104, | -.073394, | -.050246, |
| 5 | -.043453, | -.023915, | -.034869, | -.030565, | -.025806, |
| 5 | -.014311, | -.007723, | -.000013, | -.000120, | -.033555, |
| 5 | -.074703, | -.084718, | -.083557, | -.082331, | -.077555, |
| 5 | -.043153, | -.069459, | -.033556, | -.030619, | -.027527, |
| 5 | -.023422, | -.016359, | -.011671, | -.006277, | -.000014, |
| 5 | -.086313, | -.084542, | -.058777, | -.083391, | -.083557, |
| 5 | -.022265, | -.045061, | -.023346, | -.025711, | -.023534, |
| 5 | -.103323, | -.017033, | -.014511, | -.011671, | -.003419, |
| 5 | -.002014, | -.000122, | -.015913, | -.025074, | -.032559, |
| 5 | -.077321, | -.033336, | -.032330, | -.025293, | -.015610, |
| 5 | -.012176, | -.011835, | -.010185, | -.003015, | -.007728, |
| 5 | -.043520, | -.002531, | -.000012, | -.000000, | -.000127, |
| 5 | -.000151, | -.000172, | -.000200, | -.000224, | -.000316, |
| 5 | -.000365, | -.000005, | -.000005, | -.000004, | -.000008, |
| 5 | -.000153, | -.000014, | -.000014, | -.000112, | -.000000, |

| | | | | | |
|----|-----------|-----------|-----------|-----------|-----------|
| 1 | -0.000129 | -0.000125 | -0.000145 | -0.000138 | -0.000129 |
| 2 | -0.000118 | -0.000102 | -0.000093 | -0.000071 | -0.000049 |
| 3 | -0.000091 | -0.000091 | -0.000091 | -0.000099 | -0.000114 |
| 4 | -0.000103 | -0.000101 | -0.000090 | -0.000126 | -0.013401 |
| 5 | -0.000138 | -0.000124 | -0.000093 | -0.000110 | -0.046397 |
| 6 | -0.000105 | -0.000115 | -0.000123 | -0.042900 | -0.036541 |
| 7 | -0.000102 | -0.000137 | -0.000174 | -0.014354 | -0.000145 |
| 8 | -0.000123 | -0.000177 | -0.000133 | -0.000135 | -0.000030 |
| 9 | -0.000131 | -0.000112 | -0.000159 | -0.073235 | -0.074690 |
| 10 | -0.000131 | -0.000177 | -0.000136 | -0.052823 | -0.040836 |
| 11 | -0.000177 | -0.000123 | -0.000150 | -0.000133 | -0.073533 |
| 12 | -0.000140 | -0.000179 | -0.000136 | -0.000177 | -0.000105 |
| 13 | -0.000141 | -0.000135 | -0.000170 | -0.000122 | -0.000123 |
| 14 | -0.000131 | -0.000137 | -0.000170 | -0.000129 | -0.000124 |
| 15 | -0.000131 | -0.000140 | -0.000170 | -0.000126 | -0.000124 |
| 16 | -0.000131 | -0.000137 | -0.000170 | -0.000126 | -0.000124 |
| 17 | -0.000131 | -0.000137 | -0.000170 | -0.000126 | -0.000124 |
| 18 | -0.000131 | -0.000137 | -0.000170 | -0.000126 | -0.000124 |
| 19 | -0.000131 | -0.000137 | -0.000170 | -0.000126 | -0.000124 |
| 20 | -0.000131 | -0.000137 | -0.000170 | -0.000126 | -0.000124 |

| | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| 1 | -1.000000 | -1.000000 | -1.122333 | -1.070231 | -1.122310 | -1.117934 |
| 2 | -1.000000 | -1.000000 | -1.102774 | -1.101634 | -1.123943 | -1.121274 |
| 3 | -1.000000 | -1.100000 | -1.100000 | -1.023035 | -1.063072 | -1.073105 |
| 4 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.045057 | -1.090030 |
| 5 | -1.100000 | -1.100000 | -1.100000 | -1.100000 | -1.100000 | -1.100000 |

```

3      S -.121652, -.113508, -.106166, -.099787, -.093617, -.086596,
3      S -.078009, -.066603, -.051332, -.023368, -.000244, -.000083,
3      S -.046110, -.031890, -.108096, -.125230, -.134274, -.135430,
3      S -.123716, -.118573, -.105295, -.093592, -.085096, -.079162,
3      S -.074043, -.068520, -.062040, -.053199, -.041601, -.024230,
3      S -.000378, -.000071, -.048397, -.032262, -.108177, -.124471,
3      S -.131534, -.129522, -.118573, -.093049, -.071670, -.054330,
3      S -.043096, -.044400, -.041352, -.033146, -.034576, -.029621,
3      S -.023489, -.013647, -.000397, -.000049, -.046095, -.081508,
3      S -.106697, -.121752, -.125948, -.121652, -.105295, -.071670,
3      S -.031624, -.010127, -.003266, -.007917, -.005992, -.006014,
3      S -.005051, -.003883, -.002798, -.001308, .001546/
3C
3      DATA TB33/ -.000031, -.045345, -.079325, -.104105, -.117849,
3      S -.121274, -.113508, -.093592, -.054330, -.010127, -.010240,
3      S -.009306, -.003394, -.007465, -.003489, -.005436, -.004283,
3      S -.003005, -.001581, .000003, -.000042, -.044253, -.077726,
3      S -.100741, -.113267, -.115296, -.106166, -.085096, -.048096,
3      S -.003356, -.009306, -.008554, -.007747, -.006892, -.005981,
3      S -.004936, -.003920, -.002735, -.001430, .000001, -.000041,
3      S -.042600, -.074890, -.036635, -.103086, -.109297, -.099787,
3      S -.079162, -.044400, -.007917, -.003394, -.007747, -.007033,
3      S -.006264, -.005435, -.004536, -.003555, -.002477, -.001294,
3      S -.000000, -.000061, -.040961, -.071370, -.091710, -.102177,
3      S -.102919, -.093617, -.074048, -.041352, -.006992, -.007465,
3      S -.006392, -.006264, -.005584, -.004848, -.004049, -.003175,
3      S -.002215, -.001160, -.000001, -.000073, -.003541, -.066789,
3      S -.085432, -.094351, -.095325, -.086536, -.083520, -.038146,
3      S -.006014, -.006483, -.005931, -.005435, -.004848, -.004214,
3      S -.003525, -.002770, -.001938, -.001019, -.000001/
3C
3      DATA TB34/ -.000099, -.035322, -.060756, -.077292, -.085526,
3      S -.035872, -.078089, -.062040, -.034576, -.005351, -.005436,
3      S -.004936, -.004536, -.004049, -.003525, -.002955, -.002330,
3      S -.001639, -.000867, -.000001, -.000114, -.030832, -.052425,
3      S -.066153, -.072880, -.073105, -.065503, -.053199, -.029621,
3      S -.003383, -.004283, -.003920, -.003555, -.003175, -.002770,
3      S -.002330, -.001847, -.001308, -.000693, -.000001, -.000135,
3      S -.024474, -.040846, -.050347, -.055317, -.055022, -.051332,
3      S -.041601, -.023489, -.002798, -.003005, -.002735, -.002477,
3      S -.002215, -.001938, -.001639, -.001308, -.000936, -.000507,
3      S -.000001, -.000121, -.014964, -.024140, -.023597, -.032159,
3      S -.032230, -.029369, -.024230, -.013647, -.001308, -.001581,
3      S -.001430, -.001294, -.001160, -.001019, -.000657, -.000698,
3      S -.000507, -.000231, -.000001, .000000, -.000128, -.000157,
3      S -.000170, -.000179, -.000213, -.000244, -.000278, -.000697,
3      S -.001546, .000003, .000001, -.000000, -.000001, -.000001,
3      S -.000001, -.000001, -.000001, -.000001, .000000/
3C
3C      INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3      CALL QUADRD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NGRID, NGRID, DERUSL)
3C
3      TRUE = DERUSL(S)
3C
3      RETURN
3      END
3      FUNCTION W(X,Y)
3      W = 1.
3      IF (X .LT. 0. .OR. Y .LT. 0.) RETURN
3      W = 20
3      RETURN
3      END
3      FUNCTION CDXU(X,Y)
3      CDXU = 0.
3      RETURN
3      END
3      FUNCTION CDYU(X,Y)
3      CDYU = 0.
3      RETURN
3      END

```

*EOR

 * MACRO 23 *

```

* 000000000000
* TWO DIMENSIONS & HOMOGENEOUS
*  $U(0,0) + U(0,1) + X Y U(0,0) = 0$ .
* BOUNDARY
*  $U(0,0) = U(0,1) = U(1,0) = U(1,1) = 0$ 
*  $U(0,0) = U(0,1) = U(1,0) = U(1,1) = 0$ 
*  $U(0,0) = U(0,1) = U(1,0) = U(1,1) = 0$ 
* FUNCTION, TRUNCATED
3C
3C *****
3C *
3C * MACRO 23 PARAMETERS
3C *
3C *****
3C *
3C *
3C * A I B
3C * ---I---
3C * -3 I 1
3C * I
3C * -1 I 2
3C * I
3C * 1 I 3
3C * I
3C * 3 I 4
3C * I
3C * 5 I 5
3C *
3C *****
3C
3C REAL DERUSL(5), GRID(20), TABLE(20,20),
3C $ T1B1(100), T1B2(100), T1B3(100), T1B4(100),
3C $ T2B1(100), T2B2(100), T2B3(100), T2B4(100),
3C $ T3B1(100), T3B2(100), T3B3(100), T3B4(100),
3C $ T4B1(100), T4B2(100), T4B3(100), T4B4(100),
3C $ T5B1(100), T5B2(100), T5B3(100), T5B4(100)
3C EQUIVALENCE (TABLE(1, 1), T&B1(1)),
3C $ (TABLE(1, 6), T&B2(1)),
3C $ (TABLE(1,11), T&B3(1)),
3C $ (TABLE(1,16), T&B4(1))
3C DATA NGRID, NSPDD, GRID /20, 20, 0.000000, 0.0526316,
3C $0.1052632, 0.1578947, 0.2105263, 0.2631579, 0.3157895,
3C $0.3684211, 0.4210526, 0.4736842, 0.5263153, 0.5789474,
3C $0.6315789, 0.6842105, 0.7368421, 0.7894737, 0.8421053,
3C $0.8947368, 0.9473684, 1.0000000/
3C
3C APPROXIMATE SOLUTION OF PROBLEM USING
3C P3-C1 COLLOCATION (3 X 3 GRID)
3C
3C DATA T1B1/ .100000, -.017544, -.035088, -.052632, -.070175,
3C $ -.087719, -.105263, -.122807, -.140351, -.157895, -.175439,
3C $ -.192983, -.210526, -.228070, -.245614, -.263158, -.280702,
3C $ -.298246, -.315789, -.333333, -.350877, -.368421, -.385965,
3C $ -.403509, -.421053, -.438596, -.456140, -.473684, -.491228,
3C $ -.508772, -.526316, -.543859, -.561403, -.578947, -.596491,
3C $ -.614035, -.631579, -.649123, -.666667, -.684211, -.701755,
3C $ -.719298, -.736842, -.754386, -.771929, -.789474, -.807018,
3C $ -.824562, -.842105, -.859649, -.877193, -.894737, -.912281,
3C $ -.929825, -.947368, -.964912, -.982456, -.999999, -.017544,
3C $ -.035088, -.052632, -.069676, -.087220, -.104764, -.122308,
3C $ -.139852, -.157396, -.174939, -.192483, -.210027, -.227571,
3C $ -.245115, -.262659, -.280203, -.297747, -.315291, -.332835,
3C $ -.350379, -.367923, -.385467, -.403011, -.420555, -.438099,
3C $ -.455643, -.473187, -.490731, -.508275, -.525819, -.543363,
3C $ -.560907, -.578451, -.595995, -.613539, -.631083, -.648627,
3C $ -.666171, -.683715, -.701259, -.718803, -.736347, -.753891,
3C $ -.771435, -.788979, -.806523, -.824067, -.841611, -.859155,
3C $ -.876699, -.894243, -.911787, -.929331, -.946875, -.964419,
3C $ -.981963, -.999507, -.017051, -.034595, -.052139, -.069683,
3C $ -.087227, -.104771, -.122315, -.139859, -.157403, -.174947,
3C $ -.192491, -.210035, -.227579, -.245123, -.262667, -.280211,
3C $ -.297755, -.315299, -.332843, -.350387, -.367931, -.385475,
3C $ -.403019, -.420563, -.438107, -.455651, -.473195, -.490739,
3C $ -.508283, -.525827, -.543371, -.560915, -.578459, -.595999,
3C $ -.613543, -.631087, -.648631, -.666175, -.683719, -.701263,
3C $ -.718807, -.736351, -.753895, -.771439, -.788983, -.806527,
3C $ -.824071, -.841615, -.859159, -.876703, -.894247, -.911791,
3C $ -.929335, -.946879, -.964423, -.981967, -.999511, -.016999,
3C $ -.034543, -.052087, -.069631, -.087175, -.104719, -.122263,
3C $ -.139807, -.157351, -.174895, -.192439, -.210003, -.227547,
3C $ -.245091, -.262635, -.280179, -.297723, -.315267, -.332811,
3C $ -.350355, -.367899, -.385443, -.402987, -.420531, -.438075,
3C $ -.455619, -.473163, -.490707, -.508251, -.525795, -.543339,
3C $ -.560883, -.578427, -.595971, -.613515, -.631059, -.648603,
3C $ -.666147, -.683691, -.701235, -.718779, -.736323, -.753867,
3C $ -.771411, -.788955, -.806499, -.824043, -.841587, -.859131,
3C $ -.876675, -.894219, -.911763, -.929307, -.946851, -.964395,
3C $ -.981939, -.999483, -.016927, -.034471, -.051995, -.069539,
3C $ -.087083, -.104627, -.122171, -.139715, -.157259, -.174803,
3C $ -.192347, -.210001, -.227545, -.245089, -.262633, -.280177,
3C $ -.297721, -.315265, -.332809, -.350353, -.367897, -.385441,
3C $ -.402985, -.420529, -.438073, -.455617, -.473161, -.490705,
3C $ -.508249, -.525793, -.543337, -.560881, -.578425, -.595969,
3C $ -.613513, -.631057, -.648601, -.666145, -.683689, -.701233,
3C $ -.718777, -.736321, -.753865, -.771409, -.788953, -.806497,
3C $ -.824041, -.841585, -.859129, -.876673, -.894217, -.911761,
3C $ -.929305, -.946849, -.964393, -.981937, -.999481, -.016919,
3C $ -.034463, -.051987, -.069531, -.087075, -.104619, -.122163,
3C $ -.139707, -.157251, -.174795, -.192339, -.210003, -.227547,
3C $ -.245091, -.262635, -.280179, -.297723, -.315267, -.332811,
3C $ -.350355, -.367899, -.385443, -.402987, -.420531, -.438075,
3C $ -.455619, -.473163, -.490707, -.508251, -.525795, -.543339,
3C $ -.560883, -.578427, -.595971, -.613515, -.631059, -.648603,
3C $ -.666147, -.683691, -.701235, -.718779, -.736323, -.753867,
3C $ -.771411, -.788955, -.806499, -.824043, -.841587, -.859131,
3C $ -.876675, -.894219, -.911763, -.929307, -.946851, -.964395,
3C $ -.981939, -.999483, -.016927, -.034471, -.051995, -.069539,
3C $ -.087083, -.104627, -.122171, -.139715, -.157259, -.174803,
3C $ -.192347, -.210001, -.227545, -.245089, -.262633, -.280177,
3C $ -.297721, -.315265, -.332809, -.350353, -.367897, -.385441,
3C $ -.402985, -.420529, -.
```

[illegible]

3C
3 DATA T3B3/ -.526316, -.515864, -.492907, -.477526, -.451383,
3 \$ -.420057, -.334673, -.344668, -.390242, -.251897, -.192203,
3 \$ -.142333, -.091321, -.016024, .053208, .123074, .206927,
3 \$.291093, .379242, .473634, .578947, .563427, .542685,
3 \$ -.517698, -.468425, -.454690, -.417256, -.375775, -.330413,
3 \$ -.261553, -.223872, -.172516, -.112495, -.043676, .019100,
3 \$.090831, .166670, .247030, .331763, .421053, .631579,
3 \$ -.612331, -.537209, -.558296, -.526833, -.490245, -.451095,
3 \$ -.402065, -.351514, -.312347, -.259538, -.203613, -.144564,
3 \$ -.082200, -.016244, .053035, .125787, .203105, .28.11,
3 \$.353421, .634211, .660061, .631667, .599267, .564728,
3 \$ -.526177, -.404831, -.440463, .393209, .343367, .290699,
3 \$ -.235313, -.177215, -.116293, -.052414, .014448, .084460,
3 \$.158030, .235011, .315789, .735242, .709155, .676676,
3 \$ -.641629, -.603775, -.562507, -.519474, -.473623, -.425213,
3 \$ -.375069, -.322306, -.267323, -.210193, -.150655, -.088602,
3 \$ -.024120, .042951, .113444, .185604, .263158/
3C
3 DATA T3B4/ -.739474, -.757741, -.721485, -.683114, -.642412,
3 \$ -.593737, -.553627, -.505561, -.457198, -.406500, -.353830,
3 \$ -.299308, -.243115, -.184938, -.124621, -.062718, .001496,
3 \$.060571, .138074, .210526, .842105, .805374, .765767,
3 \$ -.723912, -.680122, -.634527, -.587437, -.533853, -.488857,
3 \$ -.437570, -.384927, -.330963, -.275671, -.218931, -.160823,
3 \$ -.101112, -.039663, .023764, .039453, .157855, .894737,
3 \$ -.854617, -.810225, -.764943, -.718479, -.669856, -.621283,
3 \$ -.571204, -.519912, -.463432, -.415666, -.362035, -.307710,
3 \$ -.252345, -.195923, -.133593, -.080211, -.019909, .041528,
3 \$.105263, .947368, .901763, .853271, .804300, .754761,
3 \$ -.704039, -.653443, -.602053, -.550034, -.493028, -.445286,
3 \$ -.392150, -.338593, -.284712, -.230193, -.175253, -.119777,
3 \$ -.063232, -.006182, .052632, -1.000000, -.947368, -.894737,
3 \$ -.842105, -.789474, -.736842, -.684211, -.631579, -.578947,
3 \$ -.526316, -.473684, -.421053, -.368421, -.315789, -.263158,
3 \$ -.210526, -.157895, -.105263, -.052632, .000000/
3C
3 DATA T4B1/ .000000, .017544, .035088, .052632, .070175,
3 \$.087719, .105263, .122807, .140351, .157895, .175439,
3 \$.192932, .210526, .228070, .245614, .263158, .280702,
3 \$.298246, .315789, .333333, -.017544, .779001, 2.690273,
3 \$ 3.932558, 4.862359, 6.117348, 6.426946, 6.550239, 6.616098,
3 \$ 6.601650, 6.596406, 6.658000, 6.732147, 6.713958, 6.512142,
3 \$ 5.769548, 4.538145, 3.783746, 2.092277, .315789, -.035088,
3 \$ -.281251, -.124527, -.151831, -.209338, -.049844, -.102840,
3 \$ -.125276, -.110463, -.105180, -.095543, -.061557, -.004853,
3 \$.076933, .190508, .231464, .205233, .423570, .372075,
3 \$.293246, -.052632, -.521119, -.903337, -1.277191, -1.590329,
3 \$ -1.783466, -1.333602, -1.593913, -2.010344, -2.003571, -1.987109,
3 \$ -1.953244, -1.905362, -1.801071, -1.616921, -1.356578, -1.027987,
3 \$ -.533222, -.164227, .280702, -.070175, -.333489, -.490084,
3 \$ -.663069, -.323933, -.803374, -.971233, -1.011257, -1.017736,
3 \$ -1.013631, -.937771, -.965932, -.914458, -.833233, -.710224,
3 \$ -.567530, -.407032, -.152796, .051074, .263158/
3C
3 DATA T4B2/ -.087719, -.233716, -.351070, -.430336, -.551673,
3 \$ -.612530, -.630740, -.663620, -.694155, -.633395, -.671620,
3 \$ -.641635, -.597507, -.535511, -.451634, -.343563, -.227030,
3 \$ -.076052, .079140, .245514, .105263, .204339, .281165,
3 \$ -.358243, -.411200, -.448739, -.430297, -.494953, -.498160,
3 \$ -.480151, -.471305, -.442354, -.404304, -.354799, -.288875,
3 \$ -.210532, -.120470, -.005599, .104026, .223070, .122807,
3 \$ -.190775, -.241065, -.237155, -.324723, -.347631, -.365799,
3 \$ -.372808, -.369912, -.360745, -.342865, -.317153, -.283232,
3 \$ -.240837, -.187413, -.125739, -.056163, .022594, .116012,
3 \$.210526, .140351, .184335, .222617, .253372, .276937,
3 \$ -.233103, -.302121, -.304030, -.209167, -.257927, -.270377,
3 \$ -.246532, -.218263, -.179230, -.135143, -.033301, .025228,
3 \$.040710, .113479, .162932, .157025, .192139, .210677,
3 \$ -.237245, -.232414, -.259329, -.200039, .230436, .253217,
3 \$ -.241066, -.223009, -.200490, -.172697, -.132656, -.110895,
3 \$ -.056000, -.007593, .043111, .109357, .175439/
3C
3 DATA T4B3/ -.175439, -.192402, -.216444, -.239443, -.267857,
3 \$ -.240709, -.210109, -.253474, -.224520, -.211532, -.193779,
3 \$ -.172233, -.140551, -.113705, -.082703, -.042737, .000830,


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1  5 -1.135702, -.140153, -.142302, -.144517, -.143161, -.133613,
2  6 -1.137115, -.140845, -.142971, -.145123, -.143447, -.074195,
3  7 -1.138528, -.141537, -.143657, -.145822, -.143468, -.044268,
4  8 -1.139941, -.142229, -.144348, -.146514, -.144541, -.142067,
5  9 -1.141354, -.142921, -.145033, -.147201, -.145178, -.095632,
6  10 -1.142767, -.143613, -.145725, -.147888, -.145932, -.150790,
7  11 -1.144180, -.144305, -.146417, -.148575, -.146684, -.114235,
8  12 -1.145593, -.144997, -.147109, -.149262, -.147371, -.043474,
9  13 -1.147006, -.145689, -.147741, -.149949, -.148060, -.052632/
10 14 -1.148419, -.146381, -.148373, -.150636, -.148751, -.147098,
11 15 -1.149832, -.147073, -.148985, -.151323, -.149438, -.093395,
12 16 -1.151245, -.147765, -.149597, -.152010, -.150125, -.015693,
13 17 -1.152658, -.148457, -.150209, -.152697, -.150812, -.162771,
14 18 -1.154071, -.149149, -.150821, -.153384, -.151499, -.114115,
15 19 -1.155484, -.149841, -.151433, -.154071, -.152184, -.047097,
16 20 -1.156897, -.150533, -.152045, -.154758, -.152871, -.178947,
17 21 -1.158310, -.151225, -.152657, -.155444, -.153564, -.134603,
18 22 -1.159723, -.151917, -.153269, -.156131, -.154251, -.072057,
19 23 -1.161136, -.152609, -.153881, -.156818, -.154942, -.004181,
20 24 -1.162549, -.153301, -.154493, -.157505, -.155632, -.155746,
21 25 -1.163962, -.153993, -.155105, -.158192, -.156323, -.094306,
22 26 -1.165375, -.154685, -.155717, -.158879, -.157014, -.028244,
23 27 -1.166788, -.155377, -.156329, -.159566, -.157705, -.178947,
24 28 -1.168201, -.156069, -.156941, -.160253, -.158396, -.115789,
25 29 -1.169614, -.156761, -.157553, -.160940, -.159087, -.052632,
26 30 -1.171027, -.157453, -.158165, -.161627, -.159778, -.000000/
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3 F1 = X + Y**2
3 P1 = (2.*X)**(B-1.)
3 DP1 = 2.*(B-1.)*(2.*X)**(B-2.)
3 DDP1 = 4.*(B-1.)*(B-2.)*(2.*X)**(B-3.)
3 DEN1 = 1. + F1
3 U1 = F1/DEN1
3 UXX1 = -2.*(1. - F1*DP1/DEN1)*DP1 + F1*DDP1/DEN1**2
3 UYY1 = 2./DEN1
3 E2 = EXP(-A*Y**4)
3 U2 = (1.+X)*(Y-1.)*E2
3 UXX2 = 0.0
3 UYY2 = (-4.*A*E2*((5.*Y-3.) - 4*A*Y**4*(Y-1.))*Y**2)*(1.+X)
3 C3 = COS(X*Y)
3 S3 = SIN(X*Y)
3 XY3 = X+Y
3 U3 = C*XY3*C3
3 UXX3 = -Y*(2.*C*S3 + Y*U3)
3 UYY3 = -X*(2.*C*S3 + X*U3)
3 COE1 = 2. + (Y-1.)*E2
3 COE2 = 1. + 1./(1.+2.*X*P1)
3 COE3 = C*(X*(X-1.)+(Y-3)*(Y-7))
3 F = COE1*(UXX1+UXX2+UXX3) + COE2*(UYY1+UYY2+UYY3) + COE3*(U1+U2+U3)
3 RETURN
3 END
3 FUNCTION TRUE(X,Y)
3 COMMON /CONCOM/ A,B,C
3 TRUE = (X+Y*Y)/(1.+(2.*X)**(B-1.))
3 S + (Y-1.)*(1.+X)*EXP(-A*Y**4)
3 S + C*(X+Y)*COS(X*Y)
3 RETURN
3 END

```

*EOP

 * MACRO 31 *

*EOR

 * MACRO 32 *

*EOR

 * MACRO 33 *

*EOR

 * MACRO 34 *

*EOR

 * MACRO 35 *

```

* 2022021200020
1 TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1 POISSON $ LAPLACE
1 UXXS + UYYs = 0.
2 MIXED
2 X=-1. , MIXED = (1.+(A))U + (-A)UX = G(X,Y)
2 X= 1. , MIXED = (1.+(A))U + (A)UX = G(X,Y)
2 Y=-1. , U = TRUE(X,Y)
2 Y= 1. , U = TRUE(X,Y)
3 FUNCTION TRUE(X,Y)
3 X2 = X*X
3 Y1 = X2*Y2
3 Y6 = Y6*Y2
3 Y8 = Y8*Y2
3 Y12 = Y12*Y2
3 Y4 = Y4*Y2
3 Y6 = Y6*Y2
3 Y8 = Y8*Y2
3 U1 = X4 - 6.*X2*Y2 + Y4
3 U2 = X8 - 28.*X6*Y2 + 70.*X4*Y4 - 28.*X2*Y6 + Y8

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3      TRUE = 1.1786 - .1801*U1 + .006*U2
3      RETURN
3      END
3      FUNCTION G(X,Y)
3      U1X = 4.*X**3 - 12.*X*Y**2
3      U2X = 8.*X**7 - 162.*X**5*Y**2 + 280.*X**3*Y**4 -
3      $      56.*X*Y**6
3      UX = -.1801*U1X + .006*U2X
3      U = TRUE(X,Y)
3      G = (1.+(&A))*U + SIGN(1.0,X)*(&A)*UX
3      RETURN
3      END
-----
*EOR
*****
* MACRO 36 *
*****
*      2000200002000
1      TWO DIMENSIONS
1      (1.+(&B))UXX$ + (1./((X+(&A))**2)UY$ + (2./((X+(&A))))UX$ +
1      E(X,Y)UY$ = F(X,Y)
2      DIRICHLET
2      X=0. , U=TRUE(X,Y)
2      X=1. , U=TRUE(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TRUE = (1.-(&B))*EXP(X+Y)
3      IF (X+(&A) .NE. 0.) TRUE = TRUE + (&B)*ALOG(X+(&A))
3      RETURN
3      END
3      FUNCTION E(X,Y)
3      E = 1./((X+(&A))*TAN(Y))
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      TEMP = (1.-(&B))*EXP(X+Y)
3      UX = TEMP + (&B)/(X+(&A))
3      UXX= TEMP - (&B)/(X+(&A))**2
3      UY = TEMP
3      UYY= TEMP
3      F = (1.+(&B))*UXX + 1./((X+(&A))**2)UY +
3      $      2./((X+(&A))*UX + E(X,Y)*UY
3      RETURN
3      END

```

```

*EOR
*****
* MACRO 37 *
*****

```

```

*EOR
*****
* MACRO 38 *
*****
*      2022021200200
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1      POISSON $ LAPLACE
1      UXX$ + UYY$ = 0.
2      X=-1.570796327 , U =TRUE(X,Y)
2      X= 1.570796327 , U =TRUE(X,Y)
2      Y= 0. , UY=G(X)
2      Y= 1. , U =TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TEMP = 2.*(&A) + 1.
3      TRUE = EXP(-SORT(TEMP))*COS(TEMP*X)*SINH(TEMP*Y)/TEMP
3      RETURN
3      END
3      FUNCTION G(X)
3      TEMP = 2.*(&A) + 1.
3      G = EXP(-SORT(TEMP))*COS(TEMP*X)
3      RETURN
3      END
3      FUNCTION SINH(X)
3      EXPX = EXP(X)
3      SINH = 0.5*(EXPX - 1./EXPX)

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| 3 | 0 | .922240, | .947760, | .965578, | .982914, | 1.000000, | 1.000000, |
| 3 | 0 | .693755, | .712102, | .619783, | .633231, | .664970, | .693619, |
| 3 | 0 | .713193, | .752532, | .733972, | .808175, | .833322, | .858400, |
| 3 | 0 | .031453, | .903230, | .924017, | .943843, | .962975, | .981613, |
| 3 | 0 | 1.000000, | 1.000000, | .665912, | .610520, | .615112, | .633757, |
| 3 | 0 | .663123, | .665901, | .715069, | .744391, | .773116, | .800823, |
| 3 | 0 | .827232, | .852449, | .876315, | .893976, | .920559, | .941262, |
| 3 | 0 | .961251, | .930752, | 1.000000, | 1.000000, | .665795, | .609738, |
| 3 | 0 | .614414, | .631208, | .654903, | .682226, | .711162, | .740446, |
| 3 | 0 | .709234, | .797218, | .823993, | .843509, | .873767, | .896840, |
| 3 | 0 | .910355, | .939375, | .960392, | .980322, | 1.000000/ | |
| 3 | 0 | DATA T2B3/ | 1.000000, | .665795, | .609733, | .614414, | .631208, |
| 3 | 0 | .654903, | .682226, | .711162, | .740446, | .769284, | .797218, |
| 3 | 0 | .823993, | .849509, | .873767, | .896240, | .918855, | .939975, |
| 3 | 0 | .930392, | .930322, | 1.000000, | 1.000000, | .665912, | .610520, |
| 3 | 0 | .613112, | .633757, | .658128, | .685901, | .715069, | .744391, |
| 3 | 0 | .773116, | .800823, | .827292, | .852449, | .876315, | .898976, |
| 3 | 0 | .920559, | .941262, | .961251, | .980752, | 1.000000, | 1.000000, |
| 3 | 0 | .665755, | .612102, | .619783, | .639222, | .664970, | .693619, |
| 3 | 0 | .713193, | .752532, | .733972, | .808175, | .833992, | .858400, |
| 3 | 0 | .031453, | .903230, | .924017, | .943849, | .962975, | .981613, |
| 3 | 0 | 1.000000, | 1.000000, | .665044, | .615183, | .625273, | .648566, |
| 3 | 0 | .673340, | .705181, | .735197, | .765387, | .793243, | .819562, |
| 3 | 0 | .844207, | .857503, | .869294, | .903815, | .923240, | .947760, |
| 3 | 0 | .965573, | .932914, | 1.000000, | 1.000000, | .665859, | .620765, |
| 3 | 0 | .637101, | .663405, | .693772, | .724382, | .755111, | .783737, |
| 3 | 0 | .810503, | .835331, | .858492, | .879954, | .899948, | .918661, |
| 3 | 0 | .936226, | .953022, | .969075, | .984639, | 1.000000/ | |
| 3 | 0 | DATA T2B4/ | 1.000000, | .6659171, | .630817, | .654959, | .686480, |
| 3 | 0 | .715922, | .751595, | .781344, | .808614, | .833483, | .856173, |
| 3 | 0 | .876922, | .895373, | .913568, | .929303, | .945208, | .959665, |
| 3 | 0 | .973430, | .925354, | 1.000000, | 1.000000, | .675673, | .650231, |
| 3 | 0 | .665324, | .722473, | .757510, | .783945, | .816743, | .841284, |
| 3 | 0 | .833046, | .832431, | .899365, | .915816, | .930298, | .943639, |
| 3 | 0 | .963043, | .967705, | .978797, | .983500, | 1.000000, | 1.000000, |
| 3 | 0 | .637142, | .687413, | .737431, | .778528, | .812321, | .840174, |
| 3 | 0 | .863432, | .883135, | .900089, | .914891, | .927976, | .939678, |
| 3 | 0 | .950251, | .959905, | .968317, | .977140, | .985018, | .992590, |
| 3 | 0 | 1.000000, | 1.000000, | .741509, | .778332, | .832454, | .866267, |
| 3 | 0 | .630710, | .809183, | .923769, | .935611, | .945494, | .953931, |
| 3 | 0 | .961253, | .967719, | .973492, | .978713, | .983495, | .987932, |
| 3 | 0 | .932103, | .933103, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000/ | |
| 3 | 0 | DATA T2B1/ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | 0 | 1.000000, | 1.000000, | 1.000000, | 1.000000, | .933734, | .937509, |
| 3 | 0 | .631163, | .974776, | .968325, | .961347, | .955346, | .948878, |
| 3 | 0 | .812520, | .836319, | .930423, | .924252, | .920279, | .910883, |
| 3 | 0 | .915547, | .917824, | .925256, | .947825, | 1.000000, | 1.000000, |
| 3 | 0 | .633330, | .977311, | .955333, | .954451, | .943025, | .931643, |
| 3 | 0 | .920353, | .909277, | .893541, | .879231, | .878300, | .870380, |
| 3 | 0 | .852357, | .853579, | .853567, | .863290, | .864035, | .862490, |
| 3 | 0 | 1.000000, | 1.000000, | .834553, | .869093, | .953349, | .938262, |
| 3 | 0 | .822179, | .907850, | .893977, | .873534, | .864950, | .852072, |
| 3 | 0 | .612152, | .630563, | .823270, | .819346, | .822158, | .833520, |
| 3 | 0 | .655252, | .903300, | 1.000000, | 1.000000, | .931280, | .862581, |
| 3 | 0 | .918253, | .925501, | .907233, | .893334, | .871971, | .855228, |
| 3 | 0 | .800115, | .824343, | .811933, | .801492, | .794350, | .792061, |
| 3 | 0 | .706775, | .812053, | .843193, | .900154, | 1.000000/ | |
| 3 | 0 | DATA T2B2/ | 1.000000, | .978729, | .957520, | .933459, | .915647, |
| 3 | 0 | .653123, | .875223, | .855922, | .837510, | .820293, | .804662, |
| 3 | 0 | .701161, | .737512, | .773347, | .772734, | .779305, | .797983, |
| 3 | 0 | .833163, | .894023, | 1.000000, | 1.000000, | .976808, | .953708, |
| 3 | 0 | .900317, | .903259, | .835161, | .864690, | .844035, | .824466, |
| 3 | 0 | .805223, | .790002, | .776293, | .765637, | .759520, | .759340, |
| 3 | 0 | .782140, | .786301, | .825635, | .831622, | 1.000000, | 1.000000, |
| 3 | 0 | .713123, | .650373, | .825737, | .900004, | .879755, | .857239, |
| 3 | 0 | .885655, | .815323, | .795534, | .773909, | .765948, | .755532, |
| 3 | 0 | .740230, | .750763, | .730494, | .782723, | .822539, | .869546, |

AD-A090 025

WISCONSIN UNIV-MADISON MATHEMATICS RESEARCH CENTER

F/G 12/1

A POPULATION OF LINEAR, SECOND ORDER ELLIPTIC PARTIAL DIFFERENT--ETC(U)

MAY 80 J R RICE, E N HOUSTIS, W R DYKSEN

DAAG29-80-C-0041

NL

UNCLASSIFIED

MRC-TSR-2079

2 012
ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED

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| | | | | | | | |
|----|----|------------|-----------|-----------|-----------|-----------|-----------|
| 3 | \$ | 1.000000, | 1.000000, | .974552, | .949240, | .924215, | .899635, |
| 3 | \$ | .875657, | .852483, | .830336, | .809523, | .790433, | .773547, |
| 3 | \$ | .759540, | .749267, | .743985, | .745430, | .755951, | .779176, |
| 3 | \$ | .820182, | .888353, | 1.000000, | 1.000000, | .974120, | .948385, |
| 3 | \$ | .922953, | .897989, | .873657, | .850164, | .827743, | .806706, |
| 3 | \$ | .787453, | .770474, | .756455, | .746262, | .741162, | .742893, |
| 3 | \$ | .753803, | .777506, | .819049, | .887783, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T3B3/ | 1.000000, | .974120, | .948385, | .922953, | .897989, |
| 3 | \$ | .873657, | .850164, | .827743, | .806706, | .787453, | .770474, |
| 3 | \$ | .756455, | .746262, | .741162, | .742892, | .753803, | .777506, |
| 3 | \$ | .819049, | .887783, | 1.000000, | 1.000000, | .974552, | .949240, |
| 3 | \$ | .924215, | .899635, | .875657, | .852483, | .830336, | .809523, |
| 3 | \$ | .790433, | .773547, | .759540, | .749267, | .743985, | .745430, |
| 3 | \$ | .755951, | .779176, | .820182, | .888353, | 1.000000, | 1.000000, |
| 3 | \$ | .975433, | .950988, | .926797, | .903003, | .879755, | .857238, |
| 3 | \$ | .835665, | .815323, | .796584, | .779909, | .765948, | .755532, |
| 3 | \$ | .749899, | .750769, | .760494, | .782729, | .822589, | .889546, |
| 3 | \$ | 1.000000, | 1.000000, | .976808, | .953708, | .930817, | .908259, |
| 3 | \$ | .886160, | .864689, | .844035, | .824465, | .806323, | .790032, |
| 3 | \$ | .776208, | .765637, | .759520, | .759540, | .768040, | .788690, |
| 3 | \$ | .826685, | .891622, | 1.000000, | 1.000000, | .978729, | .957520, |
| 3 | \$ | .936459, | .915647, | .895188, | .875226, | .855922, | .837510, |
| 3 | \$ | .820298, | .804662, | .791160, | .780512, | .773847, | .772784, |
| 3 | \$ | .779605, | .797983, | .833163, | .894928, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T3B4/ | 1.000000, | .981280, | .962581, | .943963, | .925501, |
| 3 | \$ | .907269, | .889384, | .871971, | .855227, | .839414, | .824842, |
| 3 | \$ | .811996, | .801492, | .794350, | .792061, | .796775, | .812068, |
| 3 | \$ | .843199, | .900164, | 1.000000, | 1.000000, | .984558, | .969098, |
| 3 | \$ | .953649, | .938262, | .922979, | .907890, | .893077, | .878694, |
| 3 | \$ | .864950, | .852072, | .840452, | .830568, | .823270, | .819846, |
| 3 | \$ | .822158, | .833520, | .858962, | .908600, | 1.000000, | 1.000000, |
| 3 | \$ | .988680, | .977311, | .965896, | .954461, | .943025, | .931643, |
| 3 | \$ | .920358, | .909277, | .898541, | .888291, | .878800, | .870380, |
| 3 | \$ | .863657, | .859579, | .859566, | .866290, | .884035, | .922490, |
| 3 | \$ | 1.000000, | 1.000000, | .993784, | .987508, | .981169, | .974776, |
| 3 | \$ | .968325, | .961847, | .955346, | .948978, | .942520, | .936319, |
| 3 | \$ | .930428, | .924962, | .920279, | .916883, | .915547, | .917824, |
| 3 | \$ | .926266, | .947896, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T4B1/ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | .996011, | .991983, |
| 3 | \$ | .987907, | .983782, | .979611, | .975413, | .971205, | .967027, |
| 3 | \$ | .962937, | .958994, | .955309, | .952007, | .949329, | .947623, |
| 3 | \$ | .947416, | .949647, | .955896, | .969798, | 1.000000, | 1.000000, |
| 3 | \$ | .992618, | .985194, | .977717, | .970195, | .962645, | .955105, |
| 3 | \$ | .947622, | .940278, | .933185, | .926480, | .920374, | .915139, |
| 3 | \$ | .911221, | .909277, | .910276, | .915861, | .928649, | .953712, |
| 3 | \$ | 1.000000, | 1.000000, | .989784, | .979538, | .969260, | .958972, |
| 3 | \$ | .948707, | .938529, | .928514, | .918787, | .909515, | .900903, |
| 3 | \$ | .893260, | .886985, | .882696, | .881288, | .884038, | .893007, |
| 3 | \$ | .911265, | .944131, | 1.000000, | 1.000000, | .987464, | .974914, |
| 3 | \$ | .962366, | .949857, | .937439, | .925200, | .913248, | .901745, |
| 3 | \$ | .890904, | .880998, | .872412, | .865649, | .861458, | .860892, |
| 3 | \$ | .865422, | .877300, | .899736, | .937977, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T4B2/ | 1.000000, | .985609, | .971226, | .956380, | .942625, |
| 3 | \$ | .928534, | .914715, | .901305, | .888499, | .876552, | .865785, |
| 3 | \$ | .856650, | .849727, | .845852, | .846178, | .852277, | .866476, |
| 3 | \$ | .891984, | .933918, | 1.000000, | 1.000000, | .994181, | .968385, |
| 3 | \$ | .952662, | .937079, | .921726, | .906731, | .892253, | .878514, |
| 3 | \$ | .865801, | .854478, | .845040, | .838122, | .834620, | .835741, |
| 3 | \$ | .843105, | .859051, | .886756, | .931222, | 1.000000, | 1.000000, |
| 3 | \$ | .983141, | .966321, | .949601, | .933061, | .916806, | .900978, |
| 3 | \$ | .885755, | .871378, | .858159, | .846489, | .836897, | .830053, |
| 3 | \$ | .826886, | .828634, | .836934, | .854118, | .883320, | .929460, |
| 3 | \$ | 1.000000, | 1.000000, | .982464, | .964977, | .947609, | .930451, |
| 3 | \$ | .913616, | .897256, | .881562, | .866787, | .853261, | .841392, |
| 3 | \$ | .831729, | .824963, | .822042, | .824218, | .833132, | .851103, |
| 3 | \$ | .881239, | .928405, | 1.000000, | 1.000000, | .982130, | .954314, |

| | | | | | | | |
|----|----|------------|-----------|-----------|-----------|-----------|-----------|
| 3 | \$ | .946627, | .929166, | .912046, | .895428, | .879505, | .864540, |
| 3 | \$ | .850859, | .838909, | .829220, | .822500, | .819707, | .822098, |
| 3 | \$ | .831314, | .849668, | .880250, | .927901, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T4B3/ | 1.000000, | .932130, | .964314, | .946627, | .929166, |
| 3 | \$ | .912046, | .895428, | .879505, | .864540, | .850859, | .838909, |
| 3 | \$ | .829220, | .822500, | .819707, | .822098, | .831314, | .849668, |
| 3 | \$ | .880250, | .927901, | 1.000000, | 1.000000, | .982464, | .964977, |
| 3 | \$ | .947609, | .930451, | .913616, | .897256, | .881562, | .866787, |
| 3 | \$ | .853251, | .841392, | .831729, | .824963, | .822042, | .824218, |
| 3 | \$ | .833132, | .851103, | .881239, | .928405, | 1.000000, | 1.000000, |
| 3 | \$ | .983141, | .966321, | .949601, | .933061, | .916806, | .900978, |
| 3 | \$ | .885755, | .871378, | .858159, | .846489, | .836897, | .830053, |
| 3 | \$ | .826885, | .828634, | .836934, | .854118, | .883320, | .929460, |
| 3 | \$ | 1.000000, | 1.000000, | .934181, | .968385, | .952662, | .937079, |
| 3 | \$ | .921726, | .906731, | .892253, | .878514, | .865801, | .854478, |
| 3 | \$ | .845040, | .838122, | .834620, | .835741, | .843105, | .859051, |
| 3 | \$ | .835756, | .931222, | 1.000000, | 1.000000, | .985609, | .971226, |
| 3 | \$ | .956880, | .942625, | .928534, | .914715, | .901305, | .888499, |
| 3 | \$ | .876552, | .865785, | .856650, | .849727, | .845852, | .846178, |
| 3 | \$ | .852277, | .866476, | .891984, | .933918, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T4B4/ | 1.000000, | .987464, | .974914, | .962366, | .949857, |
| 3 | \$ | .937439, | .925200, | .913248, | .901745, | .890904, | .880998, |
| 3 | \$ | .872412, | .865649, | .861458, | .860892, | .865422, | .877300, |
| 3 | \$ | .899736, | .937977, | 1.000000, | 1.000000, | .989784, | .979538, |
| 3 | \$ | .959260, | .958972, | .948707, | .938529, | .928514, | .918787, |
| 3 | \$ | .909515, | .900903, | .893260, | .886985, | .882696, | .881288, |
| 3 | \$ | .884038, | .893007, | .911265, | .944131, | 1.000000, | 1.000000, |
| 3 | \$ | .992618, | .985194, | .977717, | .970195, | .962645, | .955105, |
| 3 | \$ | .947622, | .940278, | .933185, | .926480, | .920374, | .915139, |
| 3 | \$ | .911221, | .909277, | .910276, | .915861, | .920649, | .953712, |
| 3 | \$ | 1.000000, | 1.000000, | .936011, | .991983, | .987907, | .983782, |
| 3 | \$ | .979611, | .975413, | .971205, | .967027, | .962937, | .958994, |
| 3 | \$ | .955309, | .952007, | .949329, | .947623, | .947416, | .949647, |
| 3 | \$ | .955896, | .969798, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000/ |
| 3C | | | | | | | |
| 3 | | DATA T5B1/ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | .997605, | .995186, |
| 3 | \$ | .992734, | .990248, | .987731, | .985194, | .982652, | .980134, |
| 3 | \$ | .977678, | .975333, | .973173, | .971293, | .969844, | .969042, |
| 3 | \$ | .969210, | .970876, | .974928, | .983205, | 1.000000, | 1.000000, |
| 3 | \$ | .995523, | .991017, | .985469, | .981881, | .977264, | .972643, |
| 3 | \$ | .968054, | .963553, | .959220, | .955157, | .951509, | .948470, |
| 3 | \$ | .946327, | .945492, | .946555, | .950453, | .958648, | .973717, |
| 3 | \$ | 1.000000, | 1.000000, | .993750, | .987473, | .981160, | .974819, |
| 3 | \$ | .968472, | .962159, | .955939, | .949896, | .944149, | .938849, |
| 3 | \$ | .934210, | .930512, | .928155, | .927703, | .929942, | .936052, |
| 3 | \$ | .947751, | .967740, | 1.000000, | 1.000000, | .992271, | .984521, |
| 3 | \$ | .976750, | .968973, | .961223, | .953559, | .946057, | .938831, |
| 3 | \$ | .932034, | .925861, | .920583, | .916549, | .914251, | .914356, |
| 3 | \$ | .917771, | .925800, | .940237, | .963735, | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T5B2/ | 1.000000, | .991070, | .982128, | .973182, | .964256, |
| 3 | \$ | .955396, | .946673, | .938185, | .930069, | .922506, | .915730, |
| 3 | \$ | .910056, | .905888, | .903779, | .904454, | .908919, | .918496, |
| 3 | \$ | .934995, | .960986, | 1.000000, | 1.000000, | .990132, | .980261, |
| 3 | \$ | .970401, | .960589, | .950878, | .941353, | .932129, | .923360, |
| 3 | \$ | .915254, | .903072, | .902163, | .897959, | .896085, | .897288, |
| 3 | \$ | .902587, | .913348, | .931351, | .959097, | 1.000000, | 1.000000, |
| 3 | \$ | .989442, | .978323, | .968351, | .957902, | .947575, | .937476, |
| 3 | \$ | .927729, | .918505, | .910031, | .902587, | .896545, | .892375, |
| 3 | \$ | .890697, | .892310, | .898233, | .909848, | .928895, | .957830, |
| 3 | \$ | 1.000000, | 1.000000, | .988989, | .977987, | .967023, | .956142, |
| 3 | \$ | .945415, | .934945, | .924864, | .915355, | .906652, | .899052, |
| 3 | \$ | .892942, | .883306, | .872779, | .861173, | .849517, | .837672, |
| 3 | \$ | .927379, | .957054, | 1.000000, | 1.000000, | .988765, | .977541, |
| 3 | \$ | .959330, | .955271, | .944348, | .933695, | .923452, | .913804, |
| 3 | \$ | .904932, | .897320, | .891181, | .887067, | .885620, | .887656, |
| 3 | \$ | .894206, | .906628, | .926653, | .956681, | 1.000000/ | |
| 3C | | | | | | | |

```

3 DATA T5B3/ 1.000000, .988765, .977541, .966360, .955271,
3 $ .944343, .933695, .923452, .913804, .904992, .897320,
3 $ .891181, .887067, .885620, .887656, .894206, .906628,
3 $ .926553, .956681, 1.000000, 1.000000, .988989, .977987,
3 $ .937023, .956142, .945415, .934945, .924864, .915355,
3 $ .906652, .899052, .892942, .888806, .887279, .889173,
3 $ .895517, .907672, .927379, .957054, 1.000000, 1.000000,
3 $ .939442, .978888, .968361, .957902, .947575, .937476,
3 $ .927729, .918506, .910031, .902587, .895545, .892375,
3 $ .890697, .892310, .898239, .909848, .928895, .957830,
3 $ 1.000000, 1.000000, .990132, .980261, .970401, .960588,
3 $ .950878, .941353, .932129, .923360, .915254, .908072,
3 $ .902163, .897969, .896085, .897289, .902587, .913348,
3 $ .931351, .959097, 1.000000, 1.000000, .991070, .982128,
3 $ .973182, .964256, .955396, .946673, .938185, .930069,
3 $ .922506, .915730, .910056, .905888, .903779, .904464,
3 $ .908919, .918496, .934995, .960986, 1.000000/
3C
3 DATA T5B4/ 1.000000, .992271, .984521, .976750, .968973,
3 $ .961223, .953559, .946057, .938831, .932034, .925861,
3 $ .920583, .916549, .914251, .914356, .917772, .925800,
3 $ .940237, .963735, 1.000000, 1.000000, .993750, .987472,
3 $ .981160, .974819, .968472, .962159, .955939, .949896,
3 $ .944149, .938849, .934210, .930512, .928155, .927703,
3 $ .929942, .936052, .947751, .967740, 1.000000, 1.000000,
3 $ .995523, .991017, .986469, .981881, .977264, .972643,
3 $ .968054, .963553, .959221, .955157, .951509, .948470,
3 $ .946328, .945492, .946555, .950453, .958648, .973717,
3 $ 1.000000, 1.000000, .997605, .995186, .992734, .990248,
3 $ .987731, .985194, .982652, .980134, .977678, .975333,
3 $ .973174, .971293, .969844, .969042, .969210, .970876,
3 $ .974928, .983205, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000/
3C
3C INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3 CALL QUARD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NGRDD, NGRDD, DERUSL)
3C
3 TRUE = DERUSL(6)
3C
3 RETURN
3 END
3 FUNCTION H(X)
3 GO TO(10,10,20,20,20), &A
3 10 H = 0.0
3 IF (X .NE. 0.) H = 1./X
3 RETURN
3 20 H = EXP(X)
3 RETURN
3 END
3 FUNCTION W(X,Y)
3C
3 REAL DERUSL(6), GRID(9), TAB1(9,9), TAB2(9,9),
3 $ TAB3(9,9), TAB4(9,9), TAB5(9,9)
3 DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3 $0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C COLLOCATION
3C
3 DATA TAB1/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .506876,
3 $ .667850, .769627, .839584, .891757, .933243, .968259,
3 $ 1.000000, 1.000000, .410154, .535076, .650126, .744913,
3 $ .822954, .888785, .946495, 1.000000, 1.000000, .381814,
3 $ .483191, .594221, .696058, .785410, .863715, .933997,
3 $ 1.000000, 1.000000, .374994, .469323, .577958, .681090,
3 $ .773552, .855656, .929943, 1.000000, 1.000000, .381814,
3 $ .483191, .594221, .696058, .785411, .863715, .933997,
3 $ 1.000000, 1.000000, .410154, .535076, .650126, .744914,
3 $ .822954, .888785, .946495, 1.000000, 1.000000, .506876,
3 $ .667850, .769628, .839585, .891758, .933243, .968259,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/

```

```

3C
3 DATA TAB2/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .602893,
3 $ .739247, .822810, .878615, .919148, .950600, .976638,
3 $ 1.000000, 1.000000, .512695, .621554, .720883, .800325,
3 $ .863629, .915379, .959599, 1.000000, 1.000000, .485164,
3 $ .573183, .670610, .757792, .831835, .894601, .949386,
3 $ 1.000000, 1.000000, .478416, .559979, .655650, .744447,
3 $ .821555, .887770, .946000, 1.000000, 1.000000, .485164,
3 $ .573183, .670609, .757791, .831834, .894601, .949387,
3 $ 1.000000, 1.000000, .512695, .621554, .720882, .800324,
3 $ .863628, .915379, .959599, 1.000000, 1.000000, .602893,
3 $ .739248, .822809, .878615, .919148, .950601, .976638,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB3/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .969133,
3 $ .938216, .907820, .879233, .855269, .842995, .863848,
3 $ 1.000000, 1.000000, .950959, .902895, .857303, .816798,
3 $ .786550, .778103, .820581, 1.000000, 1.000000, .941574,
3 $ .884947, .832317, .787160, .755922, .751881, .805331,
3 $ 1.000000, 1.000000, .938692, .879478, .824808, .778445,
3 $ .747215, .744783, .801431, 1.000000, 1.000000, .941574,
3 $ .884947, .832318, .787160, .755922, .751882, .805331,
3 $ 1.000000, 1.000000, .950960, .902895, .857303, .816799,
3 $ .786551, .778103, .820582, 1.000000, 1.000000, .969133,
3 $ .938217, .907820, .879233, .855269, .842995, .863848,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB4/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .979728,
3 $ .959246, .938933, .919863, .904380, .897858, .914513,
3 $ 1.000000, 1.000000, .966833, .933969, .902427, .874367,
3 $ .854068, .850356, .882916, 1.000000, 1.000000, .959791,
3 $ .920374, .883276, .851374, .830024, .829479, .870497,
3 $ 1.000000, 1.000000, .957565, .916106, .877340, .844387,
3 $ .822928, .823561, .867130, 1.000000, 1.000000, .959792,
3 $ .920374, .883276, .851374, .830024, .829479, .870497,
3 $ 1.000000, 1.000000, .966833, .933969, .902427, .874367,
3 $ .854068, .850356, .882916, 1.000000, 1.000000, .979728,
3 $ .959246, .938933, .919863, .904380, .897858, .914513,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB5/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .987658,
3 $ .975113, .962598, .950876, .941611, .938390, .949788,
3 $ 1.000000, 1.000000, .979429, .958883, .938986, .921260,
3 $ .908740, .907369, .929229, 1.000000, 1.000000, .974782,
3 $ .949842, .926125, .905660, .892267, .892922, .920524,
3 $ 1.000000, 1.000000, .973287, .946951, .922060, .900817,
3 $ .887281, .888697, .918071, 1.000000, 1.000000, .974783,
3 $ .949843, .926125, .905660, .892266, .892921, .920524,
3 $ 1.000000, 1.000000, .979431, .958885, .938987, .921259,
3 $ .908738, .907368, .929228, 1.000000, 1.000000, .987659,
3 $ .975115, .962599, .950875, .941603, .938389, .949788,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3C INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3 CALL QUADRD(X,Y,TAB&A,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3 W = DERUSL(6)
3C
3 RETURN
3 END

```

EOB

* MACRO 40 *

* 20002000000020
1 TWO DIMENSIONS

```

1      UXX$ + (1.+X**2)UYY$ - (Y)UX$ = F(X,Y)
2      MIXED
2      X=0. , MIXED = (&A)U + (&B)UX = G(X,Y)
2      X=1. , MIXED = (&A)U + (&B)UX = G(X,Y)
2      Y=0. , U=TRUE(X,Y)
2      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      U = (X+Y)/(2.+X-Y)
3      U1 = EXP(2.*U-2.)
3      W = (X+1.)/(Y+1.)
3      U2 = ALOG10(W)
3      TRUE = U1 + U2
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      DATA ALOGE10/2.3025850929940/
3      U = (X+Y)/(2.+X-Y)
3      UX = 2.*(1.-Y)/(2.+X-Y)**2
3      UXX = 4.*(Y-1.)/(2.+X-Y)**3
3      UY = 2.*(1.+X)/(2.+X-Y)**2
3      UYY = 4.*(1.+X)/(2.+X-Y)**3
3      U1 = EXP(2.*U-2.)
3      U1X = 2.*UX*U1
3      U1XX = 2.*(UXX + 2.*UX**2)*U1
3      U1Y = 2.*UY*U1
3      U1YY = 2.*(UYY + 2.*UY**2)*U1
3      W = (X+1.)/(Y+1.)
3      WX = 1./(Y+1.)
3      WY = -(X+1.)/(Y+1.)**2
3      WYY = 2.*(X+1.)/(Y+1.)**3
3      U2 = ALOG10(W)
3      U2X = (WX/W)/ALOG10
3      U2XX = (-WX/W)**2/ALOG10
3      U2Y = (WY/W)/ALOG10
3      U2YY = (WYY/W - (WY/W)**2)/ALOG10
3      UX = U1X + U2X
3      UXX = U1XX + U2XX
3      UY = U1Y + U2Y
3      F = UXX + (1.+X**2)*UYY - Y*UX
3      RETURN
3      END
3      FUNCTION G(X,Y)
3      DATA ALOGE10/2.3025850929940/
3      U = (X+Y)/(2.+X-Y)
3      UX = 2.*(1.-Y)/(2.+X-Y)**2
3      U1 = EXP(2.*U-2.)
3      U1X = 2.*UX*U1
3      W = (X+1.)/(Y+1.)
3      WX = 1./(Y+1.)
3      U2 = ALOG10(W)
3      U2X = (WX/W)/ALOG10
3      U = U1 + U2
3      UX = U1X + U2X
3      G = &A*U + (&B)*UX
3      RETURN
3      END

```

'EOR

* MACRO 41 *

```

*      2000021002002
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS
1      UXX$ + UYY$ + (&A)U$ = F(X,Y)
2      DIRICHLET $ HOMOGENEOUS
2      X=0. , U=0.
2      X=3.14159265358979 , U=0.
2      Y=0. , U=0.
2      Y=3.14159265358979 , U=0.
3      FUNCTION TRUE(X,Y)
3      DATA PI/3.14159265358979/
3      SUM = 0.
3      DO 100 K = 1,&B
3      TEMP = 2.*K - 1.
3      SUM = SUM + SIN(TEMP*X)*COSH(TEMP*(Y-PI*.5))/
3      $      (TEMP**3*COSH(TEMP*PI*.5))

```

```

3 100 CONTINUE
3   TRUE = .5*X*(PI-X) - 4./PI*SUM
3   RETURN
3   END
3   FUNCTION F(X,Y)
3   F = -1. +(&A)*TRUE(X,Y)
3   RETURN
3   END
3   FUNCTION COSH(X)
3   EXPX = EXP(X)
3   COSH = 0.5*(EXPX + 1./EXPX)
3   RETURN
3   END

```

```

*EOR

```

```

*****
* MACRO 42 *
*****

```

```

*      2000220200200
1      TWO DIMENSIONS $ CONSTANT COEFFICIENTS
1      UXX$ + UYY$ + UY$ - US = 0.
2      NEUMANN
2      X=&A , UX = -G1(X,Y)
2      X=&B , UX = G1(X,Y)
2      Y=0. , UY = -G2(X,Y)
2      Y=1. , UY = G2(X,Y)
3      FUNCTION TRUE(X,Y)
3      COMMON /CONCOM/ PI
3      DATA PI/3.14159265358979/
3      F0 = (&C)*PI/((&B)-(&A))
3      F1 = SQRT(5./4. +F0*F0)
3      TRUE = EXP(-Y*.5)*SINH(F1*Y)*SIN(F0*(X-(&A)))
3      RETURN
3      END
3      FUNCTION G1(X,Y)
3      COMMON /CONCOM/PI
3      F0 = (&C)*PI/((&B)-(&A))
3      F1 = SQRT(5./4. +F0*F0)
3      G1 = EXP(-Y*.5)*SINH(F1*Y)*F0*COS(F0*(X-(&A)))
3      IF (ABS(X-(&A)) .LT. 1.E-7) G1 = -1.*G1
3      RETURN
3      END
3      FUNCTION G2(X,Y)
3      COMMON /CONCOM/PI
3      F0 = (&C)*PI/((&B)-(&A))
3      F1 = SQRT(5./4. +F0*F0)
3      G2 = -.5*TRUE(X,Y) + F1*EXP(-Y*.5)*COSH(F1*Y)*
3      SIN(F0*(X-(&A)))
3      IF (Y .EQ. 0.) G2 = -1.*G2
3      RETURN
3      END
3      FUNCTION SINH(X)
3      EXPX = EXP(X)
3      SINH = 0.5*(EXPX - 1./EXPX)
3      RETURN
3      END
3      FUNCTION COSH(X)
3      EXPX = EXP(X)
3      COSH = 0.5*(EXPX + 1./EXPX)
3      RETURN
3      END

```

```

*EOR

```

```

*****
* MACRO 43 *
*****

```

```

*EOR

```

```

*****
* MACRO 44 *
*****

```

```

*      2000001002002
1      TWO DIMENSIONS
1      UXX$ + UYY$ + W(X,Y)US = W(X,Y)
2      DIPICHLET $ HOMOGENEOUS
2      K=0. , U=0.

```

QUESTION

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1. *What is the main purpose of the study?*
 2. *What are the research objectives?*
 3. *What is the significance of the study?*
 4. *What is the scope of the study?*
 5. *What are the limitations of the study?*
 6. *What is the structure of the study?*
 7. *What is the methodology used in the study?*
 8. *What are the results of the study?*
 9. *What are the conclusions of the study?*
 10. *What are the recommendations of the study?*

.....

```

3C
3 DATA T1B3/ .000000, .033001, .050855, .084076, .103078,
3 $ .118274, .130010, .138554, .144150, .146907, .146907,
3 $ .144150, .133554, .130010, .118274, .103078, .084076,
3 $ .060836, .033001, .000000, .000000, .032514, .059913,
3 $ .032690, .101308, .116179, .127650, .136006, .141459,
3 $ .144150, .144150, .141459, .136006, .127650, .116179,
3 $ .101308, .082690, .059913, .032514, .000000, .000000,
3 $ .031522, .057958, .079859, .097710, .111921, .122862,
3 $ .130819, .136006, .138554, .138564, .136006, .130819,
3 $ .122862, .111921, .097710, .079859, .057958, .031522,
3 $ .000000, .000000, .029984, .054957, .075507, .092159,
3 $ .105358, .115506, .122862, .127650, .130010, .130010,
3 $ .127650, .122862, .115506, .105358, .092159, .075507,
3 $ .054957, .029984, .000000, .000000, .027830, .050752,
3 $ .069435, .084451, .095312, .105358, .111921, .116179,
3 $ .118274, .118274, .116179, .111921, .105358, .096312,
3 $ .084451, .069435, .050752, .027830, .000000/

3C
3 DATA T1B4/ .000000, .024955, .045161, .061406, .074337,
3 $ .084451, .092159, .097710, .101308, .103078, .103078,
3 $ .101308, .097710, .092159, .084451, .074337, .061406,
3 $ .045161, .024955, .000000, .000000, .021191, .037893,
3 $ .051051, .051406, .069435, .075507, .079859, .082690,
3 $ .084076, .084076, .082690, .079859, .075507, .069435,
3 $ .061406, .051051, .037893, .021191, .000000, .000000,
3 $ .016256, .028493, .037893, .045161, .050752, .054957,
3 $ .057958, .059913, .050855, .060855, .059913, .057958,
3 $ .054957, .050752, .045161, .037893, .028493, .016256,
3 $ .000000, .000000, .003616, .016256, .021191, .024955,
3 $ .027830, .029984, .031522, .032514, .033001, .033001,
3 $ .032514, .031522, .029984, .027830, .024955, .021191,
3 $ .016256, .009616, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000/

3C
3 DATA T2B1/ .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .000000, .000000,
3 $ .000000, .000000, .000000, .000000, .252731, .367756,
3 $ .422720, .447250, .458919, .464413, .457014, .468253,
3 $ .468582, .468582, .468253, .467014, .464413, .458919,
3 $ .447250, .422720, .367756, .252731, .000000, .000000,
3 $ .367756, .557305, .650506, .693899, .714513, .724187,
3 $ .728757, .730855, .731652, .731652, .730855, .728757,
3 $ .724187, .714513, .693899, .650506, .557305, .567756,
3 $ .000000, .000000, .422720, .650506, .765119, .819808,
3 $ .845933, .858258, .854071, .868731, .867747, .867747,
3 $ .858258, .854071, .858258, .845933, .819808, .765119,
3 $ .650506, .422720, .000000, .000000, .447250, .693899,
3 $ .819808, .880741, .910053, .923977, .930554, .933563,
3 $ .934720, .934720, .933563, .930554, .923977, .910053,
3 $ .830741, .819808, .693899, .447250, .000000/

3C
3 DATA T2B2/ .000000, .458919, .714513, .845933, .910053,
3 $ .941055, .955358, .962039, .965079, .967321, .967321,
3 $ .955079, .952859, .953858, .941055, .910053, .845933,
3 $ .714513, .458919, .000000, .000000, .464413, .724187,
3 $ .858258, .923977, .955358, .971139, .978392, .981719,
3 $ .933009, .933009, .931719, .978392, .971139, .955858,
3 $ .923977, .853258, .724187, .464413, .000000, .000000,
3 $ .457014, .728757, .854071, .930554, .962859, .978392,
3 $ .985772, .983162, .990430, .990430, .989162, .985772,
3 $ .978392, .962859, .930554, .854071, .728757, .467014,
3 $ .000000, .000000, .468253, .730855, .868731, .933563,
3 $ .955079, .931719, .939162, .992584, .993916, .993916,
3 $ .922534, .983162, .931719, .965079, .933563, .868731,
3 $ .730235, .468253, .000000, .000000, .468392, .731652,
3 $ .857747, .934720, .957321, .983009, .990430, .993916,
3 $ .995254, .935254, .993916, .990430, .983009, .867321,
3 $ .934720, .857747, .731652, .468392, .000000/

3C
3 DATA T2B3/ .000000, .468382, .731652, .857747, .934720,
3 $ .967321, .933003, .990430, .993916, .995254, .995254,
3 $ .993916, .990430, .993009, .967321, .934720, .867747,

```

| | | | | | | | |
|---|----|----------|----------|----------|----------|----------|----------|
| 3 | \$ | .731652, | .468682, | .000000, | .000000, | .468253, | .730865, |
| 3 | \$ | .866731, | .933563, | .955079, | .981719, | .989162, | .992584, |
| 3 | \$ | .993916, | .993916, | .992584, | .989162, | .981719, | .966079, |
| 3 | \$ | .933563, | .866731, | .730865, | .468253, | .000000, | .000000, |
| 3 | \$ | .467014, | .728757, | .864071, | .930554, | .962869, | .978392, |
| 3 | \$ | .985772, | .989162, | .990480, | .990480, | .989162, | .985772, |
| 3 | \$ | .978392, | .962869, | .930554, | .864071, | .728757, | .467014, |
| 3 | \$ | .000000, | .000000, | .464413, | .724187, | .858258, | .923977, |
| 3 | \$ | .955858, | .971139, | .978392, | .981719, | .983009, | .983009, |
| 3 | \$ | .981719, | .978392, | .971139, | .955858, | .923977, | .858258, |
| 3 | \$ | .724187, | .464413, | .000000, | .000000, | .458919, | .714513, |
| 3 | \$ | .845933, | .910053, | .941055, | .955858, | .962869, | .966079, |
| 3 | \$ | .967321, | .967321, | .966079, | .962869, | .955858, | .941055, |
| 3 | \$ | .910053, | .845933, | .714513, | .458919, | .000000/ | |

3C

| | | | | | | | |
|---|----|------------|----------|----------|----------|----------|----------|
| 3 | | DATA T2B4/ | .000000, | .447250, | .693899, | .819808, | .880741, |
| 3 | \$ | .910053, | .923977, | .930554, | .933563, | .934720, | .934720, |
| 3 | \$ | .933563, | .930554, | .923977, | .910053, | .880741, | .819808, |
| 3 | \$ | .693899, | .447250, | .000000, | .000000, | .422720, | .650506, |
| 3 | \$ | .765119, | .819808, | .845933, | .858258, | .864071, | .866731, |
| 3 | \$ | .867747, | .867747, | .866731, | .864071, | .858258, | .845933, |
| 3 | \$ | .819808, | .765119, | .650506, | .422720, | .000000, | .000000, |
| 3 | \$ | .367756, | .557305, | .650506, | .693899, | .714513, | .724187, |
| 3 | \$ | .728757, | .730865, | .731652, | .731652, | .730865, | .728757, |
| 3 | \$ | .724187, | .714513, | .693899, | .650506, | .557305, | .367756, |
| 3 | \$ | .000000, | .000000, | .252731, | .367756, | .422720, | .447250, |
| 3 | \$ | .458919, | .464413, | .467014, | .458253, | .468682, | .468682, |
| 3 | \$ | .468253, | .467014, | .464413, | .458919, | .447250, | .422720, |
| 3 | \$ | .367756, | .252731, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .000000/ | |

3C

| | | | | | | | |
|---|----|------------|----------|----------|----------|----------|----------|
| 3 | | DATA T3B1/ | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | \$ | .000000, | .000000, | .000000, | .000000, | .009168, | .015386, |
| 3 | \$ | .019938, | .023367, | .025957, | .027881, | .029246, | .030122, |
| 3 | \$ | .030550, | .030550, | .030122, | .029246, | .027881, | .025957, |
| 3 | \$ | .023367, | .019938, | .015386, | .009168, | .000000, | .000000, |
| 3 | \$ | .015386, | .026806, | .035451, | .042060, | .047093, | .050847, |
| 3 | \$ | .053517, | .055233, | .056072, | .056072, | .055233, | .053517, |
| 3 | \$ | .050847, | .047093, | .042060, | .035451, | .026806, | .015386, |
| 3 | \$ | .000000, | .000000, | .019938, | .035451, | .047532, | .056920, |
| 3 | \$ | .064138, | .069552, | .073417, | .075906, | .077125, | .077125, |
| 3 | \$ | .075906, | .073417, | .069552, | .064138, | .056920, | .047532, |
| 3 | \$ | .035451, | .019938, | .000000, | .000000, | .023367, | .042060, |
| 3 | \$ | .056920, | .068630, | .077715, | .084572, | .089487, | .092659, |
| 3 | \$ | .094214, | .094214, | .092659, | .089487, | .084572, | .077715, |
| 3 | \$ | .068630, | .056920, | .042060, | .023367, | .000000/ | |

3C

| | | | | | | | |
|---|----|------------|----------|----------|----------|----------|----------|
| 3 | | DATA T3D2/ | .000000, | .025957, | .047093, | .064138, | .077715, |
| 3 | \$ | .083333, | .096390, | .102187, | .105938, | .107779, | .107779, |
| 3 | \$ | .105938, | .102187, | .096390, | .083333, | .077715, | .064138, |
| 3 | \$ | .047093, | .025957, | .000000, | .000000, | .027881, | .050847, |
| 3 | \$ | .069552, | .084572, | .096390, | .105399, | .111901, | .116116, |
| 3 | \$ | .118189, | .113189, | .116116, | .111901, | .105399, | .096390, |
| 3 | \$ | .084572, | .069552, | .050847, | .027881, | .000000, | .000000, |
| 3 | \$ | .029246, | .053517, | .073417, | .089487, | .102187, | .111901, |
| 3 | \$ | .118189, | .123493, | .125738, | .125738, | .123493, | .118929, |
| 3 | \$ | .111901, | .102187, | .089487, | .073417, | .053517, | .029246, |
| 3 | \$ | .000000, | .000000, | .030122, | .055233, | .075906, | .092659, |
| 3 | \$ | .105938, | .116116, | .123493, | .128288, | .130650, | .130650, |
| 3 | \$ | .128288, | .123493, | .116116, | .105938, | .092659, | .075906, |
| 3 | \$ | .055233, | .030122, | .000000, | .000000, | .030550, | .056072, |
| 3 | \$ | .077125, | .094214, | .107779, | .118189, | .125738, | .130650, |
| 3 | \$ | .133069, | .133069, | .130650, | .125738, | .118189, | .107779, |
| 3 | \$ | .094214, | .077125, | .056072, | .030550, | .000000/ | |

3C

| | | | | | | | |
|---|----|------------|----------|----------|----------|----------|----------|
| 3 | | DATA T3B3/ | .000000, | .030550, | .056072, | .077125, | .094214, |
| 3 | \$ | .107779, | .118189, | .125738, | .130650, | .133069, | .133069, |
| 3 | \$ | .130650, | .125738, | .118189, | .107779, | .094214, | .077125, |
| 3 | \$ | .056072, | .030550, | .000000, | .000000, | .030122, | .055233, |
| 3 | \$ | .075906, | .092659, | .105938, | .116116, | .123493, | .128288, |
| 3 | \$ | .130650, | .130650, | .128288, | .123493, | .116116, | .105938, |
| 3 | \$ | .092659, | .075906, | .055233, | .030122, | .000000, | .000000, |

| | | | | | | | |
|----|---|------------|----------|----------|----------|----------|----------|
| 3 | S | .029246, | .053517, | .073417, | .023437, | .102137, | .111901, |
| 3 | S | .110323, | .123433, | .125733, | .125733, | .123433, | .118929, |
| 3 | S | .111901, | .102137, | .023437, | .073417, | .053517, | .029246, |
| 3 | S | .000000, | .000000, | .027631, | .050347, | .035552, | .084572, |
| 3 | S | .003333, | .105533, | .111901, | .113115, | .118183, | .118183, |
| 3 | S | .113115, | .111901, | .105533, | .023330, | .034572, | .069552, |
| 3 | S | .053517, | .027631, | .000000, | .000000, | .025557, | .047093, |
| 3 | S | .034133, | .077715, | .023333, | .003330, | .102137, | .105933, |
| 3 | S | .107773, | .107773, | .105333, | .102137, | .053530, | .083333, |
| 3 | S | .077715, | .034133, | .047093, | .025557, | .000000, | |
| 3C | | | | | | | |
| 3 | | DATA T034/ | .000000, | .023357, | .042050, | .056920, | .068530, |
| 3 | S | .077715, | .034572, | .033437, | .032653, | .094214, | .094214, |
| 3 | S | .092553, | .033437, | .034572, | .077715, | .035530, | .056920, |
| 3 | S | .042050, | .023357, | .000000, | .000000, | .018333, | .035451, |
| 3 | S | .047532, | .056920, | .034133, | .035552, | .073417, | .075906, |
| 3 | S | .077183, | .077183, | .075306, | .073417, | .035552, | .064138, |
| 3 | S | .056920, | .047532, | .035151, | .019323, | .000000, | .000000, |
| 3 | S | .015333, | .026303, | .033151, | .042050, | .047093, | .050847, |
| 3 | S | .053517, | .053223, | .033172, | .033072, | .055233, | .053517, |
| 3 | S | .053347, | .047093, | .042050, | .033451, | .025303, | .015385, |
| 3 | S | .000000, | .000000, | .000153, | .015323, | .015333, | .023267, |
| 3 | S | .025557, | .027631, | .029246, | .030122, | .030550, | .030550, |
| 3 | S | .030122, | .029246, | .027631, | .025557, | .023337, | .015938, |
| 3 | S | .015333, | .009163, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000000, | |
| 3C | | | | | | | |
| 3 | | DATA T031/ | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .009154, | .015350, |
| 3 | S | .015333, | .023316, | .025335, | .027811, | .023169, | .030040, |
| 3 | S | .030455, | .030455, | .030240, | .029169, | .027811, | .025896, |
| 3 | S | .023316, | .019300, | .015350, | .009154, | .000000, | .000000, |
| 3 | S | .015350, | .023754, | .035373, | .041353, | .043971, | .050706, |
| 3 | S | .053353, | .055969, | .055903, | .055903, | .055069, | .053353, |
| 3 | S | .050706, | .045971, | .041959, | .035373, | .023754, | .015360, |
| 3 | S | .000000, | .000000, | .019300, | .035373, | .047417, | .055770, |
| 3 | S | .053353, | .033343, | .073187, | .075352, | .073374, | .076874, |
| 3 | S | .075352, | .073187, | .063343, | .063355, | .055770, | .047417, |
| 3 | S | .035373, | .019300, | .000000, | .000000, | .023316, | .041959, |
| 3 | S | .055770, | .063422, | .077475, | .084233, | .033185, | .092338, |
| 3 | S | .092338, | .093385, | .092333, | .059135, | .084233, | .077476, |
| 3 | S | .063432, | .055770, | .041953, | .023316, | .000000, | |
| 3C | | | | | | | |
| 3 | | DATA T432/ | .000000, | .025335, | .046371, | .053355, | .077476, |
| 3 | S | .033044, | .093053, | .101321, | .105543, | .107379, | .107379, |
| 3 | S | .105543, | .101321, | .093053, | .033044, | .077476, | .063956, |
| 3 | S | .046371, | .025335, | .000000, | .000000, | .027811, | .050706, |
| 3 | S | .033044, | .034233, | .093053, | .105018, | .111431, | .115670, |
| 3 | S | .117723, | .117723, | .115370, | .111431, | .105018, | .093053, |
| 3 | S | .034233, | .033343, | .050706, | .027811, | .000000, | .000000, |
| 3 | S | .025153, | .033333, | .073137, | .039125, | .101821, | .111481, |
| 3 | S | .115133, | .123001, | .125232, | .125232, | .123001, | .118456, |
| 3 | S | .111431, | .101321, | .033135, | .073137, | .053353, | .029169, |
| 3 | S | .000000, | .000000, | .030040, | .035053, | .075352, | .092338, |
| 3 | S | .105543, | .115370, | .123001, | .127735, | .130110, | .130110, |
| 3 | S | .127735, | .123001, | .115370, | .105543, | .092338, | .075662, |
| 3 | S | .033133, | .030040, | .000000, | .000000, | .030455, | .055903, |
| 3 | S | .073374, | .023335, | .107379, | .117723, | .125232, | .130110, |
| 3 | S | .130110, | .130110, | .125232, | .117723, | .107379, | |
| 3 | S | .027735, | .073374, | .055903, | .030455, | .000000, | |
| 3C | | | | | | | |
| 3 | | DATA T432/ | .000000, | .030455, | .035203, | .073374, | .093885, |
| 3 | S | .107379, | .117723, | .125232, | .130110, | .125213, | .132513, |
| 3 | S | .125213, | .125232, | .117723, | .107379, | .053335, | .076874, |
| 3 | S | .030455, | .030455, | .000000, | .000000, | .030040, | .055069, |
| 3 | S | .035203, | .027735, | .105543, | .115370, | .123001, | .127765, |
| 3 | S | .127765, | .123001, | .127735, | .123001, | .115370, | .105549, |
| 3 | S | .105543, | .035203, | .035203, | .030040, | .000000, | .000000, |
| 3 | S | .123001, | .030040, | .073137, | .039125, | .101321, | .111481, |
| 3 | S | .117723, | .123001, | .125232, | .125232, | .123001, | .118456, |
| 3 | S | .111431, | .101321, | .033135, | .073137, | .053353, | .029169, |
| 3 | S | .000000, | .000000, | .030040, | .030040, | .030040, | |

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3  $ .095853, .105013, .111431, .115570, .117729, .117729,
3  $ .115570, .111431, .105013, .095853, .084293, .060343,
3  $ .050706, .027311, .000000, .000000, .025393, .046971,
3  $ .060343, .077475, .050044, .030053, .101021, .105549,
3  $ .107375, .107375, .103313, .101021, .055058, .088044,
3  $ .077475, .050055, .046971, .025393, .000000/
3
3  DATA TAB1, .000000, .020316, .041059, .055770, .068432,
3  $ .077475, .084293, .080165, .082033, .083535, .093885,
3  $ .092033, .089165, .084203, .077475, .069432, .055770,
3  $ .041959, .023316, .000000, .000000, .019900, .035373,
3  $ .047417, .055770, .050355, .059343, .073187, .075662,
3  $ .076374, .076874, .075652, .073187, .059343, .063956,
3  $ .055770, .047417, .035373, .019900, .000000, .000000,
3  $ .015350, .026754, .035373, .041959, .046971, .050706,
3  $ .053353, .055069, .055903, .055903, .055069, .053353,
3  $ .050706, .046971, .041959, .035373, .026754, .015350,
3  $ .000000, .000000, .009154, .015350, .019900, .023316,
3  $ .025393, .027311, .029153, .030040, .030455, .030455,
3  $ .030040, .029153, .027311, .025393, .023316, .019900,
3  $ .015350, .009154, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000, .000000, .000000/
3C
3C  INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3  CALL QUADRD(X,Y,TABLE,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3  TRUE = DERUSL(6)
3C
3  RETURN
3  END
3  FUNCTION N(X,Y)
3C
3  REAL DERUSL(6), GRID(9), TAB1(9,9), TAB2(9,9),
3  $ TAB3(9,9), TAB4(9,9)
3  DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3  $ 0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C  APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C  COLLOCATION
3C
3  DATA TAB1, .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000, .000000, .036712,
3  $ .056745, .067035, .070223, .057036, .056745, .036712,
3  $ .000000, .000000, .056745, .091025, .109316, .115060,
3  $ .109316, .091025, .056745, .000000, .000000, .067035,
3  $ .109316, .132414, .133733, .132414, .109316, .067035,
3  $ .000000, .000000, .070223, .115050, .133733, .147590,
3  $ .133733, .115050, .070223, .000000, .000000, .067035,
3  $ .109316, .132414, .133733, .132414, .109316, .067035,
3  $ .000000, .000000, .056744, .091025, .109316, .115060,
3  $ .109316, .091025, .056744, .000000, .000000, .036712,
3  $ .056744, .067035, .070223, .057036, .056744, .036712,
3  $ .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000/
3C
3  DATA TAB2, .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000, .000000, .648110,
3  $ .770994, .791955, .791955, .791955, .770994, .648110,
3  $ .000000, .000000, .770993, .829309, .957243, .951261,
3  $ .057243, .023309, .770994, .000000, .000000, .791955,
3  $ .057243, .023309, .691103, .023309, .957242, .791955,
3  $ .000000, .000000, .791955, .051251, .931133, .995494,
3  $ .691103, .051251, .791955, .000000, .000000, .791955,
3  $ .057242, .023309, .691103, .023309, .957242, .791955,
3  $ .000000, .000000, .770993, .829309, .957242, .951261,
3  $ .057242, .023309, .770993, .000000, .000000, .648110,
3  $ .770994, .791955, .791955, .791955, .770993, .648110,
3  $ .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000/
3C
3  DATA TAB3, .000000, .000000, .000000, .000000, .000000, .000000,
3  $ .000000, .000000, .000000, .000000, .000000, .034389,
3  $ .051251, .051251, .051251, .051251, .051251, .034389,

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3      S .000000, .000000, .052305, .032511, .093351, .104916,
3      S .002351, .033511, .052305, .000000, .000000, .061771,
3      S .003351, .120335, .123773, .120335, .093351, .061771,
3      S .000000, .000000, .054533, .104916, .123773, .133669,
3      S .123773, .104916, .054533, .000000, .000000, .061771,
3      S .002351, .120335, .123773, .120335, .093351, .061771,
3      S .000000, .000000, .052304, .032511, .093350, .104916,
3      S .092330, .032511, .052304, .000000, .000000, .034389,
3      S .052304, .051770, .054533, .051770, .052304, .034389,
3      S .000000, .000000, .000000, .000000, .000000, .000000,
3      S .000000, .000000, .000000, .000000, .000000, .000000,
3C
3      DATA TAB4/ .000000, .000000, .000000, .000000, .000000, .000000,
3      S .000000, .000000, .000000, .000000, .000000, .034316,
3      S .052435, .051525, .054333, .051525, .052435, .034316,
3      S .000000, .000000, .052435, .033345, .033345, .104531,
3      S .033345, .033345, .052435, .000000, .000000, .061586,
3      S .033345, .119354, .123259, .119354, .093507, .061586,
3      S .000000, .000000, .054332, .104531, .123259, .133110,
3      S .123259, .104531, .054332, .000000, .000000, .061586,
3      S .033345, .119354, .123259, .119354, .093507, .061586,
3      S .000000, .000000, .052435, .033345, .033345, .104531,
3      S .033345, .033345, .052435, .000000, .000000, .034315,
3      S .052435, .051525, .054332, .051525, .052435, .034315,
3      S .000000, .000000, .000000, .000000, .000000, .000000,
3      S .000000, .000000, .000000, .000000, .000000, .000000,
3C
3C      INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3      CALL QUADRD(X,Y,TAB&E,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3      G = DERUSL(G)
3C
3      H = -(2A**2)*(1.-G)**(2B-1)*EXP(&C*2D*G/(1.+2D*G))
3C
3      RETURN
3      END

```

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1EOR
*****
* MACRO 45 *
*****
*      2000001203000
1      TWO DIMENSIONS & HOMOGENEOUS
1      UXX5 + UYY5 - (2A*R(X,Y))U5 = 0.0
2      DIRICHLET
3      X=0. , U=TRUE(X,Y)
3      X=1. , U=TRUE(X,Y)
3      Y=0. , U=TRUE(X,Y)
3      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3C
3C      *****
3C      *
3C      *      MACRO 45 PARAMETERS
3C      *
3C      *****
3C      *
3C      *      A      I      3      I      C
3C      *      -----I-----I-----
3C      *      2      I      1      I      1
3C      *      I      I
3C      *      1000 I      1      I      2
3C      *      I      I
3C      *      2      I      2      I      3
3C      *
3C      *****
3C
3      REAL DERUSL(G), GRID(20), TABLE(20,20),
3      S T1B1(100), T1B2(100), T1B3(100), T1B4(100),
3      S T2B1(100), T2B2(100), T2B3(100), T2B4(100),
3      S T3B1(100), T3B2(100), T3B3(100), T3B4(100)
3      EQUIVALENCE (TABLE(1, 1), T&C31(1)),
3      S (TABLE(1, 5), T&C32(1)),
3      S (TABLE(1,11), T&C33(1)),
3      S (TABLE(1,15), T&C34(1))

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```

3 DATA NGRID, NGRDD, GRID /20, 20, 0.000000, 0.0526316,
3 $0.1052632, 0.1578947, 0.2105263, 0.2631579, 0.3157895,
3 $0.3684211, 0.4210526, 0.4736842, 0.5263158, 0.5789474,
3 $0.6315789, 0.6842105, 0.7368421, 0.7894737, 0.8421053,
3 $0.8947368, 0.9473684, 1.0000000/
3C
3C APPROXIMATE SOLUTION OF LINEARIZED PROBLEM USING
3C HODIE-ACF (METHOD=4, IORDER=41, 20 X 20 GRID)
3C
3 DATA T1B1/ .726132, .712680, .701080, .691075, .682910,
3 $ .676141, .670804, .665917, .664211, .662966, .662966,
3 $ .654211, .665917, .670805, .676142, .682910, .691075,
3 $ .701080, .712680, .726132, .712679, .698560, .686375,
3 $ .675985, .667311, .660220, .654633, .650495, .647745,
3 $ .645386, .646386, .647745, .650496, .654633, .660220,
3 $ .667312, .675985, .685376, .698560, .712680, .701079,
3 $ .685375, .673701, .662897, .653849, .645454, .640630,
3 $ .635314, .633459, .632039, .632039, .633459, .636314,
3 $ .640631, .645455, .653849, .662897, .673701, .686375,
3 $ .701080, .691074, .675984, .662897, .651725, .642360,
3 $ .634703, .628672, .624202, .621247, .619777, .619777,
3 $ .621247, .624202, .623672, .634703, .642361, .651726,
3 $ .652337, .675984, .691074, .682909, .667311, .653849,
3 $ .642360, .632726, .624845, .618537, .614036, .610995,
3 $ .609482, .609482, .610995, .614036, .618637, .624846,
3 $ .632726, .642360, .653849, .667311, .682908/
3C
3 DATA T1B2/ .676140, .660219, .645454, .634703, .624845,
3 $ .616781, .610426, .605716, .602602, .601053, .601053,
3 $ .602602, .605716, .610426, .616781, .624845, .634703,
3 $ .645454, .660219, .676140, .670803, .654532, .640630,
3 $ .628671, .618637, .610426, .603954, .599157, .595986,
3 $ .594408, .594408, .595986, .599157, .603954, .610426,
3 $ .618637, .628671, .640630, .654532, .670804, .666916,
3 $ .650495, .636314, .624202, .614036, .605716, .599157,
3 $ .594295, .591080, .589481, .589481, .591080, .594295,
3 $ .599157, .605715, .614036, .624202, .636314, .650495,
3 $ .666916, .664211, .647745, .633459, .621247, .610995,
3 $ .602602, .595985, .591080, .587837, .586223, .586223,
3 $ .587837, .591080, .595985, .602602, .610995, .621247,
3 $ .633458, .647745, .664210, .662967, .646387, .632039,
3 $ .619777, .609482, .601053, .594408, .589481, .586223,
3 $ .584603, .584603, .586223, .589481, .594408, .601053,
3 $ .609482, .619777, .632039, .646386, .662966/
3C
3 DATA T1B3/ .662968, .646387, .632039, .619777, .609482,
3 $ .601053, .594408, .589481, .586223, .584603, .584603,
3 $ .586223, .589481, .594408, .601053, .609482, .619777,
3 $ .632039, .646386, .662966, .664212, .647746, .633459,
3 $ .621247, .610995, .602602, .595985, .591080, .587837,
3 $ .586223, .586223, .587837, .591080, .595985, .602602,
3 $ .610995, .621247, .633459, .647745, .654211, .666918,
3 $ .650495, .636314, .624202, .614036, .605716, .599157,
3 $ .594295, .591080, .589481, .589481, .591080, .594295,
3 $ .599157, .605715, .614036, .624202, .636314, .650495,
3 $ .666917, .670805, .654533, .640631, .623672, .618637,
3 $ .610426, .603954, .599157, .595985, .594408, .594408,
3 $ .595985, .599157, .603954, .610425, .618637, .628672,
3 $ .640630, .654533, .670804, .673143, .660220, .646455,
3 $ .634703, .624845, .616780, .610425, .605715, .602602,
3 $ .601053, .601053, .602602, .605715, .610425, .616780,
3 $ .624845, .634703, .646454, .660220, .676141/
3C
3 DATA T1B4/ .682910, .667312, .653849, .642360, .632726,
3 $ .624845, .618637, .614036, .610995, .609482, .609482,
3 $ .610994, .614036, .618637, .624845, .632726, .642360,
3 $ .653849, .667311, .682910, .691075, .675934, .662897,
3 $ .651725, .642360, .634703, .623671, .624202, .621247,
3 $ .619777, .619777, .621247, .624201, .628671, .634703,
3 $ .642360, .651725, .662897, .675935, .691075, .701079,
3 $ .685374, .673701, .662895, .653843, .645454, .640630,
3 $ .636314, .633459, .632039, .632039, .633459, .636313,
3 $ .640630, .645454, .653843, .662897, .673701, .686375,
3 $ .701080, .712678, .726132, .698560, .675934, .667310,
3 $ .659219, .654532, .650495, .647745, .646386, .646386,
3 $ .647744, .650495, .654532, .660219, .667310, .675934,

```

| | | | | | | | |
|----|---|------------|----------|----------|----------|----------|----------|
| 3 | S | .695375, | .593550, | .712580, | .726129, | .712678, | .701078, |
| 3 | S | .691073, | .632903, | .676140, | .670803, | .665316, | .664210, |
| 3 | S | .682333, | .632933, | .664210, | .665916, | .670803, | .676140, |
| 3 | S | .682303, | .631074, | .701079, | .712579, | .725131, | |
| 30 | | DATA T231/ | .055352, | .048304, | .037356, | .031205, | .033785, |
| 3 | S | .033551, | .033579, | .033571, | .033566, | .033569, | .033569, |
| 3 | S | .033566, | .033571, | .033579, | .033551, | .033785, | .031205, |
| 3 | S | .037356, | .043304, | .055352, | .043804, | .014807, | .008223, |
| 3 | S | .005439, | .005373, | .005387, | .005385, | .005384, | .006384, |
| 3 | S | .006234, | .006384, | .005334, | .005384, | .006385, | .006387, |
| 3 | S | .005373, | .005459, | .008223, | .014807, | .048804, | .037356, |
| 3 | S | .002223, | .002597, | .001450, | .001251, | .001220, | .001215, |
| 3 | S | .001214, | .001214, | .001214, | .001214, | .001214, | .001214, |
| 3 | S | .001215, | .001220, | .001251, | .001450, | .002597, | .008223, |
| 3 | S | .037356, | .031205, | .005459, | .001450, | .000468, | .000275, |
| 3 | S | .002223, | .000231, | .000231, | .000231, | .000231, | .000231, |
| 3 | S | .000231, | .000231, | .000232, | .000233, | .000275, | .000468, |
| 3 | S | .001450, | .005459, | .031205, | .033785, | .005373, | .001251, |
| 3 | S | .002275, | .000383, | .000052, | .000045, | .000044, | .000044, |
| 3 | S | .000044, | .000044, | .000044, | .000044, | .000045, | .000052, |
| 3 | S | .000033, | .000275, | .001251, | .005373, | .033785, | |
| 30 | | DATA T232/ | .033551, | .005337, | .001220, | .000239, | .000052, |
| 3 | S | .000017, | .000010, | .000009, | .000003, | .000003, | .000008, |
| 3 | S | .000003, | .000003, | .000010, | .000017, | .000052, | .000239, |
| 3 | S | .001220, | .005337, | .033551, | .033579, | .005385, | .001215, |
| 3 | S | .002232, | .000045, | .000010, | .000003, | .000002, | .000002, |
| 3 | S | .000012, | .000003, | .000002, | .000002, | .000003, | .000010, |
| 3 | S | .000045, | .000232, | .001215, | .005335, | .033579, | .033571, |
| 3 | S | .005334, | .001214, | .000231, | .000044, | .000009, | .000002, |
| 3 | S | .000001, | .000000, | .000000, | .000000, | .000000, | .000001, |
| 3 | S | .000002, | .000003, | .000044, | .000231, | .001214, | .006384, |
| 3 | S | .033571, | .033566, | .005384, | .001214, | .000231, | .000044, |
| 3 | S | .000003, | .000002, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000002, | .000003, | .000044, | .000231, |
| 3 | S | .001214, | .005384, | .033566, | .033563, | .005384, | .001214, |
| 3 | S | .000231, | .000044, | .000008, | .000002, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000002, | .000008, |
| 3 | S | .000044, | .000231, | .001214, | .005384, | .033569, | |
| 30 | | DATA T233/ | .033569, | .005384, | .001214, | .000231, | .000044, |
| 3 | S | .000003, | .000002, | .000000, | .000000, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000002, | .000003, | .000044, | .000231, |
| 3 | S | .001214, | .005384, | .033569, | .033566, | .006384, | .001214, |
| 3 | S | .000231, | .000044, | .000008, | .000002, | .000000, | .000000, |
| 3 | S | .000000, | .000000, | .000000, | .000000, | .000002, | .000008, |
| 3 | S | .000044, | .000231, | .001214, | .005384, | .033566, | .033571, |
| 3 | S | .005384, | .001214, | .000231, | .000044, | .000009, | .000002, |
| 3 | S | .000001, | .000000, | .000000, | .000000, | .000000, | .000001, |
| 3 | S | .000012, | .000003, | .000044, | .000231, | .001214, | .006384, |
| 3 | S | .033571, | .033579, | .005335, | .001215, | .000232, | .000045, |
| 3 | S | .000010, | .000003, | .000002, | .000002, | .000002, | .000002, |
| 3 | S | .000012, | .000002, | .000003, | .000010, | .000045, | .000232, |
| 3 | S | .001215, | .005335, | .033579, | .033551, | .005387, | .001220, |
| 3 | S | .000232, | .000052, | .000017, | .000010, | .000009, | .000008, |
| 3 | S | .000013, | .000003, | .000003, | .000009, | .000010, | .000017, |
| 3 | S | .000052, | .000233, | .001220, | .005337, | .033551, | |
| 30 | | DATA T234/ | .033785, | .005373, | .001251, | .000275, | .000088, |
| 3 | S | .000052, | .000045, | .000044, | .000044, | .000044, | .000044, |
| 3 | S | .000044, | .000044, | .000045, | .000052, | .000033, | .000275, |
| 3 | S | .001251, | .005373, | .033735, | .031205, | .005459, | .001450, |
| 3 | S | .000463, | .000275, | .000239, | .000232, | .000231, | .000231, |
| 3 | S | .000231, | .000231, | .000231, | .000231, | .000232, | .000239, |
| 3 | S | .000275, | .000463, | .001450, | .005453, | .031205, | .037356, |
| 3 | S | .002223, | .002507, | .001450, | .001251, | .001220, | .001215, |
| 3 | S | .001214, | .001214, | .001214, | .001214, | .001214, | .001214, |
| 3 | S | .001215, | .001220, | .001450, | .001450, | .002597, | .008223, |
| 3 | S | .002336, | .002304, | .002223, | .002223, | .003459, | .006373, |
| 3 | S | .005337, | .005335, | .005334, | .005334, | .005334, | .006384, |
| 3 | S | .005334, | .005334, | .005335, | .005337, | .005373, | .005459, |
| 3 | S | .002336, | .001450, | .043304, | .055352, | .043304, | .037356, |
| 3 | S | .031215, | .002305, | .005351, | .033579, | .033571, | .033566, |
| 3 | S | .005330, | .005333, | .002333, | .002371, | .033579, | .033551, |
| 3 | S | .002333, | .001203, | .002333, | .043304, | .033552, | |

[illegible]

COLL, CLAT2004, Y, Y, BLE, SP19, SP12, NGR19, NGR12, NGR00, NGR00, DERUSL)

```

3C
3 TRUE = DERUSL(6)
3C
3 RETURN
3 END
3 FUNCTION R(X,Y)
3C
3 REAL DERUSL(6), GRID(9), TAB3(9,9)
3 DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3 $0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C COLLOCATION
3C
3 DATA TAB3/ .781915, .759056, .743903, .735237, .732417,
3 $ .735235, .743903, .759066, .781915, .759065, .733775,
3 $ .716957, .707335, .704204, .707335, .716957, .733776,
3 $ .759065, .743902, .716956, .698974, .688669, .685312,
3 $ .688668, .698973, .716955, .743900, .735236, .707335,
3 $ .638666, .677955, .674465, .677955, .688666, .707333,
3 $ .735234, .732416, .704204, .685311, .674464, .670928,
3 $ .674463, .685309, .704201, .732414, .735234, .707333,
3 $ .638666, .677954, .674463, .677953, .688665, .707332,
3 $ .735233, .743899, .716953, .698970, .688665, .685309,
3 $ .688665, .698970, .716952, .743899, .759061, .733772,
3 $ .716952, .707331, .704200, .707332, .716952, .733771,
3 $ .759062, .781909, .759060, .743897, .735231, .732412,
3 $ .735232, .743897, .759061, .781911/
3C
3 IF (&B .EQ. 2) GO TO 10
3 R = 1.0
3 RETURN
3C
3C INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3 10 CALL QUADRD(X,Y,TAB3,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3 R = DERUSL(6)
3C
3 RETURN
3 END

```

```

-----
*EOR
*****
* MACRO 46 *
*****
*
* 2000220202000
1 TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1 UXXS + UYYS - &BUYS = 0.
2 DIRICHLET
2 X=0. , U= 0.
2 X=&A , U= 0.
2 Y=0. , U=-1.
2 Y=1. , U= 1.
3 FUNCTION TRUE(X,Y)

```

```

3C
3C *****
3C *
3C MACRO 46 PARAMETERS
3C *
3C *****
3C *
3C A I B I C
3C ---I---I---
3C * 1 I 2 I 1
3C * I I
3C * 4 I 2 I 2
3C * I I
3C * 4 I 10 I 3
3C * I I
3C * 8 I 2 I 4
3C *
3C *****
3C
3 REAL DERUSL(6), TABLE(20,20), GRID1(20),
3 $ GRID2(20), GRID3(20), GRID4(20),

```


| | | | | | | | |
|---|---|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | 5 | - .003237 | -.003237 | -.005676 | -.010176 | -.013191 | -.018690 |
| 3 | 5 | -.022780 | -.022780 | -.027278 | -.027119 | -.025143 | -.021619 |
| 3 | 5 | -.017503 | -.011956 | -.007304 | -.004332 | .000184 | .000626 |
| 3 | 5 | .000000 | -.000000 | .002227 | .033102 | .053523 | .063214 |
| 3 | 5 | .132355 | .172410 | .170533 | .073905 | .073785 | .073824 |
| 3 | 5 | .070012 | .070373 | .072622 | .053332 | .063926 | .053844 |
| 3 | 5 | .067335 | .121193 | -.000005 | -.000002 | .043677 | .088153 |
| 3 | 5 | .132155 | .143300 | .134133 | .174223 | .180593 | .184310 |
| 3 | 5 | .133674 | .135713 | .134453 | .131530 | .175081 | .165306 |
| 3 | 5 | .142305 | .123393 | .031333 | .048563 | -.000002 | |
| 3 | 5 | DATA T131 | .000000 | .077702 | .152670 | .208663 | .247505 |
| 3 | 5 | .275060 | .232390 | .302760 | .308873 | .311346 | .311390 |
| 3 | 5 | .309025 | .303747 | .293226 | .277171 | .250465 | .210048 |
| 3 | 5 | .153400 | .032355 | .000000 | -.000001 | .138542 | .244360 |
| 3 | 5 | .024223 | .377563 | .410414 | .431180 | .443662 | .450375 |
| 3 | 5 | .450423 | .453502 | .450337 | .443745 | .431250 | .410515 |
| 3 | 5 | .007331 | .024114 | .244573 | .138975 | -.000001 | .000000 |
| 3 | 5 | .132666 | .072736 | .479230 | .534312 | .572794 | .593440 |
| 3 | 5 | .603291 | .611330 | .614897 | .614676 | .611773 | .605705 |
| 3 | 5 | .593524 | .574053 | .503910 | .481864 | .384839 | .206024 |
| 3 | 5 | .000000 | .000000 | .364539 | .600069 | .692728 | .736814 |
| 3 | 5 | .763311 | .782081 | .790041 | .794434 | .796406 | .796274 |
| 3 | 5 | .794520 | .790233 | .782132 | .763066 | .739573 | .694278 |
| 3 | 5 | .617339 | .378554 | .000000 | .000000 | 1.031332 | .957860 |
| 3 | 5 | .952230 | 1.105363 | .391341 | .938282 | 1.000391 | .999039 |
| 3 | 5 | .999977 | .999977 | .999039 | 1.000391 | .998282 | .991341 |
| 3 | 5 | 1.006233 | .952230 | .957350 | 1.031332 | .000000 | |
| 3 | 5 | DATA T231 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.000000 |
| 3 | 5 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.000000 |
| 3 | 5 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.000000 | -1.000000 |
| 3 | 5 | -1.000000 | -1.000000 | -1.000000 | .031332 | -.337383 | -.743785 |
| 3 | 5 | -.913351 | -.935099 | -.956727 | -.963381 | -.964623 | -.964870 |
| 3 | 5 | -.966531 | -.955318 | -.955444 | -.966943 | -.964632 | -.965433 |
| 3 | 5 | -.973333 | -.935573 | -1.024956 | -1.053698 | .031332 | -.042140 |
| 3 | 5 | -.533009 | -.820302 | -.833901 | -.907831 | -.920828 | -.924419 |
| 3 | 5 | -.925646 | -.925183 | -.926869 | -.926601 | -.926387 | -.926451 |
| 3 | 5 | -.924354 | -.923351 | -.921108 | -.895691 | -.917931 | -.831729 |
| 3 | 5 | -.042140 | -.047770 | -.662054 | -.820058 | -.847692 | -.869017 |
| 3 | 5 | -.877901 | -.831399 | -.882810 | -.883104 | -.884071 | -.883668 |
| 3 | 5 | -.833347 | -.883194 | -.881111 | -.878338 | -.870970 | -.848504 |
| 3 | 5 | -.027376 | -.677133 | -.047770 | .006356 | -.553459 | -.742226 |
| 3 | 5 | -.791510 | -.316764 | -.828035 | -.833113 | -.834958 | -.835207 |
| 3 | 5 | -.836599 | -.835071 | -.835586 | -.835566 | -.832664 | -.829495 |
| 3 | 5 | -.819303 | -.792775 | -.753521 | -.576948 | .006366 | |
| 3 | 5 | DATA T232 | -.003557 | -.475263 | -.670619 | -.733207 | -.761222 |
| 3 | 5 | -.773474 | -.773639 | -.781104 | -.792017 | -.782625 | -.782525 |
| 3 | 5 | -.782077 | -.781200 | -.778597 | -.773707 | -.761709 | -.733410 |
| 3 | 5 | -.672442 | -.479021 | -.008557 | -.001713 | -.417859 | -.601276 |
| 3 | 5 | -.662234 | -.693453 | -.712347 | -.713571 | -.722325 | -.722988 |
| 3 | 5 | -.724377 | -.723393 | -.723272 | -.722708 | -.719149 | -.713804 |
| 3 | 5 | -.700611 | -.633502 | -.593330 | -.403151 | -.001713 | .000366 |
| 3 | 5 | -.612512 | -.525231 | -.523374 | -.631821 | -.645230 | -.653400 |
| 3 | 5 | -.633641 | -.637452 | -.653720 | -.658345 | -.657674 | -.656841 |
| 3 | 5 | -.673070 | -.645000 | -.622727 | -.593534 | -.522977 | -.339572 |
| 3 | 5 | -.001803 | -.000909 | -.279552 | -.445953 | -.523293 | -.557765 |
| 3 | 5 | -.572644 | -.573732 | -.532272 | -.534377 | -.585328 | -.585318 |
| 3 | 5 | -.534332 | -.532200 | -.579754 | -.573691 | -.557788 | -.523298 |
| 3 | 5 | -.445300 | -.279293 | -.000909 | -.000015 | -.236101 | -.372847 |
| 3 | 5 | -.442412 | -.473725 | -.491462 | -.493207 | -.502775 | -.503925 |
| 3 | 5 | -.500184 | -.504352 | -.504103 | -.502288 | -.453892 | -.491874 |
| 3 | 5 | -.473310 | -.442191 | -.339005 | -.224010 | -.000015 | |
| 3 | 5 | DATA T233 | -.000003 | -.174350 | -.233796 | -.354438 | -.386991 |
| 3 | 5 | -.421673 | -.402212 | -.418863 | -.411247 | -.415195 | -.415051 |
| 3 | 5 | -.414021 | -.412253 | -.409066 | -.401353 | -.337034 | -.354336 |
| 3 | 5 | -.353036 | -.163730 | -.000003 | -.000052 | -.115435 | -.203240 |
| 3 | 5 | -.332240 | -.332200 | -.302459 | -.303642 | -.313150 | -.314670 |
| 3 | 5 | -.315173 | -.315351 | -.314571 | -.313133 | -.303525 | -.302397 |
| 3 | 5 | -.263202 | -.263723 | -.211537 | -.111454 | -.000032 | .000004 |
| 3 | 5 | -.061003 | -.112623 | -.154302 | -.120712 | -.152793 | -.199325 |
| 3 | 5 | -.207206 | -.204183 | -.204753 | -.204792 | -.204139 | -.202671 |
| 3 | 5 | -.162275 | -.162314 | -.170327 | -.154832 | -.107355 | -.049564 |
| 3 | 5 | .000004 | .000005 | .016155 | -.007423 | -.003303 | -.060347 |

| | | | | | | | |
|----|-----------|------------|------------|------------|------------|------------|------------|
| 3 | \$ | - .071134, | - .076930, | - .080023, | - .081035, | - .081555, | - .081963, |
| 3 | \$ | - .081355, | - .080014, | - .075007, | - .071000, | - .069127, | - .039669, |
| 3 | \$ | - .006190, | .015553, | - .000005, | - .000002, | .003753, | .103147, |
| 3 | \$ | .005410, | .001635, | .003513, | .003120, | .003459, | .054982, |
| 3 | \$ | .055015, | .054713, | .055162, | .053787, | .056830, | .064149, |
| 3 | \$ | .072827, | .086860, | .109354, | .101001, | - .000002, | |
| 3 | DATA T234 | .000000, | .135035, | .232263, | .226260, | .218343, | |
| 3 | \$ | .212633, | .209716, | .207645, | .210339, | .206549, | .206230, |
| 3 | \$ | .206376, | .207907, | .209142, | .212037, | .213600, | .226734, |
| 3 | \$ | .239342, | .201143, | .000000, | - .000001, | .325205, | .324356, |
| 3 | \$ | .381550, | .382339, | .378775, | .370553, | .375239, | .374585, |
| 3 | \$ | .374347, | .374320, | .374601, | .375321, | .376535, | .378831, |
| 3 | \$ | .362444, | .381600, | .384350, | .322554, | - .000001, | .000000, |
| 3 | \$ | .447745, | .538473, | .551926, | .562225, | .562458, | .563397, |
| 3 | \$ | .562762, | .561406, | .552354, | .562046, | .561944, | .563510, |
| 3 | \$ | .562623, | .564325, | .565423, | .553316, | .558360, | .493554, |
| 3 | \$ | .000000, | .000000, | .608531, | .735743, | .742208, | .769425, |
| 3 | \$ | .766365, | .769300, | .769354, | .768829, | .770034, | .769489, |
| 3 | \$ | .769152, | .770303, | .768533, | .767435, | .771525, | .743000, |
| 3 | \$ | .747631, | .716116, | .000000, | .000000, | 1.031332, | .957860, |
| 3 | \$ | .952230, | 1.006366, | .931341, | .992232, | 1.000391, | .999039, |
| 3 | \$ | .999977, | .999977, | .993039, | 1.000331, | .936232, | .991341, |
| 3 | \$ | 1.006366, | .952230, | .957250, | 1.031332, | .000000, | |
| 3C | | | | | | | |
| 3 | DATA T3B1 | -1.000000, | -1.000000, | -1.000000, | -1.000000, | -1.000000, | |
| 3 | \$ | -1.000000, | -1.000000, | -1.000000, | -1.000000, | -1.000000, | -1.000000, |
| 3 | \$ | -1.000000, | -1.000000, | -1.000000, | -1.000000, | -1.000000, | -1.000000, |
| 3 | \$ | -1.000000, | -1.000000, | -1.000000, | .031332, | -.391353, | -.787651, |
| 3 | \$ | -.952148, | -.972313, | -.892515, | -.333377, | -.999771, | -.999732, |
| 3 | \$ | -1.001583, | -1.000718, | -1.000356, | -1.002265, | -1.000166, | -1.001937, |
| 3 | \$ | -1.013562, | -.976541, | -1.068341, | -1.155170, | .031332, | -.042140, |
| 3 | \$ | -.733253, | -.934475, | -.973754, | -.988436, | -.997347, | -.999244, |
| 3 | \$ | -.999549, | -.999790, | -1.000378, | -1.000076, | -1.000010, | -1.000515, |
| 3 | \$ | -.999592, | -1.000618, | -1.002753, | -.982258, | -1.038831, | -.998814, |
| 3 | \$ | -.042140, | -.047770, | -.367053, | -.935265, | -.984043, | -.996921, |
| 3 | \$ | -.999381, | -1.000133, | -1.000146, | -.999665, | -1.000622, | -1.000080, |
| 3 | \$ | -.999976, | -1.000483, | -.999562, | -1.000217, | -.997765, | -.984089, |
| 3 | \$ | -1.003428, | -.886322, | -.047770, | .006366, | -.785534, | -.970029, |
| 3 | \$ | -.981972, | -.995063, | -.938531, | -1.000227, | -1.000181, | -.999340, |
| 3 | \$ | -1.000876, | -1.000032, | -.999224, | -1.000713, | -.999338, | -.999933, |
| 3 | \$ | -.996334, | -.992643, | -.982737, | -.815523, | .006366, | |
| 3C | | | | | | | |
| 3 | DATA T3B2 | -.008657, | -.734549, | -.951262, | -.979500, | -.932541, | |
| 3 | \$ | -.997615, | -.933527, | -.923770, | -.998758, | -.999012, | -.998877, |
| 3 | \$ | -.998336, | -.938855, | -.998385, | -.997823, | -.932751, | -.979611, |
| 3 | \$ | -.953295, | -.739347, | -.002557, | -.001713, | -.695870, | -.931239, |
| 3 | \$ | -.974706, | -.930749, | -.993110, | -.938562, | -.998715, | -.997850, |
| 3 | \$ | -.999426, | -.938584, | -.999229, | -.999219, | -.997652, | -.997354, |
| 3 | \$ | -.991834, | -.974567, | -.923379, | -.683361, | -.001713, | .000386, |
| 3 | \$ | -.643518, | -.903353, | -.367714, | -.997958, | -.993304, | -.996573, |
| 3 | \$ | -.995971, | -.993303, | -.997574, | -.996915, | -.996383, | -.997365, |
| 3 | \$ | -.995832, | -.994877, | -.998340, | -.967684, | -.901591, | -.633833, |
| 3 | \$ | .000386, | -.000903, | -.590133, | -.372571, | -.959490, | -.983681, |
| 3 | \$ | -.990511, | -.932719, | -.993539, | -.992534, | -.993747, | -.993730, |
| 3 | \$ | -.993544, | -.993549, | -.992700, | -.990535, | -.963704, | -.958489, |
| 3 | \$ | -.872526, | -.389933, | -.000909, | -.000015, | -.565299, | -.845608, |
| 3 | \$ | -.946555, | -.977233, | -.965404, | -.933575, | -.990322, | -.989379, |
| 3 | \$ | -.991131, | -.990251, | -.999305, | -.990367, | -.933562, | -.986861, |
| 3 | \$ | -.979124, | -.947003, | -.843311, | -.555348, | -.000015, | |
| 3C | | | | | | | |
| 3 | DATA T3B3 | -.000000, | -.521620, | -.813193, | -.931706, | -.968043, | |
| 3 | \$ | -.977270, | -.331166, | -.902321, | -.922009, | -.982914, | -.982485, |
| 3 | \$ | -.922232, | -.992572, | -.990539, | -.977942, | -.953339, | -.931669, |
| 3 | \$ | -.818872, | -.521027, | -.001002, | -.010052, | -.431214, | -.787378, |
| 3 | \$ | -.9111476, | -.953237, | -.960560, | -.963005, | -.959483, | -.969411, |
| 3 | \$ | -.970045, | -.990775, | -.960564, | -.962639, | -.867733, | -.964274, |
| 3 | \$ | -.953727, | -.911553, | -.797263, | -.969058, | -.000052, | .000004, |
| 3 | \$ | -.464270, | -.752357, | -.967224, | -.930362, | -.942674, | -.948234, |
| 3 | \$ | -.949701, | -.949004, | -.057227, | -.313319, | -.949549, | -.950201, |
| 3 | \$ | -.947210, | -.940370, | -.031326, | -.031055, | -.753829, | -.458226, |
| 3 | \$ | -.990001, | -.000005, | -.431157, | -.715539, | -.842431, | -.892722, |
| 3 | \$ | -.995375, | -.911454, | -.913355, | -.912452, | -.914024, | -.913824, |
| 3 | \$ | -.916006, | -.912471, | -.711837, | -.705882, | -.933035, | -.842488, |
| 3 | \$ | -.995361, | -.916516, | -.000000, | -.000002, | -.979534, | -.644307, |
| 3 | \$ | -.979507, | -.932203, | -.912452, | -.912452, | -.051105, | -.854061, |

```

3  $ -.054223, -.354553, -.354272, -.354215, -.351713, -.246988,
3  $ -.332222, -.779470, -.342004, -.071237, -.000002/
3C
3  DATA T434/ .000000, -.310433, -.536723, -.331513, -.733334,
3  $ -.740211, -.753235, -.755373, -.753314, -.753225, -.756430,
3  $ -.753107, -.753195, -.752514, -.713745, -.703721, -.581488,
3  $ -.540152, -.001723, .000000, -.001001, -.133793, -.394309,
3  $ -.516554, -.562503, -.576052, -.551733, -.533555, -.584012,
3  $ -.534223, -.534195, -.534031, -.532573, -.531725, -.576997,
3  $ -.532532, -.516513, -.334113, -.132059, -.000001, .000000,
3  $ -.034324, -.155323, -.254455, -.233339, -.293573, -.300552,
3  $ -.302105, -.302472, -.301933, -.202805, -.302942, -.301533,
3  $ -.301418, -.293711, -.234507, -.252845, -.145402, .011876,
3  $ .000000, .000000, .332025, .247819, .183916, .183132,
3  $ .174393, .174712, .174340, .173400, .174535, .173955,
3  $ .173718, .174737, .174192, .175519, .185451, .180282,
3  $ .250071, .359335, .000000, .000000, 1.031332, .957860,
3  $ .952230, 1.006355, .931341, .932222, 1.000391, .999039,
3  $ .999977, .999977, .999039, 1.000391, .993232, .991341,
3  $ 1.006355, .952230, .957860, 1.031332, .000000/
3C
3  DATA T431/-1.000000, -1.000000, -1.000000, -1.000000, -1.000000,
3  $ -1.000000, -1.000000, -1.000000, -1.000000, -1.000000, -1.000000,
3  $ -1.000000, -1.000000, -1.000000, -1.000000, -1.000000, -1.000000,
3  $ -1.000000, -1.000000, .031332, -.333300, -.751218,
3  $ -.914345, -.933203, -.955910, -.965106, -.935929, -.564996,
3  $ -.958304, -.953702, -.953078, -.559213, -.935975, -.968311,
3  $ -.934153, -.941438, -1.062985, -1.172757, .031332, -.042140,
3  $ -.745919, -.871901, -.899702, -.919758, -.923304, -.926552,
3  $ -.926953, -.925564, -.927720, -.927153, -.925940, -.928138,
3  $ -.926354, -.927762, -.935713, -.908953, -.930153, -1.017783,
3  $ -.042140, -.047770, -.879355, -.904387, -.870308, -.888256,
3  $ -.834009, -.835039, -.825004, -.823794, -.825323, -.884493,
3  $ -.834231, -.835423, -.834105, -.835050, -.833553, -.835857,
3  $ -.913185, -.900525, -.047770, .005355, -.785431, -.847400,
3  $ -.824578, -.839394, -.835717, -.838284, -.837921, -.836201,
3  $ -.833543, -.837251, -.835928, -.833573, -.833752, -.833353,
3  $ -.840509, -.823391, -.851101, -.817824, .006366/
3C
3  DATA T432/ -.008357, -.716559, -.794651, -.774029, -.784215,
3  $ -.783934, -.783579, -.783549, -.783235, -.783585, -.783378,
3  $ -.783331, -.783554, -.783434, -.784195, -.784315, -.773919,
3  $ -.783344, -.721744, -.009357, -.001713, -.657153, -.737640,
3  $ -.710329, -.727195, -.725574, -.725301, -.725783, -.724499,
3  $ -.725221, -.725233, -.725048, -.723228, -.725075, -.726630,
3  $ -.723149, -.717332, -.731700, -.538213, -.001713, .000386,
3  $ -.571152, -.655170, -.655241, -.651281, -.650421, -.660721,
3  $ -.650201, -.659171, -.650495, -.659728, -.655500, -.650547,
3  $ -.653733, -.651169, -.660453, -.654034, -.650524, -.556373,
3  $ .000325, -.000909, -.475175, -.532932, -.583535, -.587074,
3  $ -.537537, -.589974, -.589553, -.535533, -.583509, -.586490,
3  $ -.523534, -.523552, -.523550, -.537705, -.537053, -.583506,
3  $ -.532373, -.474797, -.000503, -.000015, -.415553, -.507417,
3  $ -.505007, -.503455, -.507453, -.507422, -.503353, -.505942,
3  $ -.507022, -.503353, -.503233, -.507159, -.503702, -.508112,
3  $ -.507015, -.505027, -.500147, -.394151, -.000015/
3C
3  DATA T433/ -.000000, -.320572, -.412314, -.413051, -.418808,
3  $ -.417933, -.417433, -.418374, -.415337, -.416733, -.416493,
3  $ -.416502, -.417013, -.417073, -.418235, -.415554, -.417645,
3  $ -.410333, -.310223, -.000003, -.000052, -.229702, -.312095,
3  $ -.221332, -.319571, -.315531, -.317527, -.316993, -.316778,
3  $ -.315504, -.316523, -.315739, -.315993, -.317515, -.318509,
3  $ -.316410, -.220573, -.309297, -.221335, -.000052, .000004,
3  $ -.150003, -.203574, -.212207, -.210190, -.203235, -.207107,
3  $ -.203134, -.203203, -.203132, -.203113, -.203215, -.206474,
3  $ -.207002, -.203213, -.200709, -.212331, -.200313, -.127103,
3  $ .000001, .000005, -.063235, -.023017, -.093450, -.087715,
3  $ -.073373, -.021223, -.000312, -.033333, -.033227, -.083224,
3  $ -.073353, -.021310, -.034020, -.035531, -.037553, -.093282,
3  $ -.020003, -.023103, -.000005, -.000002, .069327, .042659,
3  $ .020153, .013332, .051150, .050013, .053340, .053179,
3  $ .051111, .053323, .053334, .053334, .052331, .051364,
3  $ .040312, .052351, .050003, .094533, -.000002/
3C
3  DATA T431/ .000000, .200504, .102239, .105132, .155304,

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3      $ .201593, .204578, .205242, .204799, .205165, .205515,
3      $ .205167, .205715, .203339, .202557, .200838, .186231,
3      $ .199215, .227337, .000000, -.000001, .377693, .358224,
3      $ .349150, .358393, .359445, .372032, .373215, .375255,
3      $ .373505, .373550, .373226, .373246, .372002, .369526,
3      $ .358935, .349153, .359143, .379935, -.000001, .000000,
3      $ .510527, .521369, .529337, .555947, .555588, .561830,
3      $ .562639, .560416, .554150, .552308, .561470, .563803,
3      $ .559904, .558547, .550709, .530083, .545407, .564037,
3      $ .000000, .000000, .744265, .727279, .729842, .768632,
3      $ .762253, .768695, .770050, .768224, .770819, .769714,
3      $ .768857, .770743, .767540, .764029, .770889, .730290,
3      $ .741703, .776371, .000000, .000000, 1.031332, .957860,
3      $ .952230, 1.006356, .991341, .998282, 1.000391, .999039,
3      $ .999977, .999977, .999039, 1.000391, .998282, .991341,
3      $ 1.006356, .952230, .957860, 1.031332, .000000/

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INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS

CALL QUADRD(X,Y, TABLE, GRID&C, GRID1, NGRID, NGRID, NGRDD, NGRDD,
\$ DERUSL)

TRUE = DERUSL(6)

RETURN

END

*EOR

* MACRO 47 *

*

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TWO DIMENSIONS \$ CONSTANT COEFFICIENTS \$ POISSON

UXX\$ + UYY\$ = F(X,Y)

DIRICHLET

X=0. , U=TRUE(X,Y)

X=1. , U=TRUE(X,Y)

Y=0. , U=TRUE(X,Y)

Y=1. , U=TRUE(X,Y)

FUNCTION TRUE(X,Y)

TRUE = (X*Y)**(.5*(&A))

RETURN

END

FUNCTION F(X,Y)

IF (X.EQ.0. .OR. Y.EQ.0.) GO TO 10

F = (.5*(&A))**(.5*(&A)-1.)*(X*Y)**(.5*(&A)-2.)*(X*X+Y*Y)

RETURN

10 F = 0.

RETURN

END

*EOR

* MACRO 43 *

*

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TWO DIMENSIONS

UXX\$ + UYY\$ + R(X,Y)U\$ = 0.0

DIRICHLET

X=0. , U=1.

X=1. , U=1.

Y=0. , U=1.

Y=1. , U=1.

FUNCTION TRUE(X,Y)

TRUE = (X*Y)**(.5*(&A))

RETURN

END

FUNCTION F(X,Y)

IF (X.EQ.0. .OR. Y.EQ.0.) GO TO 10

F = (.5*(&A))**(.5*(&A)-1.)*(X*Y)**(.5*(&A)-2.)*(X*X+Y*Y)

RETURN

10 F = 0.

RETURN

END

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MACRO 43 PARAMETERS

| A | I | B | I | C | I | D |
|---|---|-----|---|---|---|---|
| 2 | I | .04 | I | 1 | I | 1 |
| | I | | I | | I | |

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30      *          25 I .04 I 1 I 2          *
30      *          I      I      I          *
30      *          2 I .04 I 2 I 3          *
30      *          I      I      I          *
30      *          25 I .04 I 2 I 4          *
30      *          I      I      I          *
30      *          2 I .50 I 2 I 5          *
30      *          *
30      *****
30
30      REAL DERUSL(S), GRID(20), TABLE(20,20),
30      $      T1B1(100), T1B2(100), T1B3(100), T1B4(100),
30      $      T2B1(100), T2B2(100), T2B3(100), T2B4(100),
30      $      T3B1(100), T3B2(100), T3B3(100), T3B4(100),
30      $      T4B1(100), T4B2(100), T4B3(100), T4B4(100),
30      $      T5B1(100), T5B2(100), T5B3(100), T5B4(100)
30      EQUIVALENCE (TABLE(1, 1), T&DB1(1)),
30      $      (TABLE(1, 6), T&DB2(1)),
30      $      (TABLE(1,11), T&DB3(1)),
30      $      (TABLE(1,16), T&DB4(1))
30      DATA NGRID, NGRDD, GRID /20, 20, 0.0000000, 0.0526316,
30      $0.1052632, 0.1578947, 0.2105263, 0.2631579, 0.3157895,
30      $0.3684211, 0.4210526, 0.4736842, 0.5263153, 0.5789474,
30      $0.6315789, 0.6842105, 0.7368421, 0.7894737, 0.8421053,
30      $0.8947368, 0.9473684, 1.0000000/
30
30      APPROXIMATE SOLUTION OF LINEARIZED PROBLEM USING
30      $RODIE-ACF (METHOD=4, IORDER=41, 20 X 20 GRID)
30
30      DATA T1B1/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
30      $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
30      $ 1.000000, 1.000000, 1.000000, 1.000000, .993444, .988963,
30      $ .935532, .983162, .981253, .979847, .978839, .978191,
30      $ .977874, .977874, .978191, .978333, .979847, .981263,
30      $ .933162, .935532, .938963, .993444, 1.000000, 1.000000,
30      $ .933933, .930721, .974445, .969521, .965930, .963166,
30      $ .951193, .959923, .959301, .959301, .959923, .961193,
30      $ .963166, .965930, .969521, .974445, .980721, .988963,
30      $ 1.000000, 1.000000, .935532, .974445, .965562, .958802,
30      $ .953504, .949515, .945657, .944813, .943909, .943909,
30      $ .944813, .946957, .949515, .953504, .958802, .965562,
30      $ .974445, .935532, 1.000000, 1.000000, .983162, .969621,
30      $ .958802, .950233, .943561, .938504, .934869, .932517,
30      $ .931362, .931362, .932517, .934869, .933504, .943561,
30      $ .950233, .953802, .959521, .983162, 1.000000/
30
30      DATA T1B2/ 1.000000, .981263, .965930, .953504, .943561,
30      $ .935752, .929805, .925515, .922733, .921365, .921365,
30      $ .922733, .925515, .929805, .935752, .943561, .953504,
30      $ .953930, .981263, 1.000000, 1.000000, .979847, .953166,
30      $ .949515, .933504, .923805, .923152, .918336, .915207,
30      $ .913337, .913667, .915207, .918336, .923152, .929805,
30      $ .933504, .949515, .953166, .979847, 1.000000, 1.000000,
30      $ .970339, .951193, .945657, .934869, .925515, .918336,
30      $ .913123, .909733, .903059, .908033, .909733, .913123,
30      $ .918336, .925515, .934869, .943561, .951193, .978839,
30      $ 1.000000, 1.000000, .978191, .953323, .944813, .932517,
30      $ .922733, .915207, .909733, .905176, .904420, .904420,
30      $ .903175, .909733, .915207, .922733, .932517, .944813,
30      $ .953323, .978191, 1.000000, 1.000000, .977874, .959301,
30      $ .943909, .931362, .921365, .913567, .908059, .904420,
30      $ .903320, .903320, .904420, .908059, .913667, .921365,
30      $ .931362, .943909, .959301, .977874, 1.000000/
30
30      DATA T1B3/ 1.000000, .977874, .959301, .943909, .931362,
30      $ .921365, .913567, .904420, .902520, .902520, .902520,
30      $ .904420, .903320, .913567, .921365, .931362, .943909,
30      $ .953320, .977874, 1.000000, 1.000000, .978191, .959923,
30      $ .943909, .932517, .922733, .915207, .909733, .906176,
30      $ .904420, .904420, .906176, .909733, .915207, .922733,
30      $ .932517, .944813, .953323, .978191, 1.000000, 1.000000,
30      $ .970339, .951193, .945657, .934869, .925515, .918336,
30      $ .913123, .909733, .903059, .908033, .909733, .913123,
30      $ .918336, .925515, .934869, .943561, .951193, .978839,
30      $ 1.000000, 1.000000, .978191, .953323, .944813, .932517,
30      $ .922733, .915207, .909733, .905176, .904420, .904420,
30      $ .903175, .909733, .915207, .922733, .932517, .944813,
30      $ .953323, .978191, 1.000000, 1.000000, .977874, .959301,
30      $ .943909, .931362, .921365, .913567, .908059, .904420,
30      $ .903320, .903320, .904420, .908059, .913667, .921365,
30      $ .931362, .943909, .959301, .977874, 1.000000/
30
30      DATA T1B4/ 1.000000, .977874, .959301, .943909, .931362,
30      $ .921365, .913567, .904420, .902520, .902520, .902520,
30      $ .904420, .903320, .913567, .921365, .931362, .943909,
30      $ .953320, .977874, 1.000000, 1.000000, .978191, .959923,
30      $ .943909, .932517, .922733, .915207, .909733, .906176,
30      $ .904420, .904420, .906176, .909733, .915207, .922733,
30      $ .932517, .944813, .953323, .978191, 1.000000, 1.000000,
30      $ .970339, .951193, .945657, .934869, .925515, .918336,
30      $ .913123, .909733, .903059, .908033, .909733, .913123,
30      $ .918336, .925515, .934869, .943561, .951193, .978839,
30      $ 1.000000, 1.000000, .978191, .953323, .944813, .932517,
30      $ .922733, .915207, .909733, .905176, .904420, .904420,
30      $ .903175, .909733, .915207, .922733, .932517, .944813,
30      $ .953323, .978191, 1.000000, 1.000000, .977874, .959301,
30      $ .943909, .931362, .921365, .913567, .908059, .904420,
30      $ .903320, .903320, .904420, .908059, .913667, .921365,
30      $ .931362, .943909, .959301, .977874, 1.000000/

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3 $ .916237, .916237, .917779, .920809, .925493, .931901,
3 $ .040203, .950953, .954170, .980353, 1.000000/
3C
3 DATA T231/ 1.000000, .932333, .953131, .955544, .947487,
3 $ .940303, .934343, .930393, .923333, .927079, .927079,
3 $ .923333, .930393, .934343, .940303, .947487, .955544,
3 $ .953131, .932333, 1.000000, 1.000000, .965052, .973273,
3 $ .953953, .955544, .950953, .943545, .943545, .941539,
3 $ .940554, .940554, .941539, .943545, .946644, .950953,
3 $ .955544, .953353, .973273, .935052, 1.000000, 1.000000,
3 $ .933547, .979910, .973273, .963131, .954170, .961187,
3 $ .959048, .957657, .955933, .953989, .957657, .959048,
3 $ .961187, .964170, .963131, .973273, .979910, .988547,
3 $ 1.000000, 1.000000, .993229, .983547, .935052, .982399,
3 $ .930353, .978836, .977744, .977039, .976693, .976693,
3 $ .977039, .977744, .978836, .930363, .982399, .985062,
3 $ .933547, .993229, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA T331/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, .993549, .989350,
3 $ .935233, .933355, .932115, .980804, .973874, .979279,
3 $ .978933, .978933, .979279, .979874, .980804, .982115,
3 $ .933355, .935233, .933355, .933549, 1.000000, 1.000000,
3 $ .939350, .931493, .975558, .971033, .967595, .965035,
3 $ .953217, .952050, .961479, .961479, .962050, .963217,
3 $ .965035, .967595, .971033, .975558, .981493, .989350,
3 $ 1.000000, 1.000000, .985233, .975553, .967259, .960843,
3 $ .955913, .952221, .949589, .947895, .947036, .947066,
3 $ .947835, .949589, .952221, .955913, .950843, .967269,
3 $ .975553, .935233, 1.000000, 1.000000, .983835, .971033,
3 $ .960343, .952332, .943627, .941951, .938504, .936445,
3 $ .935333, .935333, .936445, .938504, .941951, .946627,
3 $ .952332, .960343, .971033, .983835, 1.000000/
3C
3 DATA T332/ 1.000000, .982115, .957595, .955913, .946627,
3 $ .939377, .933333, .929334, .927381, .925128, .926128,
3 $ .927331, .929334, .933333, .939377, .945627, .955913,
3 $ .957595, .932115, 1.000000, 1.000000, .980304, .965035,
3 $ .952221, .941951, .933333, .927740, .923311, .920441,
3 $ .919031, .919031, .920441, .923311, .927740, .933883,
3 $ .941951, .952221, .965035, .980304, 1.000000, 1.000000,
3 $ .979374, .963217, .949589, .938504, .929334, .923311,
3 $ .918523, .915416, .913387, .913387, .915416, .918523,
3 $ .923311, .929934, .933304, .949589, .963217, .979374,
3 $ 1.000000, 1.000000, .979279, .962050, .947835, .936445,
3 $ .927331, .920441, .915416, .912151, .910544, .910544,
3 $ .912151, .915416, .920441, .927331, .936445, .947895,
3 $ .962050, .979279, 1.000000, 1.000000, .978933, .961479,
3 $ .947036, .935333, .926128, .919031, .913837, .910544,
3 $ .908337, .908337, .910544, .913837, .919031, .926128,
3 $ .935333, .947066, .951479, .978533, 1.000000/
3C
3 DATA T333/ 1.000000, .978333, .951479, .947066, .935386,
3 $ .925123, .919031, .913337, .910544, .908897, .908897,
3 $ .910544, .913337, .919031, .925123, .935333, .947066,
3 $ .951479, .978333, 1.000000, 1.000000, .979279, .962050,
3 $ .947835, .936445, .927331, .920441, .915416, .912151,
3 $ .910544, .910544, .912151, .915416, .920441, .927381,
3 $ .936445, .947895, .962050, .979279, 1.000000, 1.000000,
3 $ .979374, .963217, .949589, .938504, .929334, .923311,
3 $ .918523, .915416, .913337, .913337, .915416, .918523,
3 $ .923311, .929934, .933304, .949589, .963217, .979374,
3 $ 1.000000, 1.000000, .980304, .965035, .952221, .941951,
3 $ .933333, .927740, .923311, .920441, .919031, .919031,
3 $ .920441, .923311, .927740, .933333, .941951, .952221,
3 $ .965035, .980304, 1.000000, 1.000000, .932115, .957595,
3 $ .935012, .933377, .939377, .933333, .927331, .927331,
3 $ .925123, .925123, .927331, .929334, .935333, .939377,
3 $ .945627, .955913, .957595, .922115, 1.000000/
3C
3 DATA T334/ 1.000000, .933333, .971033, .960343, .952332,

```

| | | | | | | | |
|----|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | \$ | .946627, | .941951, | .938604, | .936445, | .935386, | .935386, |
| 3 | \$ | .936445, | .938604, | .941951, | .946627, | .952832, | .960843, |
| 3 | \$ | .971033, | .983885, | 1.000000, | 1.000000, | .986233, | .975558, |
| 3 | \$ | .967269, | .960843, | .955913, | .952221, | .949589, | .947895, |
| 3 | \$ | .947066, | .947066, | .947895, | .949589, | .952221, | .955913, |
| 3 | \$ | .960843, | .967269, | .975558, | .986233, | 1.000000, | 1.000000, |
| 3 | \$ | .989360, | .981493, | .975558, | .971033, | .967595, | .965035, |
| 3 | \$ | .963217, | .962050, | .961479, | .961479, | .962050, | .963217, |
| 3 | \$ | .965035, | .967595, | .971033, | .975558, | .981493, | .989360, |
| 3 | \$ | 1.000000, | 1.000000, | .993649, | .989360, | .986233, | .983885, |
| 3 | \$ | .982115, | .980804, | .979874, | .979279, | .978988, | .978988, |
| 3 | \$ | .979279, | .979874, | .980804, | .982115, | .983885, | .986233, |
| 3 | \$ | .989360, | .993649, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3C | | | | | | | |
| 3 | DATA T4B1/ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | \$ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | .993468, | .989010, |
| 3 | \$ | .985730, | .983248, | .981366, | .979963, | .978966, | .978325, |
| 3 | \$ | .978011, | .978011, | .978325, | .978966, | .979963, | .981366, |
| 3 | \$ | .983248, | .985730, | .989010, | .993468, | 1.000000, | 1.000000, |
| 3 | \$ | .989010, | .980813, | .974578, | .969791, | .966132, | .963395, |
| 3 | \$ | .961443, | .960186, | .959571, | .959571, | .960186, | .961443, |
| 3 | \$ | .963395, | .966132, | .969791, | .974578, | .980813, | .989010, |
| 3 | \$ | 1.000000, | 1.000000, | .985730, | .974578, | .965855, | .959050, |
| 3 | \$ | .953800, | .949849, | .947022, | .945198, | .944304, | .944304, |
| 3 | \$ | .945198, | .947022, | .949849, | .953800, | .959050, | .965855, |
| 3 | \$ | .974578, | .985730, | 1.000000, | 1.000000, | .983248, | .969791, |
| 3 | \$ | .959050, | .950555, | .943941, | .938935, | .935338, | .933013, |
| 3 | \$ | .931871, | .931871, | .933013, | .935338, | .938935, | .943941, |
| 3 | \$ | .950555, | .959050, | .969791, | .983248, | 1.000000, | |
| 3C | | | | | | | |
| 3 | DATA T4B2/ | 1.000000, | .981366, | .966132, | .953800, | .943941, | |
| 3 | \$ | .936206, | .930320, | .926076, | .923325, | .921973, | .921973, |
| 3 | \$ | .923325, | .926076, | .930320, | .936206, | .943941, | .953800, |
| 3 | \$ | .966132, | .981366, | 1.000000, | 1.000000, | .979963, | .963395, |
| 3 | \$ | .949849, | .938935, | .930320, | .923735, | .918973, | .915880, |
| 3 | \$ | .914358, | .914358, | .915880, | .918973, | .923735, | .930320, |
| 3 | \$ | .938935, | .949849, | .963395, | .979963, | 1.000000, | 1.000000, |
| 3 | \$ | .978966, | .961443, | .947022, | .935338, | .926076, | .918973, |
| 3 | \$ | .913823, | .910473, | .908823, | .908823, | .910473, | .913823, |
| 3 | \$ | .918973, | .926076, | .935338, | .947022, | .961443, | .978966, |
| 3 | \$ | 1.000000, | 1.000000, | .978325, | .960186, | .945198, | .933013, |
| 3 | \$ | .923325, | .915880, | .910473, | .906953, | .905217, | .905217, |
| 3 | \$ | .906953, | .910473, | .915880, | .923325, | .933013, | .945198, |
| 3 | \$ | .960186, | .978325, | 1.000000, | 1.000000, | .978011, | .959571, |
| 3 | \$ | .944304, | .931871, | .921973, | .914358, | .908823, | .905217, |
| 3 | \$ | .903440, | .903440, | .905217, | .908823, | .914358, | .921973, |
| 3 | \$ | .931871, | .944304, | .959571, | .978011, | 1.000000, | |
| 3C | | | | | | | |
| 3 | DATA T4B3/ | 1.000000, | .978011, | .959571, | .944304, | .931871, | |
| 3 | \$ | .921973, | .914358, | .908823, | .905217, | .903440, | .903440, |
| 3 | \$ | .905217, | .908823, | .914358, | .921973, | .931871, | .944304, |
| 3 | \$ | .959571, | .978011, | 1.000000, | 1.000000, | .978325, | .960186, |
| 3 | \$ | .945198, | .933013, | .923325, | .915880, | .910473, | .906953, |
| 3 | \$ | .905217, | .905217, | .906953, | .910473, | .915880, | .923325, |
| 3 | \$ | .933013, | .945198, | .960186, | .978325, | 1.000000, | 1.000000, |
| 3 | \$ | .978966, | .961443, | .947022, | .935338, | .926076, | .918973, |
| 3 | \$ | .913823, | .910473, | .908823, | .908823, | .910473, | .913823, |
| 3 | \$ | .918973, | .926076, | .935338, | .947022, | .961443, | .978966, |
| 3 | \$ | 1.000000, | 1.000000, | .979963, | .963395, | .949849, | .938935, |
| 3 | \$ | .930320, | .923735, | .918973, | .915880, | .914358, | .914358, |
| 3 | \$ | .915880, | .918973, | .923735, | .930320, | .938935, | .949849, |
| 3 | \$ | .963395, | .979963, | 1.000000, | 1.000000, | .981366, | .966132, |
| 3 | \$ | .953800, | .943941, | .936206, | .930320, | .926076, | .923325, |
| 3 | \$ | .921973, | .921973, | .923325, | .926076, | .930320, | .936206, |
| 3 | \$ | .943941, | .953800, | .966132, | .981366, | 1.000000, | |
| 3C | | | | | | | |
| 3 | DATA T4B4/ | 1.000000, | .983248, | .969791, | .959050, | .950555, | |
| 3 | \$ | .943941, | .938935, | .935338, | .933013, | .931871, | .931871, |
| 3 | \$ | .933013, | .935338, | .938935, | .943941, | .950555, | .959050, |
| 3 | \$ | .969791, | .983248, | 1.000000, | 1.000000, | .985730, | .974578, |
| 3 | \$ | .965855, | .959050, | .953800, | .949849, | .947022, | .945198, |


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3  $ .953451, .956181, .969831, .974609, .980834, .989020,
3  $ 1.000000, 1.000000, .993473, .999020, .985745, .983268,
3  $ .981390, .979991, .978537, .978357, .973044, .978044,
3  $ .978357, .978997, .979991, .981359, .983268, .985745,
3  $ .989020, .993473, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3C
3C  INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3  CALL QUADRD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NGRDD, NGRDD, DERUSL)
3C
3  TRUE = DERUSL(6)
3C
3  RETURN
3  END
3  FUNCTION R(X,Y)
3C
3  REAL DERUSL(6), GRID(9), TAB1(9,9), TAB2(9,9),
3  $ TAB3(9,9), TAB4(9,9), TAB5(9,9)
3  DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3  $0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C  APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C  COLLOCATION
3C
3  DATA TAB1/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .975227,
3  $ .961931, .955174, .953091, .955175, .961931, .975227,
3  $ 1.000000, 1.000000, .961931, .939237, .927238, .923486,
3  $ .927237, .939237, .961931, 1.000000, 1.000000, .955175,
3  $ .927238, .912095, .907312, .912095, .927237, .955175,
3  $ 1.000000, 1.000000, .953091, .923487, .907313, .902186,
3  $ .907312, .923487, .953091, 1.000000, 1.000000, .955176,
3  $ .927238, .912095, .907312, .912095, .927238, .955175,
3  $ 1.000000, 1.000000, .961932, .939238, .927238, .923486,
3  $ .927238, .939237, .961932, 1.000000, 1.000000, .975228,
3  $ .961932, .955175, .953091, .955175, .961931, .975227,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3  DATA TAB2/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .974112,
3  $ .959940, .952637, .950369, .952638, .959940, .974113,
3  $ 1.000000, 1.000000, .959939, .935661, .922668, .918581,
3  $ .922669, .935662, .959941, 1.000000, 1.000000, .952637,
3  $ .922668, .906244, .901028, .906245, .922668, .952637,
3  $ 1.000000, 1.000000, .950368, .918580, .901028, .895433,
3  $ .901028, .918580, .950368, 1.000000, 1.000000, .952637,
3  $ .922668, .906245, .901028, .906245, .922668, .952637,
3  $ 1.000000, 1.000000, .959940, .935662, .922669, .918581,
3  $ .922668, .935661, .959940, 1.000000, 1.000000, .974112,
3  $ .959940, .952637, .950369, .952637, .959940, .974113,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3  DATA TAB3/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .976286,
3  $ .963816, .957569, .955656, .957570, .963816, .976286,
3  $ 1.000000, 1.000000, .963816, .942608, .931532, .928093,
3  $ .931533, .942609, .963817, 1.000000, 1.000000, .957569,
3  $ .931532, .917577, .913196, .917578, .931534, .957570,
3  $ 1.000000, 1.000000, .955656, .928093, .913196, .908502,
3  $ .913197, .928094, .955657, 1.000000, 1.000000, .957569,
3  $ .931532, .917577, .913196, .917578, .931534, .957570,
3  $ 1.000000, 1.000000, .963815, .942607, .931533, .928093,
3  $ .931533, .942609, .963817, 1.000000, 1.000000, .976286,
3  $ .963816, .957569, .955656, .957569, .963817, .976287,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3  DATA TAB4/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3  $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .975353,
3  $ .962161, .955471, .953410, .955471, .962161, .975354,
3  $ 1.000000, 1.000000, .962161, .933658, .927783, .924075,

```

```

3      S .927783, .933659, .952152, 1.000000, 1.000000, .955471,
3      S .927783, .912803, .933077, .912804, .927784, .955473,
3      S 1.000000, 1.000000, .953410, .924075, .908078, .903013,
3      S .903078, .924075, .953412, 1.000000, 1.000000, .955471,
3      S .927783, .912804, .933078, .912804, .927784, .955472,
3      S 1.000000, 1.000000, .952161, .933659, .927784, .924076,
3      S .927784, .933659, .952152, 1.000000, 1.000000, .975353,
3      S .952152, .955472, .953411, .955472, .952161, .975353,
3      S 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3      S 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3C
3      DATA TAB5/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3      S 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, .975382,
3      S .952216, .955545, .953491, .955546, .962217, .975383,
3      S 1.000000, 1.000000, .952217, .939764, .927924, .924229,
3      S .927925, .939764, .962217, 1.000000, 1.000000, .955546,
3      S .927925, .912992, .908283, .912992, .927924, .955545,
3      S 1.000000, 1.000000, .953491, .924229, .908283, .903226,
3      S .908282, .924228, .953490, 1.000000, 1.000000, .955546,
3      S .927925, .912993, .908283, .912991, .927923, .955544,
3      S 1.000000, 1.000000, .952217, .939765, .927925, .924228,
3      S .927923, .939763, .952216, 1.000000, 1.000000, .975382,
3      S .952217, .955545, .953490, .955544, .962216, .975382,
3      S 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3      S 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3C
3C      INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3      CALL QUADRD(X,Y,TAB&D,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3      G = DERUSL(G)
3C
3      R = -1.425*G**(&C-1)*EXP(&A*&B*(1.-G)/(1.+&B*(1.-G)))
3C
3      RETURN
3      END

```

```

*EOR
*****
* MACRO 49 *
*****
*      2000001002000
1      TWO DIMENSIONS
1      UXX$ + UYY$ + W(X,Y)US = F(X,Y)
2      DIRICHLET
2      X=0. , U=1.
2      X=1. , U=1.
2      Y=0. , U=1.
2      Y=1. , U=1.
3      FUNCTION TRUE(X,Y)
3C
3C      *****
3C      *
3C      *      MACRO 49 PARAMETERS
3C      *
3C      *****
3C      *
3C      *      A I B I C I D
3C      *      ---I---I---I---
3C      *      1 I .50 I 2 I 1
3C      *      I I I
3C      *      1 I .50 I 25 I 2
3C      *      I I I
3C      *      2 I .04 I 2 I 3
3C      *      I I I
3C      *      2 I .50 I 2 I 4
3C      *
3C      *****
3C
3      REAL DERUSL(G), GRID(20), TABLE(20,20),
3      S T131(100), T132(100), T133(100), T134(100),
3      S T231(100), T232(100), T233(100), T234(100),
3      S T331(100), T332(100), T333(100), T334(100),
3      S T431(100), T432(100), T433(100), T434(100)
3      EQUIVALENCE (TABLE(1, 1), T2331(1)),
3      S (TABLE(1, 6), T2332(1)),

```

```

3 $ (TABLE(1,11) , T&DB3(1)),
3 $ (TABLE(1,16) , T&DB4(1))
3 DATA NGRID, NGRDD, GRID /20, 20, 0.0000000, 0.0526316,
3 $0.1052632, 0.1578947, 0.2105263, 0.2631579, 0.3157895,
3 $0.3684211, 0.4210526, 0.4736842, 0.5263158, 0.5789474,
3 $0.6315789, 0.6842105, 0.7368421, 0.7894737, 0.8421053,
3 $0.8947368, 0.9473684, 1.0000000/
3C
3C APPROXIMATE SOLUTION OF LINEARIZED PROBLEM USING
3C HODIE-ACF (METHOD=4, IORDER=41, 20 X 20 GRID)
3C
3 DATA T1B1/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.010595, 1.012473, 1.013915, 1.014992, 1.015761, 1.016257,
3 $ 1.016500, 1.016500, 1.016257, 1.015761, 1.014992, 1.013915,
3 $ 1.012473, 1.010595, 1.008128, 1.004808, 1.000000, 1.000000,
3 $ 1.008128, 1.014249, 1.018947, 1.022581, 1.025376, 1.027479,
3 $ 1.028985, 1.029957, 1.030433, 1.030433, 1.029957, 1.028985,
3 $ 1.027479, 1.025376, 1.022581, 1.018947, 1.014249, 1.008128,
3 $ 1.000000, 1.000000, 1.010595, 1.018947, 1.025531, 1.030703,
3 $ 1.034718, 1.037754, 1.039935, 1.041346, 1.042038, 1.042038,
3 $ 1.041346, 1.039935, 1.037754, 1.034718, 1.030703, 1.025531,
3 $ 1.018947, 1.010595, 1.000000, 1.000000, 1.012478, 1.022581,
3 $ 1.030703, 1.037169, 1.042231, 1.046080, 1.048856, 1.050655,
3 $ 1.051540, 1.051540, 1.050655, 1.048856, 1.046080, 1.042231,
3 $ 1.037169, 1.030703, 1.022581, 1.012478, 1.000000/
3C
3 DATA T1B2/ 1.000000, 1.013915, 1.025376, 1.034718, 1.042231,
3 $ 1.048157, 1.052685, 1.055961, 1.058090, 1.059138, 1.059138,
3 $ 1.058090, 1.055961, 1.052685, 1.048157, 1.042231, 1.034718,
3 $ 1.025376, 1.013915, 1.000000, 1.000000, 1.014992, 1.027479,
3 $ 1.037754, 1.046080, 1.052685, 1.057754, 1.061432, 1.063826,
3 $ 1.065006, 1.065006, 1.063826, 1.061432, 1.057754, 1.052685,
3 $ 1.046080, 1.037754, 1.027479, 1.014992, 1.000000, 1.000000,
3 $ 1.015761, 1.028985, 1.039935, 1.048856, 1.055961, 1.061432,
3 $ 1.065410, 1.065410, 1.069283, 1.069283, 1.068004, 1.065410,
3 $ 1.061432, 1.055961, 1.048856, 1.039935, 1.028985, 1.015761,
3 $ 1.000000, 1.000000, 1.016257, 1.029957, 1.041346, 1.050655,
3 $ 1.058090, 1.063826, 1.065006, 1.070731, 1.072076, 1.072076,
3 $ 1.070731, 1.065006, 1.063826, 1.058090, 1.050655, 1.041346,
3 $ 1.029957, 1.016257, 1.000000, 1.000000, 1.016500, 1.030433,
3 $ 1.042038, 1.051540, 1.059138, 1.065006, 1.069283, 1.072076,
3 $ 1.073455, 1.073455, 1.072076, 1.069283, 1.065006, 1.059138,
3 $ 1.051540, 1.042038, 1.030433, 1.016500, 1.000000/
3C
3 DATA T1B3/ 1.000000, 1.016500, 1.030433, 1.042038, 1.051540,
3 $ 1.059138, 1.065006, 1.069283, 1.072076, 1.073455, 1.073455,
3 $ 1.072076, 1.069283, 1.065006, 1.059138, 1.051540, 1.042038,
3 $ 1.030433, 1.016500, 1.000000, 1.000000, 1.016257, 1.029957,
3 $ 1.041346, 1.050655, 1.058090, 1.063826, 1.065006, 1.070731,
3 $ 1.072076, 1.072076, 1.070731, 1.063826, 1.058090,
3 $ 1.050655, 1.041346, 1.029957, 1.016257, 1.000000, 1.000000,
3 $ 1.015761, 1.028985, 1.039935, 1.048856, 1.055961, 1.061432,
3 $ 1.065410, 1.065410, 1.069283, 1.069283, 1.068004, 1.065410,
3 $ 1.061432, 1.055961, 1.048856, 1.039935, 1.029957, 1.015761,
3 $ 1.000000, 1.000000, 1.014992, 1.027479, 1.037754, 1.046080,
3 $ 1.052685, 1.057754, 1.061432, 1.063826, 1.065006, 1.065006,
3 $ 1.063826, 1.061432, 1.057754, 1.052685, 1.046080, 1.037754,
3 $ 1.027479, 1.014992, 1.000000, 1.000000, 1.013915, 1.025376,
3 $ 1.034718, 1.042231, 1.048157, 1.052685, 1.055961, 1.058090,
3 $ 1.059138, 1.059138, 1.058090, 1.055961, 1.052685, 1.048157,
3 $ 1.042231, 1.034718, 1.025376, 1.013915, 1.000000/
3C
3 DATA T1B4/ 1.000000, 1.012478, 1.022581, 1.030703, 1.037169,
3 $ 1.042231, 1.046080, 1.048856, 1.050655, 1.051540, 1.051540,
3 $ 1.050655, 1.048856, 1.046080, 1.042231, 1.037169, 1.030703,
3 $ 1.022581, 1.012478, 1.000000, 1.000000, 1.010595, 1.018947,
3 $ 1.025531, 1.030703, 1.034718, 1.037754, 1.039935, 1.041346,
3 $ 1.042038, 1.042038, 1.041346, 1.039935, 1.037754, 1.034718,
3 $ 1.030703, 1.025531, 1.018947, 1.010595, 1.000000, 1.000000,
3 $ 1.003123, 1.014249, 1.018947, 1.022581, 1.025376, 1.027479,
3 $ 1.028985, 1.029957, 1.030433, 1.030433, 1.029957, 1.028985,
3 $ 1.027479, 1.025376, 1.022581, 1.018947, 1.014249, 1.008128,
3 $ 1.000000, 1.000000, 1.004303, 1.003123, 1.010595, 1.012478,

```

| | | | | | | | |
|---|---|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | S | 1.013315, | 1.014332, | 1.015731, | 1.016257, | 1.016500, | 1.016500, |
| 3 | S | 1.016257, | 1.015731, | 1.014332, | 1.013315, | 1.012478, | 1.010595, |
| 3 | S | 1.003123, | 1.004303, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T231/ | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.198997, | 1.323240, |
| 3 | S | 1.373187, | 1.348374, | 1.340131, | 1.339086, | 1.338927, | 1.338874, |
| 3 | S | 1.333890, | 1.333890, | 1.333874, | 1.338927, | 1.339086, | 1.340131, |
| 3 | S | 1.348374, | 1.373187, | 1.323240, | 1.198997, | 1.000000, | 1.000000, |
| 3 | S | 1.323240, | 1.476115, | 1.495001, | 1.491537, | 1.490550, | 1.490452, |
| 3 | S | 1.490426, | 1.490415, | 1.490420, | 1.490420, | 1.490415, | 1.490426, |
| 3 | S | 1.490452, | 1.490550, | 1.491537, | 1.495001, | 1.476115, | 1.323240, |
| 3 | S | 1.000000, | 1.000000, | 1.373187, | 1.495001, | 1.500139, | 1.500072, |
| 3 | S | 1.500079, | 1.500075, | 1.500076, | 1.500075, | 1.500075, | 1.500075, |
| 3 | S | 1.500075, | 1.500076, | 1.500076, | 1.500079, | 1.500072, | 1.500139, |
| 3 | S | 1.495001, | 1.373187, | 1.000000, | 1.000000, | 1.348374, | 1.491537, |
| 3 | S | 1.500072, | 1.499331, | 1.499991, | 1.499991, | 1.499991, | 1.499991, |
| 3 | S | 1.499331, | 1.499991, | 1.499991, | 1.499991, | 1.499991, | 1.499991, |
| 3 | S | 1.499331, | 1.500072, | 1.491537, | 1.348374, | 1.000000, | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T222/ | 1.000000, | 1.340131, | 1.490550, | 1.500079, | 1.499991, | |
| 3 | S | 1.500091, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500001, | 1.499991, | 1.500079, |
| 3 | S | 1.490550, | 1.340131, | 1.000000, | 1.000000, | 1.339086, | 1.490452, |
| 3 | S | 1.500075, | 1.499991, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.499991, | 1.500075, | 1.490452, | 1.339086, | 1.000000, | 1.000000, |
| 3 | S | 1.333327, | 1.490426, | 1.500076, | 1.499991, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.499531, | 1.500076, | 1.490426, | 1.338927, |
| 3 | S | 1.000000, | 1.000000, | 1.338374, | 1.490415, | 1.500075, | 1.499991, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.499991, | 1.500075, |
| 3 | S | 1.490415, | 1.338374, | 1.000000, | 1.000000, | 1.338890, | 1.490420, |
| 3 | S | 1.500075, | 1.499991, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.499991, | 1.500075, | 1.490420, | 1.338890, | 1.000000, | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T233/ | 1.000000, | 1.333890, | 1.490420, | 1.500075, | 1.499991, | |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.499991, | 1.500075, |
| 3 | S | 1.490420, | 1.333890, | 1.000000, | 1.000000, | 1.338874, | 1.490415, |
| 3 | S | 1.500075, | 1.499991, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.499991, | 1.500075, | 1.490415, | 1.338874, | 1.000000, | 1.000000, |
| 3 | S | 1.333327, | 1.490426, | 1.500076, | 1.499991, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.499991, | 1.500076, | 1.490426, | 1.338927, |
| 3 | S | 1.000000, | 1.000000, | 1.333086, | 1.490452, | 1.500076, | 1.499991, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.499991, | 1.500076, |
| 3 | S | 1.490452, | 1.333086, | 1.000000, | 1.000000, | 1.340131, | 1.490550, |
| 3 | S | 1.500079, | 1.499331, | 1.500001, | 1.500000, | 1.500000, | 1.500000, |
| 3 | S | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500000, | 1.500001, |
| 3 | S | 1.499331, | 1.500079, | 1.490550, | 1.340131, | 1.000000, | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T234/ | 1.000000, | 1.343374, | 1.491537, | 1.500072, | 1.499991, | |
| 3 | S | 1.499331, | 1.499331, | 1.499331, | 1.499331, | 1.499331, | 1.499331, |
| 3 | S | 1.499331, | 1.499331, | 1.499331, | 1.499331, | 1.499331, | 1.500072, |
| 3 | S | 1.491537, | 1.343374, | 1.000000, | 1.000000, | 1.373187, | 1.495001, |
| 3 | S | 1.500123, | 1.500072, | 1.500079, | 1.500075, | 1.500076, | 1.500075, |
| 3 | S | 1.500075, | 1.500075, | 1.500075, | 1.500075, | 1.500076, | 1.500079, |
| 3 | S | 1.500072, | 1.500123, | 1.495001, | 1.373187, | 1.000000, | 1.000000, |
| 3 | S | 1.373187, | 1.476115, | 1.495001, | 1.491537, | 1.490550, | 1.490452, |
| 3 | S | 1.490452, | 1.490415, | 1.490420, | 1.490420, | 1.490415, | 1.490426, |
| 3 | S | 1.490452, | 1.490550, | 1.491537, | 1.495001, | 1.476115, | 1.323240, |
| 3 | S | 1.000000, | 1.000000, | 1.333327, | 1.323240, | 1.373187, | 1.348374, |
| 3 | S | 1.348374, | 1.333327, | 1.323240, | 1.333327, | 1.333327, | 1.333327, |
| 3 | S | 1.333327, | 1.323240, | 1.333327, | 1.340131, | 1.343374, | 1.373187, |
| 3 | S | 1.373187, | 1.343374, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |
| 3 | S | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, | 1.000000, |

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1

```

3C RETURN
3 END
3 FUNCTION R(X,Y)
3C
3 REAL DERUSL(S), GRID(9), TAB1(9,9), TAB2(9,9),
3 TAB3(9,9), TAB4(9,9)
3 DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3 0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C COLLOCATION
3C
3 DATA TAB1/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.018360,
3 $ 1.028380, 1.033520, 1.035120, 1.033520, 1.028380, 1.018360,
3 $ 1.000000, 1.000000, 1.028380, 1.045520, 1.054670, 1.057540,
3 $ 1.054670, 1.045520, 1.028380, 1.000000, 1.000000, 1.033520,
3 $ 1.054670, 1.065220, 1.069880, 1.065220, 1.054670, 1.033520,
3 $ 1.000000, 1.000000, 1.035120, 1.057540, 1.069880, 1.073810,
3 $ 1.065220, 1.057540, 1.035120, 1.000000, 1.000000, 1.033520,
3 $ 1.054670, 1.065220, 1.069880, 1.065220, 1.054670, 1.033520,
3 $ 1.000000, 1.000000, 1.028380, 1.045520, 1.054670, 1.057540,
3 $ 1.054670, 1.045520, 1.028380, 1.000000, 1.000000, 1.018360,
3 $ 1.028380, 1.033520, 1.035120, 1.033520, 1.028380, 1.018360,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB2/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.522810,
3 $ 1.511040, 1.510490, 1.510470, 1.510490, 1.511040, 1.522810,
3 $ 1.000000, 1.000000, 1.511040, 1.501050, 1.500550, 1.500530,
3 $ 1.500550, 1.501050, 1.511040, 1.000000, 1.000000, 1.510490,
3 $ 1.500550, 1.500030, 1.500030, 1.500050, 1.500550, 1.510490,
3 $ 1.000000, 1.000000, 1.510470, 1.500530, 1.500030, 1.500010,
3 $ 1.500030, 1.500530, 1.510470, 1.000000, 1.000000, 1.510490,
3 $ 1.500550, 1.500030, 1.500030, 1.500050, 1.500550, 1.510490,
3 $ 1.000000, 1.000000, 1.511040, 1.501050, 1.500550, 1.500530,
3 $ 1.500550, 1.501050, 1.511040, 1.000000, 1.000000, 1.522810,
3 $ 1.511040, 1.510490, 1.510470, 1.510490, 1.511040, 1.522810,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB3/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.001310,
3 $ 1.001930, 1.002320, 1.002430, 1.002320, 1.001930, 1.001310,
3 $ 1.000000, 1.000000, 1.001930, 1.003140, 1.003730, 1.003920,
3 $ 1.003730, 1.003140, 1.001930, 1.000000, 1.000000, 1.002320,
3 $ 1.003730, 1.004480, 1.004720, 1.004480, 1.003730, 1.002330,
3 $ 1.000000, 1.000000, 1.002430, 1.003320, 1.004720, 1.004970,
3 $ 1.004720, 1.003920, 1.002430, 1.000000, 1.000000, 1.002320,
3 $ 1.003730, 1.004480, 1.004720, 1.004480, 1.003730, 1.002320,
3 $ 1.000000, 1.000000, 1.001930, 1.003140, 1.003730, 1.003920,
3 $ 1.003730, 1.003140, 1.001930, 1.000000, 1.000000, 1.001310,
3 $ 1.001930, 1.002320, 1.002430, 1.002320, 1.001930, 1.001310,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3 DATA TAB4/ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.017160,
3 $ 1.026240, 1.030800, 1.032200, 1.030800, 1.026240, 1.017160,
3 $ 1.000000, 1.000000, 1.026240, 1.041680, 1.049760, 1.052270,
3 $ 1.049760, 1.041680, 1.026240, 1.000000, 1.000000, 1.030800,
3 $ 1.049760, 1.053340, 1.053140, 1.053340, 1.049760, 1.030800,
3 $ 1.000000, 1.000000, 1.032200, 1.052280, 1.053140, 1.056570,
3 $ 1.053140, 1.052270, 1.032200, 1.000000, 1.000000, 1.030800,
3 $ 1.049760, 1.053340, 1.053140, 1.053340, 1.049760, 1.030800,
3 $ 1.000000, 1.000000, 1.026240, 1.041680, 1.049760, 1.052280,
3 $ 1.049760, 1.041680, 1.026240, 1.000000, 1.000000, 1.017160,
3 $ 1.026240, 1.030800, 1.032200, 1.030800, 1.026240, 1.017160,
3 $ 1.000000, 1.000000, 1.000000, 1.000000, 1.000000, 1.000000,
3 $ 1.000000, 1.000000, 1.000000, 1.000000/
3C
3C INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3 CALL QUADRO(X,Y,TAB4D,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)

```


[illegible]

| | | | | | | | |
|---|----|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | \$ | 1.744009, | 1.593114, | 1.642156, | 1.530253, | 1.512033, | 1.438310, |
| 3 | \$ | 1.330670, | 1.275371, | 1.133327, | 1.032572, | .959925, | .845414, |
| 3 | \$ | 1.707065, | .553300, | .335537, | .200337, | .000000, | 1.812470, |
| 3 | \$ | 1.894003, | 1.779997, | 1.743930, | 1.637252, | 1.541171, | 1.578167, |
| 3 | \$ | 1.500113, | 1.434811, | 1.355041, | 1.270995, | 1.178333, | 1.077531, |
| 3 | \$ | .955507, | .841439, | .703730, | .551440, | .383340, | .200135, |
| 3 | \$ | .000000, | 1.312430, | 1.301233, | 1.730041, | 1.743850, | 1.696785, |
| 3 | \$ | 1.639703, | 1.575553, | 1.505015, | 1.423995, | 1.349233, | 1.263228, |
| 3 | \$ | 1.170514, | 1.052672, | .953194, | .835023, | .693500, | .547470, |
| 3 | \$ | .331120, | .193735, | .000000, | 1.812494, | 1.804553, | 1.780106, |
| 3 | \$ | 1.743742, | 1.696139, | 1.637715, | 1.572120, | 1.499240, | 1.420804, |
| 3 | \$ | 1.330491, | 1.252129, | 1.156330, | 1.053435, | .947730, | .825919, |
| 3 | \$ | .331033, | .541732, | .377341, | .135320, | .000000/ | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T252/ | 1.812512, | 1.803333, | 1.779871, | 1.743037, | 1.694535, | |
| 3 | \$ | 1.635131, | 1.565743, | 1.491150, | 1.410235, | 1.325772, | 1.237056, |
| 3 | \$ | 1.140289, | 1.042333, | .933533, | .812522, | .680922, | .534227, |
| 3 | \$ | .372333, | .194452, | .000000, | 1.812535, | 1.804636, | 1.780053, |
| 3 | \$ | 1.743105, | 1.633390, | 1.622332, | 1.561908, | 1.482589, | 1.397306, |
| 3 | \$ | 1.310432, | 1.218322, | 1.123376, | 1.024165, | .916070, | .798130, |
| 3 | \$ | .638273, | .524323, | .355703, | .191152, | .000000, | 1.812562, |
| 3 | \$ | 1.894525, | 1.779973, | 1.742551, | 1.622450, | 1.529129, | 1.555381, |
| 3 | \$ | 1.471824, | 1.331975, | 1.230530, | 1.135132, | 1.039765, | 1.000372, |
| 3 | \$ | .834125, | .778990, | .652437, | .512755, | .357874, | .187297, |
| 3 | \$ | .000000, | 1.812534, | 1.804034, | 1.779775, | 1.741953, | 1.690619, |
| 3 | \$ | 1.625704, | 1.547340, | 1.453412, | 1.334293, | 1.235316, | 1.168500, |
| 3 | \$ | 1.070434, | .971153, | .857321, | .755553, | .633339, | .498295, |
| 3 | \$ | .348474, | .182333, | .000000, | 1.812531, | 1.804832, | 1.780046, |
| 3 | \$ | 1.742102, | 1.690053, | 1.622445, | 1.541769, | 1.447333, | 1.344371, |
| 3 | \$ | 1.241392, | 1.133923, | 1.035534, | .937070, | .835330, | .727381, |
| 3 | \$ | .610123, | .480993, | .335277, | .175597, | .000000/ | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T233/ | 1.812674, | 1.804514, | 1.779303, | 1.741544, | 1.688473, | |
| 3 | \$ | 1.619129, | 1.533957, | 1.433217, | 1.322333, | 1.209403, | 1.098356, |
| 3 | \$ | .933703, | .335172, | .753782, | .334005, | .582321, | .460202, |
| 3 | \$ | .322835, | .170037, | .000000, | 1.812722, | 1.804471, | 1.779899, |
| 3 | \$ | 1.741233, | 1.687334, | 1.615149, | 1.525915, | 1.419233, | 1.298555, |
| 3 | \$ | 1.174151, | 1.053505, | .943327, | .845505, | .750958, | .654130, |
| 3 | \$ | .550195, | .435345, | .305527, | .161958, | .000000, | 1.812777, |
| 3 | \$ | 1.895053, | 1.780123, | 1.741330, | 1.636397, | 1.513719, | 1.521466, |
| 3 | \$ | 1.495313, | 1.273452, | 1.135947, | 1.001613, | .834621, | .786898, |
| 3 | \$ | .695794, | .603762, | .511433, | .405533, | .283559, | .152028, |
| 3 | \$ | .000000, | 1.812333, | 1.804533, | 1.780002, | 1.740978, | 1.685927, |
| 3 | \$ | 1.611733, | 1.515622, | 1.393505, | 1.248107, | 1.085532, | .938410, |
| 3 | \$ | .813031, | .715716, | .632441, | .551934, | .453892, | .372729, |
| 3 | \$ | .234330, | .141390, | .000000, | 1.812907, | 1.805068, | 1.780247, |
| 3 | \$ | 1.741255, | 1.683051, | 1.610650, | 1.512803, | 1.394333, | 1.223785, |
| 3 | \$ | 1.042333, | .865472, | .727023, | .631918, | .556971, | .486641, |
| 3 | \$ | .413473, | .332842, | .237055, | .127525, | .000000/ | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T234/ | 1.812934, | 1.805192, | 1.780333, | 1.741439, | 1.686177, | |
| 3 | \$ | 1.610350, | 1.511702, | 1.378334, | 1.202751, | .939344, | .776065, |
| 3 | \$ | .621900, | .531492, | .463353, | .411593, | .352301, | .286265, |
| 3 | \$ | .205740, | .111533, | .000000, | 1.813039, | 1.804937, | 1.780326, |
| 3 | \$ | 1.741397, | 1.633091, | 1.610239, | 1.512334, | 1.373439, | 1.189577, |
| 3 | \$ | .930659, | .651607, | .490722, | .412533, | .335739, | .265568, |
| 3 | \$ | .252433, | .231525, | .170924, | .034141, | .000000, | 1.813160, |
| 3 | \$ | 1.805510, | 1.730731, | 1.742154, | 1.637505, | 1.612441, | 1.516513, |
| 3 | \$ | 1.333737, | 1.123343, | .377400, | .320356, | .324343, | .265546, |
| 3 | \$ | .251313, | .223507, | .193371, | .167254, | .123552, | .070127, |
| 3 | \$ | .000000, | 1.813239, | 1.805233, | 1.780323, | 1.742578, | 1.688169, |
| 3 | \$ | 1.614310, | 1.522439, | 1.393523, | 1.213537, | .830704, | .312526, |
| 3 | \$ | .110650, | .124302, | .125513, | .113255, | .104335, | .090949, |
| 3 | \$ | .065743, | .041773, | .000000, | 1.813440, | 1.804354, | 1.780815, |
| 3 | \$ | 1.742234, | 1.637733, | 1.613434, | 1.520373, | 1.400121, | 1.265763, |
| 3 | \$ | .221873, | -.073302, | -.151509, | .012233, | -.014529, | -.006469, |
| 3 | \$ | .001105, | -.002022, | -.000151, | .000030, | .000000/ | |

3C

| | | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T231/ | 1.779203, | 1.765725, | 1.743971, | 1.718304, | 1.678909, | |
| 3 | \$ | 1.300233, | 1.579734, | 1.510311, | 1.432201, | 1.375143, | 1.297450, |
| 3 | \$ | 1.235033, | 1.103753, | .865553, | .722149, | .723310, | .564193, |
| 3 | \$ | .312313, | .211750, | .000000, | 1.779203, | 1.737504, | 1.748316, |
| 3 | \$ | 1.742102, | 1.633091, | 1.610239, | 1.512334, | 1.373439, | 1.189577, |
| 3 | \$ | 1.805510, | 1.730731, | 1.742154, | 1.637505, | 1.612441, | 1.516513, |
| 3 | \$ | 1.333737, | 1.123343, | .377400, | .320356, | .324343, | .265546, |
| 3 | \$ | .251313, | .223507, | .193371, | .167254, | .123552, | .070127, |
| 3 | \$ | .000000, | 1.813239, | 1.805233, | 1.780323, | 1.742578, | 1.688169, |
| 3 | \$ | 1.614310, | 1.522439, | 1.393523, | 1.213537, | .830704, | .312526, |
| 3 | \$ | .110650, | .124302, | .125513, | .113255, | .104335, | .090949, |
| 3 | \$ | .065743, | .041773, | .000000, | 1.813440, | 1.804354, | 1.780815, |
| 3 | \$ | 1.742234, | 1.637733, | 1.613434, | 1.520373, | 1.400121, | 1.265763, |
| 3 | \$ | .221873, | -.073302, | -.151509, | .012233, | -.014529, | -.006469, |
| 3 | \$ | .001105, | -.002022, | -.000151, | .000030, | .000000/ | |

| | | | | | | | |
|----|----|------------|-----------|-----------|-----------|-----------|-----------|
| 3 | \$ | 1.516723, | 1.449031, | 1.374731, | 1.292213, | 1.200547, | 1.098586, |
| 3 | \$ | .984637, | .657921, | .717150, | .551489, | .390482, | .203402, |
| 3 | \$ | .000000, | 1.773233, | 1.767143, | 1.747997, | 1.718099, | 1.678521, |
| 3 | \$ | 1.630010, | 1.574978, | 1.512307, | 1.443801, | 1.369358, | 1.285571, |
| 3 | \$ | 1.193511, | 1.091895, | .978354, | .852395, | .712594, | .558024, |
| 3 | \$ | .383103, | .202222, | .000000, | 1.773231, | 1.767370, | 1.747912, |
| 3 | \$ | 1.717656, | 1.677386, | 1.627517, | 1.571193, | 1.507284, | 1.436458, |
| 3 | \$ | 1.360433, | 1.276110, | 1.183734, | 1.082343, | .969388, | .844534, |
| 3 | \$ | .705117, | .553055, | .384798, | .200586, | .000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T3B2/ | 1.773228, | 1.766756, | 1.747495, | 1.716588, | 1.675129, |
| 3 | \$ | 1.624252, | 1.565484, | 1.499506, | 1.426958, | 1.348532, | 1.263272, |
| 3 | \$ | 1.170505, | 1.069087, | .957311, | .833839, | .697242, | .546404, |
| 3 | \$ | .380355, | .198387, | .000000, | 1.773224, | 1.767309, | 1.747449, |
| 3 | \$ | 1.716115, | 1.673707, | 1.620573, | 1.560086, | 1.491212, | 1.415361, |
| 3 | \$ | 1.335315, | 1.247932, | 1.154145, | 1.053206, | .942199, | .820437, |
| 3 | \$ | .685148, | .537935, | .374496, | .195458, | .000000, | 1.773219, |
| 3 | \$ | 1.767121, | 1.747116, | 1.715063, | 1.671286, | 1.616250, | 1.552832, |
| 3 | \$ | 1.480704, | 1.401588, | 1.318255, | 1.228761, | 1.133893, | 1.033017, |
| 3 | \$ | .923331, | .803746, | .672297, | .527379, | .367490, | .192005, |
| 3 | \$ | .000000, | 1.773214, | 1.766549, | 1.745629, | 1.713688, | 1.668283, |
| 3 | \$ | 1.611431, | 1.544289, | 1.468434, | 1.385578, | 1.297847, | 1.205703, |
| 3 | \$ | 1.109405, | 1.008261, | .900242, | .783280, | .655274, | .514409, |
| 3 | \$ | .358974, | .187805, | .000000, | 1.773207, | 1.767280, | 1.746580, |
| 3 | \$ | 1.713103, | 1.666456, | 1.605479, | 1.535763, | 1.456217, | 1.367702, |
| 3 | \$ | 1.276349, | 1.179610, | 1.080647, | .979657, | .872679, | .758467, |
| 3 | \$ | .634579, | .498665, | .347884, | .182253, | .000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T3B3/ | 1.773200, | 1.766814, | 1.746110, | 1.711710, | 1.663318, |
| 3 | \$ | 1.601104, | 1.527036, | 1.441591, | 1.347707, | 1.249655, | 1.148220, |
| 3 | \$ | 1.046285, | .944397, | .833293, | .728751, | .609787, | .479649, |
| 3 | \$ | .335456, | .176127, | .000000, | 1.773191, | 1.766660, | 1.745749, |
| 3 | \$ | 1.710522, | 1.650490, | 1.595583, | 1.517432, | 1.423453, | 1.325900, |
| 3 | \$ | 1.220417, | 1.112360, | 1.005002, | .902860, | .799418, | .692918, |
| 3 | \$ | .579313, | .456730, | .320019, | .168456, | .000000, | 1.773182, |
| 3 | \$ | 1.767118, | 1.745610, | 1.709763, | 1.658354, | 1.590402, | 1.508589, |
| 3 | \$ | 1.411412, | 1.302522, | 1.189105, | 1.071797, | .958990, | .854169, |
| 3 | \$ | .751949, | .649863, | .543716, | .429218, | .300895, | .158910, |
| 3 | \$ | .000000, | 1.773172, | 1.766514, | 1.745120, | 1.708369, | 1.655252, |
| 3 | \$ | 1.585137, | 1.498306, | 1.394964, | 1.278019, | 1.152286, | 1.024370, |
| 3 | \$ | .903245, | .794602, | .694548, | .598701, | .500914, | .396192, |
| 3 | \$ | .279503, | .148374, | .000000, | 1.773160, | 1.766886, | 1.744994, |
| 3 | \$ | 1.707694, | 1.653350, | 1.580377, | 1.482936, | 1.379974, | 1.253020, |
| 3 | \$ | 1.115450, | .971930, | .833405, | .725452, | .626408, | .536576, |
| 3 | \$ | .448730, | .356518, | .251656, | .134418, | .000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T3B4/ | 1.773148, | 1.766886, | 1.744770, | 1.708891, | 1.651350, |
| 3 | \$ | 1.576061, | 1.481777, | 1.365440, | 1.228351, | 1.075319, | .912514, |
| 3 | \$ | .761311, | .640650, | .543399, | .452778, | .387042, | .309008, |
| 3 | \$ | .219547, | .118413, | .000000, | 1.773135, | 1.766232, | 1.744374, |
| 3 | \$ | 1.705331, | 1.649078, | 1.572301, | 1.473805, | 1.351768, | 1.205234, |
| 3 | \$ | 1.033233, | .843789, | .668069, | .534340, | .443791, | .375286, |
| 3 | \$ | .313937, | .252003, | .182072, | .093697, | .000000, | 1.773122, |
| 3 | \$ | 1.766834, | 1.744468, | 1.705732, | 1.648443, | 1.539546, | 1.465025, |
| 3 | \$ | 1.341577, | 1.185259, | .997433, | .777534, | .553751, | .410830, |
| 3 | \$ | .323713, | .239571, | .225297, | .183201, | .132078, | .074306, |
| 3 | \$ | .000000, | 1.773107, | 1.766542, | 1.744250, | 1.705180, | 1.647300, |
| 3 | \$ | 1.557542, | 1.434323, | 1.333501, | 1.169114, | .955945, | .712731, |
| 3 | \$ | .415353, | .235455, | .178328, | .148850, | .122781, | .100598, |
| 3 | \$ | .074529, | .044213, | .000000, | 1.773085, | 1.766180, | 1.744056, |
| 3 | \$ | 1.704571, | 1.643615, | 1.595430, | 1.461352, | 1.330633, | 1.155519, |
| 3 | \$ | .950850, | .681654, | .214983, | -.017429, | .020759, | .009179, |
| 3 | \$ | -.001695, | .002859, | .000223, | -.000042, | .000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T4B1/ | 2.170321, | 2.163987, | 2.143356, | 2.110933, | 2.065997, |
| 3 | \$ | 2.009433, | 1.941830, | 1.863493, | 1.774542, | 1.675014, | 1.564610, |
| 3 | \$ | 1.442931, | 1.309491, | 1.163535, | 1.004949, | .832396, | .646464, |
| 3 | \$ | .445300, | .230392, | .000000, | 2.170321, | 2.164943, | 2.144179, |
| 3 | \$ | 2.111492, | 2.053755, | 2.009425, | 1.942359, | 1.853750, | 1.774086, |
| 3 | \$ | 1.675211, | 1.564293, | 1.442411, | 1.309369, | 1.163133, | 1.004666, |
| 3 | \$ | .832533, | .645076, | .445763, | .230402, | .000000, | 2.170820, |
| 3 | \$ | 2.164315, | 2.143935, | 2.111047, | 2.065933, | 2.003905, | 1.941145, |
| 3 | \$ | 1.862293, | 1.772563, | 1.672951, | 1.562037, | 1.440076, | 1.306720, |
| 3 | \$ | 1.160872, | 1.002435, | .830322, | .644755, | .444734, | .229370, |
| 3 | \$ | .000000, | 2.170320, | 2.164326, | 2.143356, | 2.111020, | 2.065910, |
| 3 | \$ | 2.008224, | 1.940130, | 1.850721, | 1.770317, | 1.670257, | 1.558742, |

```

3  $ 1.436419, 1.303074, 1.157231, .999171, .827838, .642567,
3  $ .443231, .229120, .000000, 2.170820, 2.164825, 2.144011,
3  $ 2.110983, 2.065571, 2.007289, 1.938823, 1.858512, 1.767043,
3  $ 1.666425, 1.554060, 1.431208, 1.297840, 1.151993, .994439,
3  $ .823833, .639381, .441110, .228067, .000000/
3C
3  DATA T4B2/ 2.170819, 2.164098, 2.143687, 2.110309, 2.064295,
3  $ 2.005964, 1.936141, 1.854948, 1.762840, 1.660457, 1.547481,
3  $ 1.424094, 1.290127, 1.144794, .987705, .818033, .635024,
3  $ .438071, .226540, .000000, 2.170818, 2.164806, 2.143849,
3  $ 2.110422, 2.064206, 2.004627, 1.934402, 1.851812, 1.757772,
3  $ 1.654704, 1.540039, 1.415545, 1.281500, 1.135869, .979508,
3  $ .811029, .629400, .434190, .224595, .000000, 2.170817,
3  $ 2.164608, 2.143686, 2.109968, 2.063200, 2.002971, 1.931453,
3  $ 1.847434, 1.751836, 1.646789, 1.530574, 1.404844, 1.270023,
3  $ 1.124503, .968880, .801829, .622193, .429281, .222137,
3  $ .000000, 2.170816, 2.163945, 2.143354, 2.109216, 2.061702,
3  $ 2.001097, 1.927777, 1.842216, 1.745099, 1.637202, 1.519244,
3  $ 1.391932, 1.255739, 1.110388, .955489, .790119, .613047,
3  $ .423046, .219010, .000000, 2.170815, 2.164878, 2.143572,
3  $ 2.109384, 2.061619, 1.999350, 1.925450, 1.837810, 1.737671,
3  $ 1.628260, 1.507046, 1.377197, 1.240026, 1.093524, .939374,
3  $ .775977, .601606, .414888, .214879, .000000/
3C
3  DATA T4B3/ 2.170814, 2.164347, 2.143280, 2.108681, 2.060168,
3  $ 1.997326, 1.921510, 1.831946, 1.729613, 1.616503, 1.492337,
3  $ 1.359565, 1.219798, 1.072601, .919024, .757839, .587115,
3  $ .405026, .209919, .000000, 2.170812, 2.164198, 2.143122,
3  $ 2.108206, 2.059072, 1.995349, 1.917902, 1.826204, 1.721113,
3  $ 1.604316, 1.476192, 1.339462, 1.196371, 1.047303, .893927,
3  $ .735197, .568763, .392173, .203410, .000000, 2.170811,
3  $ 2.164797, 2.143227, 2.108187, 2.058696, 1.993526, 1.915086,
3  $ 1.821011, 1.712356, 1.592315, 1.458899, 1.316856, 1.169561,
3  $ 1.016823, .863034, .706960, .545518, .375474, .194900,
3  $ .000000, 2.170809, 2.164094, 2.142888, 2.107423, 2.057178,
3  $ 1.991610, 1.911075, 1.814909, 1.703567, 1.578141, 1.439553,
3  $ 1.291027, 1.136420, .979244, .823818, .670430, .515493,
3  $ .354935, .184513, .000000, 2.170807, 2.164585, 2.142972,
3  $ 2.107393, 2.056834, 1.990022, 1.908513, 1.810066, 1.695079,
3  $ 1.565655, 1.420163, 1.263374, 1.100096, .934038, .775150,
3  $ .624343, .476731, .326596, .170005, .000000/
3C
3  DATA T4B4/ 2.170805, 2.164616, 2.142908, 2.107137, 2.056178,
3  $ 1.988573, 1.905844, 1.805380, 1.687196, 1.553012, 1.400355,
3  $ 1.233503, 1.057230, .878645, .712617, .563897, .426092,
3  $ .290954, .151878, .000000, 2.170804, 2.163904, 2.142599,
3  $ 2.106497, 2.054970, 1.987269, 1.902875, 1.800825, 1.680286,
3  $ 1.540537, 1.381154, 1.202803, 1.008545, .811488, .629457,
3  $ .482260, .359282, .245319, .128858, .000000, 2.170802,
3  $ 2.164764, 2.142853, 2.106823, 2.055320, 1.986490, 1.901954,
3  $ 1.798338, 1.674820, 1.532175, 1.365132, 1.175784, .959747,
3  $ .729965, .526280, .377719, .269795, .181745, .096658,
3  $ .000000, 2.170800, 2.164388, 2.142693, 2.106501, 2.054723,
3  $ 1.985861, 1.900494, 1.796024, 1.671037, 1.524901, 1.352314,
3  $ 1.151884, .913571, .639924, .368356, .220849, .155262,
3  $ .105409, .057354, .000000, 2.170798, 2.163829, 2.142488,
3  $ 2.106133, 2.054137, 1.985547, 1.899508, 1.794943, 1.668884,
3  $ 1.521450, 1.346740, 1.128583, .897988, .572877, .099774,
3  $ -.018436, .031183, .002476, -.000457, .000000/
3C
3C  INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3  CALL QUADRD(X,Y, TABLE, GRID, GRID, NGRID, NGRID, NGRDD, NGRDD, DERUSL)
3C
3  TRUE = DERUSL(6)
3C
3  RETURN
3  END
3  FUNCTION D(X)
3  D = 0.
3  IF (X .NE. 0.) D=1./X
3  RETURN
3  END
3  FUNCTION C(X)
3  C = 0.
3  IF (X .NE. 0.) C=1./X**2

```

```

5 RETURN
6 END
7 FUNCTION RCKX
8 X = 0.
9 IF (.LE. 80) N=1.
10 RETURN
11 END
12 FUNCTION RCKY
13 Y = 1.
14 IF (.LE. 80) D=0.
15 RETURN
16 END

```

```

*FOR

```

```

*****
* MACRO 52 *
*****

```

```

* 2000000200020
1 TWO DIMENSIONS 5 HOMOGENEOUS
1 RCK,YOUYS + RCK,YUYYS + RCK,YUXS +
1 RCK,YUYS - (8)U5 = 0.0
1 MIXED
2 U=0. , MIXED = (1.)U + (-1.)UX = 1.
2 U=1. , MIXED = (1.)U + ( 1.)UX = 1.
2 Y=0. , MIXED = (1.)U + (-1.)UY = 1.
2 Y=1. , MIXED = (1.)U + ( 1.)UY = 1.
10 FUNCTION TRUECK(Y)

```

```

300 *****
300 *
300 * MACRO 52 PARAMETERS
300 *
300 *****
300 *
300 *      A   I   B
300 *      ---I---
300 *      2   I   1
300 *      4   I   2
300 *      49  I   3
300 *
300 *****

```

```

30 REAL DERU5L(6), GRID(20), TABLE(20,20),
30 T131(100), T132(100), T133(100), T134(100),
30 T231(100), T232(100), T233(100), T234(100),
30 T331(100), T332(100), T333(100), T334(100)
30 EQUIVALENCE (TABLE(1, 1), T2331(1)),
30 (TABLE(1, 6), T2332(1)),
30 (TABLE(1,11), T2333(1)),
30 (TABLE(1,16), T2334(1))
30 DATA NSPID, I3200, GRID /20, 20, 0.000000, 0.0526316,
30 0.1152632, 0.1576347, 0.2105263, 0.2531579, 0.3157895,
30 0.3681211, 0.4210526, 0.4736812, 0.5263158, 0.5789474,
30 0.6315790, 0.6842105, 0.7368421, 0.7894737, 0.8421053,
30 0.8947368, 0.9473684, 1.0000000/

```

```

30 APPROXIMATE SOLUTION OF LINEARIZED PROBLEM USING
30 PO-C1 COLLOCATION (3 X 3 GRID)

```

```

30 DATA T131 /-2.265261,-2.477411,-2.674675,-2.833537,-3.100260,
30 -3.310304,-3.563240,-3.741104,-3.935439,-4.103518,-4.247266,
30 -4.352371,-4.415267,-4.422123,-4.402111,-4.321443,-4.193857,
30 -4.023550,-3.815701,-3.582330,-2.477411,-2.559357,-2.877542,
30 -3.007772,-3.226190,-3.557712,-3.783302,-4.005670,-4.208767,
30 -4.403230,-4.537250,-4.642305,-4.715580,-4.734307,-4.703236,
30 -4.619255,-4.431300,-4.204310,-4.035016,-3.833016,-2.674675,
30 -2.377542,-3.007121,-3.210554,-3.570631,-3.314999,-4.056496,
30 -4.203437,-4.503424,-4.632312,-4.251172,-4.933523,-5.041497,
30 -5.073772,-5.022120,-4.222120,-4.723625,-4.607137,-4.376274,
30 -5.110100,-5.335555,-5.007755,-5.150151,-3.574302,-3.829377,
30 -4.100712,-4.420113,-4.522120,-4.215007,-5.013332,-5.165777,
30 -5.071111,-5.004007,-5.415725,-4.701112,-5.255333,-5.135442,
30 -4.100111,-4.622120,-4.115112,-4.100112,-5.326173,-3.570675,
30 -4.100111,-4.622120,-4.115112,-4.100112,-4.301375,-5.143344,

```

3 \$-5.359355, -5.538342, -5.673801, -5.757983, -5.783297, -5.750050,
3 \$-5.652781, -5.494061, -5.285534, -5.026931, -4.735006/
3C
3 DATA T1B2/-3.319588, -3.557704, -3.814992, -4.087607, -4.371136,
3 \$-4.659276, -4.945238, -5.221158, -5.478167, -5.707150, -5.898626,
3 \$-6.043953, -6.134385, -6.164839, -6.130549, -6.029687, -5.865297,
3 \$-5.642867, -5.371350, -5.064797, -3.536238, -3.786231, -4.056465,
3 \$-4.343003, -4.641409, -4.945226, -5.247200, -5.539237, -5.811945,
3 \$-6.055999, -6.260448, -6.416966, -6.516584, -6.550719, -6.518987,
3 \$-6.415240, -6.242165, -6.012213, -5.725112, -5.399797, -3.744091,
3 \$-4.005609, -4.288457, -4.528698, -4.901821, -5.221142, -5.539232,
3 \$-5.847568, -6.136268, -6.395407, -6.613634, -6.781725, -6.890016,
3 \$-6.929951, -6.899629, -6.793538, -6.614476, -6.373268, -6.072755,
3 \$-5.731579, -3.936482, -4.208748, -4.503405, -4.816681, -5.143926,
3 \$-5.478153, -5.811935, -6.136262, -6.440792, -6.714804, -6.947114,
3 \$-7.126991, -7.243976, -7.290879, -7.261707, -7.153986, -6.970878,
3 \$-6.717139, -6.404841, -6.049837, -4.106496, -4.388683, -4.693715,
3 \$-5.018842, -5.359151, -5.707111, -6.055849, -6.395290, -6.714795,
3 \$-7.004259, -7.249851, -7.441904, -7.569564, -7.621950, -7.597948,
3 \$-7.489698, -7.299751, -7.041875, -6.715955, -6.343822/
3C
3 DATA T1B3/-4.247239, -4.537166, -4.851413, -5.186694, -5.538230,
3 \$-5.898587, -6.260363, -6.613568, -6.947099, -7.249844, -7.508522,
3 \$-7.711945, -7.848491, -7.908426, -7.887137, -7.779087, -7.587039,
3 \$-7.319862, -6.984879, -6.601692, -4.352339, -4.648452, -4.969551,
3 \$-5.312337, -5.673655, -6.043918, -6.416831, -6.781617, -7.126969,
3 \$-7.441813, -7.711902, -7.925710, -8.071085, -8.137910, -8.120494,
3 \$-8.013640, -7.820049, -7.547003, -7.204432, -6.811596, -4.415631,
3 \$-4.716214, -5.041344, -5.390302, -5.757608, -6.134592, -6.516233,
3 \$-6.889737, -7.243942, -7.569313, -7.848370, -8.071077, -8.225159,
3 \$-8.297419, -8.285615, -8.180966, -7.985598, -7.712056, -7.363217,
3 \$-6.961731, -4.433248, -4.734183, -5.061680, -5.412922, -5.783169,
3 \$-6.164781, -6.550599, -6.929851, -7.290843, -7.621865, -7.908378,
3 \$-8.137895, -8.297412, -8.376323, -8.367628, -8.265814, -8.073288,
3 \$-7.796413, -7.445463, -7.043072, -4.402068, -4.702805, -5.028218,
3 \$-5.379106, -5.749601, -6.130437, -6.518531, -6.899265, -7.261659,
3 \$-7.597524, -7.886929, -8.120401, -8.285385, -8.367567, -8.363758,
3 \$-8.265618, -8.074885, -7.801117, -7.451618, -7.047560/
3C
3 DATA T1B4/-4.321397, -4.617910, -4.938938, -5.285676, -5.652307,
3 \$-6.029568, -6.414758, -6.793152, -7.153933, -7.489248, -7.778864,
3 \$-8.013537, -8.180719, -8.265745, -8.265612, -8.171591, -7.985176,
3 \$-7.716002, -7.370826, -6.970863, -4.193810, -4.481816, -4.796561,
3 \$-5.135366, -5.493972, -5.865238, -6.242077, -6.614398, -6.970830,
3 \$-7.299675, -7.586987, -7.820012, -7.985555, -8.073266, -8.074875,
3 \$-7.985171, -7.806041, -7.541693, -7.205032, -6.814478, -4.022610,
3 \$-4.303958, -4.606906, -4.936086, -5.284853, -5.642713, -6.011492,
3 \$-6.372695, -6.717078, -7.041131, -7.319499, -7.546800, -7.711523,
3 \$-7.796268, -7.800902, -7.715782, -7.541672, -7.287505, -6.960953,
3 \$-6.581414, -3.815741, -4.084604, -4.376095, -4.691890, -5.026501,
3 \$-5.371237, -5.724659, -6.072391, -6.404786, -6.715491, -6.984646,
3 \$-7.204297, -7.362887, -7.446387, -7.451482, -7.370689, -7.205016,
3 \$-6.960951, -6.647758, -6.283551, -3.583633, -3.837966, -4.116637,
3 \$-4.416831, -4.734953, -5.054746, -5.399747, -5.731531, -6.049792,
3 \$-6.343780, -6.601654, -6.811564, -6.961704, -7.043052, -7.047545,
3 \$-6.970853, -6.814473, -6.581412, -6.283551, -5.937218/
3C
3 DATA T2B1/ .478933, .448750, .413085, .372015, .325851,
3 \$.275479, .221334, .166543, .111361, .058370, .009911,
3 \$ -.031690, -.064102, -.085586, -.094622, -.090432, -.073359,
3 \$ -.043993, -.004235, .043099, .448750, .417191, .379138,
3 \$.335726, .286911, .233106, .176590, .117718, .058754,
3 \$.002353, -.048907, -.093287, -.127655, -.150734, -.160524,
3 \$ -.156153, -.138052, -.107259, -.065052, -.014599, .413085,
3 \$.379139, .338633, .292047, .239587, .182074, .121051,
3 \$.057764, -.005507, -.066099, -.121836, -.169745, -.207118,
3 \$ -.232144, -.242893, -.238474, -.219272, -.186125, -.141026,
3 \$ -.087125, .372015, .335722, .292045, .241840, .185165,
3 \$.122577, .053652, -.012216, -.081321, -.147148, -.208247,
3 \$ -.269841, -.301842, -.329721, -.341994, -.337682, -.317244,
3 \$ -.231823, -.233080, -.174720, .325853, .286905, .239585,
3 \$.185165, .123530, .055251, -.016754, -.092230, -.168236,
3 \$ -.240467, -.307984, -.366265, -.411801, -.443187, -.457441,
3 \$ -.453449, -.431711, -.393647, -.340704, -.277178/
3C
3 DATA T2B2/ .275481, .233107, .182076, .122678, .055252,

3 \$ -.019057, -.098575, -.181433, -.264749, -.345255, -.419762,
3 \$ -.434474, -.535735, -.570941, -.587490, -.584053, -.561048,
3 \$ -.519418, -.462044, -.393094, -.221833, .173589, .121053,
3 \$.055359, -.016745, -.093573, -.165203, -.276559, -.369096,
3 \$ -.457380, -.540624, -.613044, -.670245, -.710644, -.730248,
3 \$ -.727640, -.703371, -.659146, -.596471, -.520838, .166548,
3 \$.117719, .057768, -.012209, -.092221, -.181430, -.276567,
3 \$ -.376376, -.478604, -.576497, -.668670, -.749294, -.813604,
3 \$ -.859284, -.882231, -.880751, -.855335, -.807546, -.739671,
3 \$ -.657482, .111367, .058760, -.005501, -.081314, -.168230,
3 \$ -.264744, -.369092, -.478602, -.589538, -.698110, -.799441,
3 \$ -.839575, -.960848, -1.012034, -1.038636, -1.038581, -1.012203,
3 \$ -.950462, -.887457, -.798765, .058377, .002879, -.066084,
3 \$ -.147116, -.240422, -.345242, -.457338, -.576464, -.698107,
3 \$ -.815491, -.927263, -1.025851, -1.105371, -1.163352, -1.194275,
3 \$ -1.195935, -1.168805, -1.114903, -1.036203, -.940054/

3C DATA T2B3/ .009920, -.048889, -.121823, -.208226, -.307957,
3 \$ -.419750, -.540593, -.658649, -.799436, -.927260, -1.048289,
3 \$ -1.155702, -1.243353, -1.307283, -1.342371, -1.345980, -1.318398,
3 \$ -1.251056, -1.177632, -1.075312, -.031679, -.093256, -.169727,
3 \$ -.260810, -.355224, -.484457, -.613001, -.749258, -.888666,
3 \$ -1.025829, -1.155637, -1.271499, -1.366755, -1.436631, -1.475942,
3 \$ -1.481651, -1.453930, -1.394011, -1.306258, -1.198151, -.064089,
3 \$ -.127585, -.207084, -.301774, -.411703, -.535708, -.670135,
3 \$ -.813515, -.960835, -1.105281, -1.243309, -1.365751, -1.468469,
3 \$ -1.544190, -1.587655, -1.595538, -1.567957, -1.506854, -1.415280,
3 \$ -1.301859, -.085572, -.150704, -.232123, -.329691, -.443149,
3 \$ -.570920, -.710603, -.859249, -1.012019, -1.163319, -1.307269,
3 \$ -1.436625, -1.544187, -1.624282, -1.671116, -1.681080, -1.654075,
3 \$ -1.591147, -1.437287, -1.380616, -.094606, -.160425, -.242852,
3 \$ -.341905, -.457313, -.587453, -.730096, -.882109, -1.038616,
3 \$ -1.194117, -1.342292, -1.475904, -1.587562, -1.671092, -1.720865,
3 \$ -1.732707, -1.706363, -1.643403, -1.548036, -1.428969/

3C DATA T2B4/ -.090415, -.158055, -.238425, -.337588, -.453314,
3 \$ -.584014, -.727479, -.880622, -1.038559, -1.195767, -1.345895,
3 \$ -1.481618, -1.595438, -1.681051, -1.732704, -1.745057, -1.720747,
3 \$ -1.658304, -1.562861, -1.443236, -.073341, -.138027, -.219250,
3 \$ -.317218, -.431681, -.561025, -.703338, -.855305, -1.012183,
3 \$ -1.168773, -1.318375, -1.453913, -1.567948, -1.654065, -1.706357,
3 \$ -1.720745, -1.695789, -1.635080, -1.541078, -1.422911, -.043975,
3 \$ -.107112, -.185057, -.281683, -.393448, -.519358, -.658904,
3 \$ -.807352, -.950437, -1.114624, -1.260919, -1.393928, -1.506649,
3 \$ -1.591087, -1.643312, -1.658212, -1.635070, -1.575540, -1.483884,
3 \$ -1.358325, -.004278, -.064950, -.140978, -.232392, -.340577,
3 \$ -.452005, -.595317, -.739546, -.887434, -1.035027, -1.177542,
3 \$ -1.306202, -1.415145, -1.497246, -1.547978, -1.552803, -1.541071,
3 \$ -1.483833, -1.395735, -1.284420, .043116, .014531, -.087106,
3 \$ -.174700, -.277158, -.393073, -.520818, -.657461, -.798745,
3 \$ -.940035, -1.075294, -1.193136, -1.301856, -1.380506, -1.428962,
3 \$ -1.443231, -1.422908, -1.368325, -1.284419, -1.178408/

3C DATA T3B1/ .126993, .075205, .017325, -.038118, -.080112,
3 \$ -.097453, -.079531, -.024216, .060504, .162810, .261036,
3 \$.332952, .359365, .342591, .287119, .212623, .143734,
3 \$.103549, .100115, .130245, .075205, .020373, -.042050,
3 \$ -.101852, -.147439, -.167279, -.149574, -.091639, -.002502,
3 \$.103916, .205778, .280741, .305633, .283781, .221892,
3 \$.140192, .065262, .022950, .020287, .053445, .017325,
3 \$ -.042050, -.110341, -.176784, -.228232, -.251777, -.234698,
3 \$ -.174545, -.031441, .029325, .134458, .205991, .223217,
3 \$.189114, .113010, .018683, -.054313, -.109534, -.109166,
3 \$ -.070020, -.033116, -.101831, -.176773, -.250301, -.308100,
3 \$ -.335122, -.319563, -.253733, -.159295, -.044530, .060156,
3 \$.125920, .130340, .077332, -.017064, -.127447, -.221919,
3 \$ -.258308, -.253312, -.216610, -.080108, -.147420, -.228263,
3 \$ -.308093, -.371130, -.402143, -.384534, -.317027, -.213899,
3 \$ -.095518, .007775, .064722, .051990, .023335, -.138976,
3 \$ -.255617, -.339370, -.415238, -.403400, -.343335/

3C DATA T3B2/ -.097453, -.167267, -.251763, -.333117, -.402140,
3 \$ -.432453, -.410539, -.335663, -.224230, -.101519, -.000451,
3 \$.045313, .012979, .033525, .219719, .357633, .461898,
3 \$.501704, .430710, .419235, .079575, .149416, .234638,
3 \$.310502, .234472, .410570, .331537, .295745, .174111,

```

3  $ -.045230, .053343, .089557, .040849, -.074972, -.221806,
3  $ -.359340, -.455223, -.432402, -.447939, -.331213, -.024211,
3  $ -.091514, -.174497, -.253573, -.315937, -.335648, -.295742,
3  $ -.197406, -.065352, .067300, .163109, .187597, .122775,
3  $ -.004551, -.150943, -.272313, -.341846, -.340935, -.288626,
3  $ -.220243, .060503, -.002494, -.081435, -.159287, -.213890,
3  $ -.224373, -.174106, -.065350, .073450, .206813, .293471,
3  $ .301633, .219434, .085174, -.048721, -.136533, -.160111,
3  $ -.115001, -.035935, .032232, .162811, .104116, .029897,
3  $ -.044440, -.065479, -.101490, -.045247, .067285, .206815,
3  $ .331725, .400547, .385739, .285505, .145475, .028720,
3  $ -.009277, .033593, .130024, .248837, .327546/
3C
3  DATA T333/ .261032, .206367, .134488, .060196, .007841,
3  $ -.000435, .053339, .163107, .293475, .400549, .443089,
3  $ .397749, .269392, .120930, .028570, .046584, .161454,
3  $ .333233, .495164, .581070, .332953, .280758, .205994,
3  $ .125918, .064725, .045324, .089512, .187555, .301687,
3  $ .386745, .397728, .315747, .153868, -.011971, -.090161,
3  $ -.024029, .158554, .401369, .614031, .713694, .359952,
3  $ .305744, .223233, .130337, .051993, .012984, .040670,
3  $ .122335, .219465, .286367, .269328, .153868, -.041887,
3  $ -.237410, -.321575, -.230112, .000162, .291385, .551835,
3  $ .675303, .342575, .283785, .189109, .077326, -.023385,
3  $ -.093522, -.075012, -.004580, .085177, .145441, .120914,
3  $ -.011972, -.237410, -.458370, -.561218, -.473735, -.231550,
3  $ .094315, .379556, .515872, .287103, .221900, .113007,
3  $ -.017075, -.139384, -.219716, -.221952, -.151058, -.048722,
3  $ .028594, .028555, -.090070, -.321295, -.561147, -.693219,
3  $ -.641933, -.432564, -.115902, .167791, .309678/
3C
3  DATA T334/ .212612, .140202, .018682, -.127456, -.265623,
3  $ -.337632, -.359594, -.272436, -.136537, -.009309, .046566,
3  $ -.023335, -.229817, -.473657, -.641928, -.650813, -.507641,
3  $ -.244456, .008817, .145796, .143724, .065254, -.064623,
3  $ -.221921, -.369367, -.461891, -.455236, -.341655, -.160116,
3  $ .033585, .161442, .158656, .000188, -.231535, -.432552,
3  $ -.507633, -.443508, -.257927, -.054149, .068162, .103541,
3  $ .023023, -.109489, -.268428, -.415111, -.501757, -.482510,
3  $ -.341024, -.115011, .129941, .333186, .401493, .291788,
3  $ .094426, -.115635, -.244178, -.257895, -.136802, .005410,
3  $ .097410, .100109, .020356, -.109138, -.263262, -.403320,
3  $ -.480591, -.448032, -.288581, -.035947, .248778, .496127,
3  $ .614100, .552076, .379730, .167952, .008997, -.054118,
3  $ .005418, .104593, .179123, .130242, .053441, -.070020,
3  $ -.216606, -.348329, -.419277, -.381208, -.220246, .032221,
3  $ .327529, .581051, .713681, .675303, .515886, .309701,
3  $ .145820, .063182, .097421, .179127, .247236/
3C
3C  INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
3C
3  CALL QUADRD(X,Y,TABLE,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
3C
3  TRUE = DERUSL(S)
3C
3  RETURN
3  END
3  FUNCTION W(NDERU,X,Y)
3C
3  REAL DERUSL(6), GRID(9), TAB(9,9)
3  DATA NGRID, NGRDD, GRID /9, 9, 0., 0.125, 0.250,
3  0.375, 0.500, 0.625, 0.750, 0.875, 1.00/
3C
3C  APPROXIMATE SOLUTION OF NONLINEAR PROBLEM FOR NONLINEAR
3C  COLLOCATION
3C
3  DATA TAB/ -.349260, -1.033350, -1.342400, -1.591250, -1.813110,
3  0-1.076340, -2.044540, -1.975450, -1.731410, -1.089850, -1.362380,
3  0-1.646620, -1.933770, -2.133220, -2.377630, -2.458420, -2.382970,
3  0-2.103230, -1.342330, -1.640610, -1.976700, -2.303520, -2.599760,
3  0-2.224320, -2.225530, -2.342330, -2.523770, -1.591240, -1.933760,
3  0-2.303510, -2.377630, -3.022320, -3.233330, -3.420340, -3.346720,
3  0-3.001420, -1.810030, -2.123300, -2.593750, -3.022510, -3.418130,
3  0-3.722750, -3.392250, -3.831490, -3.454220, -1.976310, -2.377650,
3  0-2.224300, -3.233330, -3.732740, -4.022330, -4.252380, -4.239560,
3  0-3.037550, -2.044510, -2.453330, -2.926340, -3.420510, -3.897240,

```

```

3      3-4.292370,-4.522430,-4.434770,-4.071720,-1.975430,-2.382940,
3      3-2.349220,-3.345530,-3.301450,-4.223540,-4.434730,-4.461540,
3      3-4.055220,-1.731370,-2.195340,-2.523740,-3.001330,-3.454290,
3      3-3.337930,-4.071710,-4.955220,-3.553550/
30
31      INTERPOLATE NONLINEAR SOLUTION BY QUADRATICS
32
33      CALL QUADRD(X,Y,TAB,GRID,GRID,NGRID,NGRID,NGRDD,NGRDD,DERUSL)
34
35      H = DERUSL(NDERV)
36
37      RETURN
38      END
39      FUNCTION R(X,Y)
39      R = 11./(1. + 10.*W(6,X,Y))
39      RETURN
39      END
39      FUNCTION R1(X,Y)
39      R1 = -110./(1.+10.*W(6,X,Y))*2*W(4,X,Y)
39      RETURN
39      END
39      FUNCTION R2(X,Y)
39      R2 = -110./(1.+10.*W(6,X,Y))*2*W(5,X,Y)
39      RETURN
39      END

```

*EOR

* MACRO 53 *

```

3      2000021002000
3      TWO DIMENSIONS 5 CONSTANT COEFFICIENTS
3      UXK5 + UYK5 - (&A)US = F(X,Y)
3      DIRICHLET
3      X=0. , U=TRUE(X,Y)
3      X=1. , U=TRUE(X,Y)
3      Y=0. , U=TRUE(X,Y)
3      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      TRUE = COS(&B*Y)+SIN(&B*(X-Y))
3      RETURN
3      END
3      FUNCTION F(X,Y)
3      BXY = &B*(X-Y)
3      B2 = (&B)*(&B)
3      UXK = -B2*SIN(BXY)
3      U = COS(&B*Y)+SIN(BXY)
3      UYK = -B2*U
3      F = UXK + UYK - (&A)*U
3      RETURN
3      END

```

*EOR

* MACRO 54 *

```

3      2000000002000
3      TWO DIMENSIONS
3      (1.*X*X)UXK5 + (1.+A(Y))*2*UYK5 + (2.*X)UX5 +
3      (15.*Y*A(Y))UY5 - (1.+(3.*Y-X-4.))*2*US = F(X,Y)
3      DIRICHLET
3      X=0. , U=TRUE(X,Y)
3      X=1. , U=TRUE(X,Y)
3      Y=0. , U=TRUE(X,Y)
3      Y=1. , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      A(Y)=A(Y)
3      P = PHAX1(0.,(3.-X/A(Y))*3)
3      S = PHAX1(0.,X/A(Y))
3      T = 0.
3      IF (3.05.02) T = EXP(-P/3)
3      S = 2.23*(X-A(Y))*2/A(Y)**3
3      H = 1./1. + (3.*Y-X-4.))*2)
3      TRUE = 6*(1.-T) * H
3      RETURN
3      END

```

```

3 FUNCTION A(Y)
3 A = 4.*Y*Y + (.1A)
3 RETURN
3 END
3 FUNCTION F(X,Y)
3 A0Y = A(Y)
3 A1Y = 3.*Y
3 A2Y = 3.
3 GN = X*(X-A0Y)**2
3 GNX = 3.*X**2 - 4.*X*A0Y + A0Y**2
3 GNXX = 6.*X - 4.*A0Y
3 GNY = 2.*X*(A0Y-X)*A1Y
3 GNYX = 2.*X*A1Y**2 + 2.*X*(A0Y-X)*A2Y
3 GD = A0Y**3
3 GDY = 3.*A0Y**2*A1Y
3 GDYY = 3.*(2.*A0Y*A1Y**2 + A0Y**2*A2Y)
3 G = 2.25*GN/GD
3 GX = 2.25*GNX/GD
3 GXX = 2.25*GNXX/GD
3 GY = 2.25*(GD*GNY-GN*GDY)/GD**2
3 GYY = 2.25*((GD*GNYX-GN*GDYY)/GD**2
3 + 2.*(GN*GDY-GD*GNY)*GDY/GD**3)
3 HD = 1. + (3.*Y-X-4.)*2
3 HDX = -2.*(3.*Y-X-4.)
3 HDXX = 2.
3 HDY = 16.*(3.*Y-X-4.)
3 HDYY = 123.
3 H = 1./HD
3 HX = -HDX/HD**2
3 HXX = (-HDXX + 2.*HDX*HDX/HD)/(HD*HD)
3 HY = -HDY/HD**2
3 HYY = (-HDYY + 2.*HDY*HDY/HD)/(HD*HD)
3 T = 0.
3 TX = 0.
3 TXX = 0.
3 TY = 0.
3 TYY = 0.
3 S = AMAX1(0.,X-A0Y)
3 IF (S .LT. .02) GO TO 10
3 R = AMAX1(0.,(3.-X/A0Y)**3)
3 T = 1.0
3 IF (R .EQ. 0.0) GO TO 10
3 S2 = S*S
3 S3 = S2*S
3 SX = 1.
3 SXX = 0.
3 SY = -A1Y
3 SYX = -A2Y
3 RX = -3.*(3.-X/A0Y)**2/A0Y
3 RXX = 6.*(3.-X/A0Y)/A0Y**2
3 RY = 3.*(3.-X/A0Y)**2*X*A1Y/A0Y**2
3 RYY = 6.*(3.-X/A0Y)*(X*A1Y/A0Y**2)**2 +
3 S 3.*X*(3.-X/A0Y)**2*(A2Y-2.*A1Y**2/A0Y)/A0Y**2
3 Q = R/S
3 QX = (RX-Q)/S
3 QXX = RXX/S + 2.*(R-S*RX)/S3
3 QY = (RY-Q*SY)/S
3 QYY = (S*RYX-R*SYX)/S2 + 2.*(R*SY-S*RY)*SY/S3
3 T = EXP(-Q)
3 TX = -QX*T
3 TXX = (QX*QX - QXX)*T
3 TY = -QY*T
3 TYY = (QY*QY - QYY)*T
3 10 U = G*(1.-T) + H
3 UX = GX*(1.-T) - G*TX + HX
3 UXX = GXX*(1.-T) - 2.*SX*TX - G*TXX + HXX
3 UY = GY*(1.-T) - G*TY + HY
3 UYY = GYY*(1.-T) - 2.*SY*TY - G*TYY + HYY
3 F1 = (1.-X**2)*UXX
3 F2 = 2.*X*UX
3 F3 = (1.-A0Y**2)*UYY
3 F4 = 2.*A0Y*A1Y*UY
3 F5 = HD*U
3 F = F1 + F2 + F3 + F4 - F5
3 RETURN
3 END

```

```

3 FUNCTION CDXU(X)
3 CDXU = 2.*X
3 RETURN
3 END
3 FUNCTION CDYU(Y)
3 CDYU = 16.*Y*A(Y)
3 RETURN
3 END

```

*EOR

* MACRO 55 *

```

* 2022021200220
1 TWO DIMENSIONS $ CONSTANT COEFFICIENTS $ HOMOGENEOUS
1. POISSON $ LAPLACE
1. UXX$ + UYY$ = 0.
2 MIXED
2 X=0. , UX = 0.
2 X=6. , U = F(Y)
2 Y=0. , MIXED = (A(X))U + (B(X))UY = G(X)
2 Y=1. , MIXED = (C(X))U + (D(X))UY = H(X)
3 FUNCTION TRUE(X,Y)
3C
3C *****
3C *
3C * MACRO 55 PARAMETERS *
3C *
3C *****
3C *
3C * A I B I C I D *
3C * -----I-----I-----I----- *
3C * 1 I 3 I 1 I 1 *
3C * I I I I *
3C * 3 I 2 I 1 I 2 *
3C * I I I I *
3C * 1 I 3 I 2 I 3 *
3C * I I I I *
3C * 6 I 2 I 2 I 4 *
3C *
3C *****
3C

```

```

3C
3C *****
3C *
3C * MACRO 55 PARAMETERS *
3C *
3C *****
3C *
3C * A I B I C I D *
3C * -----I-----I-----I----- *
3C * 1 I 3 I 1 I 1 *
3C * I I I I *
3C * 3 I 2 I 1 I 2 *
3C * I I I I *
3C * 1 I 3 I 2 I 3 *
3C * I I I I *
3C * 6 I 2 I 2 I 4 *
3C *
3C *****
3C

```

```

3 REAL DERUSL(6), TABLE(20,20), GRIDX(20), GRIDY(20),
3 $ T1B1(100), T1B2(100), T1B3(100), T1B4(100),
3 $ T2B1(100), T2B2(100), T2B3(100), T2B4(100),
3 $ T3B1(100), T3B2(100), T3B3(100), T3B4(100),
3 $ T4B1(100), T4B2(100), T4B3(100), T4B4(100)
3 EQUIVALENCE (TABLE(1, 1), T&DB1(1)),
3 $ (TABLE(1, 6), T&DB2(1)),
3 $ (TABLE(1,11), T&DB3(1)),
3 $ (TABLE(1,16), T&DB4(1))
3 DATA NGRID, NGRDD/20, 20/
3 DATA GRIDX/0.0000000, 0.3157895, 0.6315789, 0.9473684,
3 $1.2631579, 1.5789474, 1.8947368, 2.2105263, 2.5263153,
3 $2.8421053, 3.1578947, 3.4736842, 3.7894737, 4.1052632,
3 $4.4210526, 4.7368421, 5.0526316, 5.3684211, 5.6842105,
3 $5.0000000/
3 DATA GRIDY/0.0000000, 0.0526316, 0.1052632, 0.1578947,
3 $0.2105263, 0.2631579, 0.3157895, 0.3684211, 0.4210526,
3 $0.4736842, 0.5263153, 0.5789474, 0.6315789, 0.6842105,
3 $0.7368421, 0.7894737, 0.8421053, 0.8947368, 0.9473684,
3 $1.0000000/
3C
3C APPROXIMATE SOLUTION OF PROBLEM USING
3C P3-C1 COLLOCATION (8 X 8 GRID)
3C

```

```

3 DATA T1B1/ 1.000000, 1.003667, .963521, .420922, .084411,
3 $ .035373, -.003856, -.015701, -.009375, -.002313, .008574,
3 $ .024493, .047173, .031810, .135551, .224512, .335447,
3 $ .574550, .825183, .193533, .893518, .901037, .853587,
3 $ .393040, .090743, .037577, .000429, -.012505, -.007912,
3 $ -.001690, .009149, .024776, .047193, .031694, .135738,
3 $ .222411, .333273, .557131, .801939, .359473, .853182,
3 $ .355271, .773575, .400049, .123393, .043542, .006698,
3 $ -.007849, -.005275, -.005533, .003540, .024355, .046719,
3 $ .031055, .134750, .217438, .342537, .549524, .762227,

```

| | | | | | | | |
|----|----|------------|----------|-----------|-----------|-----------|-----------|
| 3 | \$ | .679519. | .801162. | .300456. | .709509. | .387042. | .144879. |
| 3 | \$ | .052702. | .011476. | -.004313. | -.004395. | .000392. | .010016. |
| 3 | \$ | .024734. | .045114. | .079303. | .132392. | .213548. | .342696. |
| 3 | \$ | .535720. | .752533. | .931028. | .744500. | .735089. | .643791. |
| 3 | \$ | .333742. | .143713. | .053616. | .014893. | -.001739. | -.003249. |
| 3 | \$ | .001201. | .010233. | .024401. | .045225. | .078218. | .130098. |
| 3 | \$ | .209415. | .339227. | .524903. | .750932. | 1.120886/ | |
| 3C | | | | | | | |
| 3 | | DATA T132/ | .691121. | .676556. | .585052. | .351887. | .159677. |
| 3 | \$ | .031201. | .017742. | .000503. | -.001945. | .001772. | .010264. |
| 3 | \$ | .023329. | .043383. | .075358. | .126165. | .203839. | .333255. |
| 3 | \$ | .514169. | .773032. | 1.279803. | .635654. | .615692. | .531081. |
| 3 | \$ | .327599. | .154833. | .062477. | .019806. | .002285. | -.000822. |
| 3 | \$ | .002375. | .010237. | .023138. | .042455. | .073257. | .121987. |
| 3 | \$ | .197891. | .324684. | .504710. | .787854. | 1.394511. | .583002. |
| 3 | \$ | .553305. | .480451. | .305067. | .151547. | .063126. | .021175. |
| 3 | \$ | .003532. | .000118. | .002759. | .010037. | .022211. | .040570. |
| 3 | \$ | .070012. | .116545. | .190069. | .313769. | .492449. | .798221. |
| 3 | \$ | 1.474932. | .530252. | .509554. | .432747. | .283433. | .148548. |
| 3 | \$ | .032931. | .021359. | .004730. | .000874. | .002973. | .009690. |
| 3 | \$ | .021030. | .033318. | .065273. | .110358. | .180840. | .300630. |
| 3 | \$ | .477234. | .801975. | 1.525152. | .478274. | .458862. | .388035. |
| 3 | \$ | .255307. | .135461. | .060391. | .021829. | .005311. | .001444. |
| 3 | \$ | .003203. | .009234. | .013371. | .035070. | .052150. | .104069. |
| 3 | \$ | .171114. | .265418. | .461522. | .738957. | 1.548161/ | |
| 3C | | | | | | | |
| 3 | | DATA T133/ | .427264. | .408292. | .344767. | .232561. | .127787. |
| 3 | \$ | .057555. | .021435. | .005803. | .001848. | .003221. | .008719. |
| 3 | \$ | .018410. | .033232. | .057531. | .096368. | .159404. | .268094. |
| 3 | \$ | .439230. | .784433. | 1.548305. | .377170. | .359428. | .303185. |
| 3 | \$ | .207574. | .116843. | .053516. | .020433. | .005902. | .002086. |
| 3 | \$ | .003148. | .008054. | .016821. | .030347. | .052530. | .088189. |
| 3 | \$ | .146711. | .243916. | .413428. | .759381. | 1.528924. | .327949. |
| 3 | \$ | .312441. | .263089. | .180935. | .102626. | .043458. | .018712. |
| 3 | \$ | .005576. | .002171. | .003015. | .007308. | .015139. | .027323. |
| 3 | \$ | .047192. | .079746. | .133253. | .227699. | .384181. | .723145. |
| 3 | \$ | 1.493296. | .279529. | .265585. | .223708. | .156100. | .090615. |
| 3 | \$ | .043055. | .017082. | .005420. | .002131. | .002752. | .006455. |
| 3 | \$ | .013245. | .023834. | .041451. | .070033. | .117935. | .204819. |
| 3 | \$ | .347194. | .672061. | 1.444266. | .231817. | .220165. | .185339. |
| 3 | \$ | .129589. | .075490. | .036645. | .014486. | .004591. | .001962. |
| 3 | \$ | .002426. | .005529. | .011323. | .020400. | .035466. | .060449. |
| 3 | \$ | .102122. | .180487. | .307413. | .507928. | 1.384541/ | |
| 3C | | | | | | | |
| 3 | | DATA T134/ | .184712. | .175359. | .147577. | .103505. | .060616. |
| 3 | \$ | .029854. | .011863. | .003814. | .001697. | .002036. | .004537. |
| 3 | \$ | .009230. | .016595. | .029188. | .050189. | .034775. | .154888. |
| 3 | \$ | .251757. | .527022. | 1.316522. | .139097. | .130873. | .110217. |
| 3 | \$ | .078277. | .045749. | .022887. | .003412. | .003214. | .001360. |
| 3 | \$ | .001533. | .003485. | .007127. | .012650. | .022632. | .039263. |
| 3 | \$ | .035445. | .123333. | .210137. | .426129. | 1.242253. | .091856. |
| 3 | \$ | .037003. | .073283. | .051189. | .029749. | .015170. | .005793. |
| 3 | \$ | .001745. | .000943. | .001077. | .002372. | .005048. | .008746. |
| 3 | \$ | .015933. | .023951. | .044923. | .101410. | .155508. | .303585. |
| 3 | \$ | 1.163707. | .045335. | .043435. | .036535. | .025492. | .014754. |
| 3 | \$ | .007506. | .002359. | .000843. | .000503. | .000553. | .001222. |
| 3 | \$ | .002824. | .004336. | .008967. | .018440. | .021335. | .074371. |
| 3 | \$ | .053313. | .153543. | 1.082479. | .000000. | .000000. | .000000. |
| 3 | \$ | .000001. | .000000. | .000002. | .000005. | -.000004. | .000052. |
| 3 | \$ | .000003. | .000015. | .000903. | -.000335. | .001713. | .008657. |
| 3 | \$ | -.005035. | .047770. | .042140. | -.031332. | 1.000000/ | |
| 3C | | | | | | | |
| 3 | | DATA T231/ | .037037. | .037035. | .037042. | .037095. | .037003. |
| 3 | \$ | .037222. | .037454. | .035537. | .041350. | .037931. | .017225. |
| 3 | \$ | .017017. | .063075. | .057847. | .114554. | .191354. | .286786. |
| 3 | \$ | .492011. | .707037. | .171054. | .035093. | .035179. | .035128. |
| 3 | \$ | .035185. | .035190. | .035225. | .035523. | .035414. | .038499. |
| 3 | \$ | .035624. | .019012. | .012313. | .032331. | .033133. | .114894. |
| 3 | \$ | .139342. | .835247. | .465670. | .537150. | .303031. | .033143. |
| 3 | \$ | .032174. | .003122. | .003165. | .032217. | .033325. | .033563. |
| 3 | \$ | .033700. | .035720. | .002222. | .012535. | .020395. | .038405. |
| 3 | \$ | .037717. | .114153. | .165424. | .232504. | .470552. | .653094. |
| 3 | \$ | .532330. | .031193. | .031255. | .031213. | .031243. | .031292. |
| 3 | \$ | .031373. | .031504. | .031803. | .032217. | .023755. | .015091. |
| 3 | \$ | .021323. | .003127. | .003033. | .112055. | .132111. | .297102. |
| 3 | \$ | .453773. | .344353. | .257059. | .052245. | .052377. | .029277. |

[illegible]

| | | | | | | |
|---|------------|-----------|-----------|-----------|-----------|-----------|
| 3 | DATA T332/ | .728521, | .725022, | .635409, | .563257, | .490063, |
| 3 | \$ | .439240, | .513241, | .557235, | .502179, | .649372, |
| 3 | \$ | .745025, | .795045, | .844315, | .834459, | .944033, |
| 3 | \$ | 1.033433, | 1.069930, | 1.279303, | .578523, | .676251, |
| 3 | \$ | .549059, | .492333, | .435512, | .524344, | .561502, |
| 3 | \$ | .651833, | .693541, | .745743, | .795560, | .844727, |
| 3 | \$ | .945915, | 1.001241, | 1.042706, | 1.036208, | 1.394511, |
| 3 | \$ | .626107, | .600373, | .536070, | .497445, | .501934, |
| 3 | \$ | .554537, | .606101, | .652520, | .633997, | .743944, |
| 3 | \$ | .844635, | .895323, | .945913, | 1.002076, | 1.045757, |
| 3 | \$ | 1.474932, | .573899, | .576160, | .569576, | .523659, |
| 3 | \$ | .508034, | .532215, | .565319, | .607912, | .652459, |
| 3 | \$ | .746317, | .795277, | .844351, | .894030, | .944845, |
| 3 | \$ | 1.043169, | 1.140332, | 1.525152, | .529037, | .528689, |
| 3 | \$ | .506573, | .500610, | .512508, | .537772, | .570767, |
| 3 | \$ | .655227, | .700393, | .747743, | .797290, | .844809, |
| 3 | \$ | .946744, | 1.002657, | 1.054393, | 1.158573, | 1.548161/ |

| | | | | | | |
|----|------------|-----------|-----------|-----------|-----------|-----------|
| 3C | DATA T333/ | .479250, | .479565, | .482538, | .492438, | .502985, |
| 3 | \$ | .517597, | .540877, | .572832, | .611282, | .655203, |
| 3 | \$ | .747656, | .793353, | .844519, | .894575, | .945598, |
| 3 | \$ | 1.056993, | 1.169097, | 1.548305, | .429501, | .430858, |
| 3 | \$ | .477478, | .504019, | .522104, | .544280, | .575149, |
| 3 | \$ | .655817, | .700839, | .747820, | .795159, | .844398, |
| 3 | \$ | .945031, | 1.001697, | 1.059347, | 1.174913, | 1.528924, |
| 3 | \$ | .382393, | .403316, | .461130, | .502948, | .526040, |
| 3 | \$ | .578136, | .614192, | .657744, | .701799, | .743449, |
| 3 | \$ | .844628, | .895058, | .945775, | 1.000858, | 1.062770, |
| 3 | \$ | 1.493295, | .330180, | .332069, | .361638, | .448532, |
| 3 | \$ | .530523, | .559570, | .579407, | .615425, | .657179, |
| 3 | \$ | .748173, | .793107, | .844192, | .893519, | .943346, |
| 3 | \$ | 1.061463, | 1.172130, | 1.444265, | .230770, | .281354, |
| 3 | \$ | .433451, | .508280, | .534308, | .554118, | .581893, |
| 3 | \$ | .658716, | .702357, | .748573, | .797130, | .844327, |
| 3 | \$ | .944150, | .997884, | 1.062655, | 1.165017, | 1.384541/ |

| | | | | | | |
|----|------------|-----------|-----------|-----------|-----------|-----------|
| 3C | DATA T334/ | .231759, | .228998, | .271615, | .421767, | .514185, |
| 3 | \$ | .538402, | .556710, | .593592, | .617504, | .659321, |
| 3 | \$ | .748829, | .797220, | .844216, | .893893, | .943491, |
| 3 | \$ | 1.061550, | 1.156720, | 1.316522, | .183565, | .174313, |
| 3 | \$ | .414915, | .527255, | .542941, | .557938, | .584305, |
| 3 | \$ | .658471, | .702303, | .748453, | .795813, | .843722, |
| 3 | \$ | .941339, | .993342, | 1.057515, | 1.145287, | 1.242253, |
| 3 | \$ | .117594, | .164840, | .403226, | .532188, | .545155, |
| 3 | \$ | .585512, | .618827, | .660350, | .703191, | .749082, |
| 3 | \$ | .843939, | .893412, | .942487, | .990676, | 1.058095, |
| 3 | \$ | 1.163707, | .091935, | .057597, | .101374, | .403775, |
| 3 | \$ | .548491, | .562382, | .597606, | .619090, | .653955, |
| 3 | \$ | .748843, | .796779, | .843544, | .892211, | .941399, |
| 3 | \$ | 1.053941, | 1.130518, | 1.082479, | .050736, | -.006350, |
| 3 | \$ | .411528, | .533934, | .559513, | .593540, | .523716, |
| 3 | \$ | .659175, | .702642, | .743417, | .795595, | .843219, |
| 3 | \$ | .940470, | .983573, | 1.043731, | 1.128374, | 1.000000/ |

| | | | | | | |
|----|------------|-----------|-----------|------------|-----------|------------|
| 3C | DATA T431/ | .004630, | .004630, | .004630, | .004631, | .004629, |
| 3 | \$ | .004635, | .004642, | .004620, | .004754, | .004949, |
| 3 | \$ | .003733, | .003712, | .003700, | .025193, | -.010492, |
| 3 | \$ | .104731, | -.069799, | 2.330075, | .004325, | .004397, |
| 3 | \$ | .004335, | .004401, | .004404, | .004435, | .004473, |
| 3 | \$ | .004923, | .005653, | .003039, | .011595, | .023434, |
| 3 | \$ | .109370, | .233339, | .630533, | 1.533083, | 4.233993, |
| 3 | \$ | .004147, | .004145, | .004149, | .004155, | .004172, |
| 3 | \$ | .004293, | .004553, | .005031, | .005337, | .010163, |
| 3 | \$ | .003749, | .034759, | .175914, | .505514, | 1.025011, |
| 3 | \$ | 3.103794, | .003900, | .003305, | .003303, | .003903, |
| 3 | \$ | .003940, | .003934, | .004119, | .004477, | .005130, |
| 3 | \$ | .012042, | .020933, | .050330, | .112552, | .245553, |
| 3 | \$ | 1.355242, | 3.545549, | 11.102243, | .022555, | .003934, |
| 3 | \$ | .003633, | .003331, | .003707, | .003773, | .003937, |
| 3 | \$ | .005223, | .007679, | .013750, | .025537, | .032132, |
| 3 | \$ | .316031, | .333437, | 1.723185, | 4.533099, | 13.337451/ |

| | | | | | | |
|----|------------|-----------|-----------|------------|----------|----------|
| 3C | DATA T432/ | .003413, | .003414, | .003415, | .003422, | .003435, |
| 3 | \$ | .003472, | .003540, | .003742, | .004235, | .005273, |
| 3 | \$ | .015374, | .020597, | .072503, | .155031, | .377910, |
| 3 | \$ | 2.157031, | 5.455319, | 15.222531, | .003163, | .003176, |

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3      $ .003183, .003199, .003237, .003327, .003545, .004136,
3      $ .005283, .008585, .016550, .032337, .081578, .185377,
3      $ .430161, 1.137276, 2.467190, 5.235548, 15.630641, .002926,
3      $ .002931, .002931, .002939, .002957, .002999, .003097,
3      $ .003337, .003985, .005245, .008363, .017708, .035597,
3      $ .088740, .202862, .473275, 1.235212, 2.734299, 6.861943,
3      $17.590091, .002582, .002683, .002685, .002694, .002711,
3      $ .002760, .002851, .003118, .003811, .005160, .009009,
3      $ .018462, .037624, .094030, .216552, .506057, 1.306782,
3      $ 2.945232, 7.332422, 18.188644, .002439, .002445, .002444,
3      $ .002454, .002473, .002520, .002629, .002894, .003612,
3      $ .005015, .009014, .018820, .038742, .097273, .224356,
3      $ .526382, 1.350436, 3.076588, 7.631748, 18.463038/
3C
3      DATA T4B3/ .002195, .002198, .002200, .002209, .002227,
3      $ .002277, .002385, .002556, .003387, .004813, .008874,
3      $ .018838, .039129, .098467, .227774, .535593, 1.366356,
3      $ 3.137190, 7.762745, 18.464763, .001951, .001953, .001956,
3      $ .001954, .001982, .002033, .002140, .002409, .003136,
3      $ .004556, .003589, .018491, .038729, .097578, .226327,
3      $ .533144, 1.354719, 3.123691, 7.722816, 18.233629, .001708,
3      $ .001712, .001713, .001721, .001740, .001787, .001893,
3      $ .002154, .002858, .004246, .008161, .017774, .037522,
3      $ .094614, .219869, .518734, 1.316257, 3.033276, 7.508407,
3      $17.808733, .001464, .001465, .001468, .001476, .001492,
3      $ .001539, .001638, .001885, .002555, .003865, .007583,
3      $ .016686, .035398, .089637, .207883, .490979, 1.253101,
3      $ 2.853377, 7.103634, 17.224007, .001220, .001222, .001224,
3      $ .001231, .001247, .001290, .001382, .001610, .002229,
3      $ .003448, .006875, .015346, .032579, .082805, .192798,
3      $ .451440, 1.167923, 2.611325, 6.514965, 16.511740/
3C
3      DATA T4B4/ .000976, .000978, .000980, .000985, .001000,
3      $ .001039, .001122, .001323, .001885, .002963, .006020,
3      $ .013756, .028730, .074168, .173415, .396494, 1.064147,
3      $ 2.289928, 5.712786, 15.700562, .000732, .000733, .000735,
3      $ .000741, .000751, .000786, .000856, .001022, .001532,
3      $ .002398, .004994, .012100, .023562, .063768, .151100,
3      $ .322304, .946691, 1.894989, 4.664329, 14.814844, .000489,
3      $ .000489, .000490, .000496, .000502, .000533, .000581,
3      $ .000705, .001181, .001771, .003784, .010664, .017029,
3      $ .051712, .129230, .226529, .320912, 1.448766, 3.344271,
3      $13.878120, .000245, .000244, .000245, .000251, .000251,
3      $ .000280, .000324, .000357, .000861, .001025, .002256,
3      $ .009950, .008112, .037533, .111326, .099028, .693067,
3      $ .976338, 1.695291, 12.909414, .000001, .000000, .000001,
3      $ .000008, -.000005, .000027, .000060, -.000050, .000622,
3      $ .000096, .000182, .010843, -.004507, .020433, .103236,
3      $ -.075919, .569691, .502551, -.373554, 11.925789/
3C
3C      INTERPOLATE NUMERICAL SOLUTION BY QUADRATICS
3C
3      CALL QUADRD(X,Y, TABLE, GRIDX, GRIDY, NSRID, NSRID, NGRDD, NGRDD,
3      $      DERUSL)
3C
3      TRUE = DERUSL(6)
3C
3      RETURN
3      END
3      FUNCTION F(Y)
3      DATA BREAK, PI2/&A, 1.570796327/
3      F = EXP(PI2*(BREAK-Y))*SIN(PI2*Y)/&A**3
3      RETURN
3      END
3      FUNCTION A(X)
3      DATA BREAK/&A/
3      A = 1.
3      IF (X .GE. BREAK) A=0.
3      RETURN
3      END
3      FUNCTION B(X)
3      DATA BREAK/&A/
3      B = 0.
3      IF (X .GE. BREAK) B=1.
3      RETURN
3      END

```

```

3 FUNCTION C(X)
3 DATA BREAK,KASE/&A,&C/
3 C = 1.
3 IF (KASE .EQ. 2 .AND. X .GE. BREAK) C=0.
3 RETURN
3 END
3 FUNCTION D(X)
3 DATA BREAK,KASE/&A,&C/
3 D = 0.
3 IF (KASE .EQ. 2 .AND. X .GE. BREAK) D=1.
3 RETURN
3 END
3 FUNCTION G(X)
3 DATA BREAK,DECAY0/&A,2./
3 G = 1./&A**3
3 IF (X .GE. BREAK) G=G*EXP(DECAY0*(BREAK-X))
3 RETURN
3 END
3 FUNCTION H(X)
3 DATA BREAK,KASE,DECAY1/&A,&C,&B/
3 H = 0.
3 IF (KASE .EQ. 1) RETURN
3 IF (X .GE. BREAK) H=EXP(DECAY1*(BREAK-X))/&A**3
3 RETURN
3 END

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*EOR

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* MACRO SS *

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*      2000200202000
1      TWO DIMENSIONS $ HOMOGENEOUS
1      UXX$ + C(X)UYYS + D(X)UX$ = 0.
2      DIRICHLET
2      X=0. ,          U=TRUE(X,Y)
2      X=1. ,          U=TRUE(X,Y)
2      Y=0. ,          U=TRUE(X,Y)
2      Y=6.28318530718 , U=TRUE(X,Y)
3      FUNCTION TRUE(X,Y)
3      DIMENSION ALPHA(8), W(4), Z(4)
3      DATA ALPHA/1., .5, .25, .16666666667, -.1, -.06666666667,
3      $ .03333333333, -.02/
3      DATA W/0.34785485, .65214515, .652515, .34785485/
3      DATA Z/-.85113631, -.033998104, .33998104, .85113631/
3      IF (&A .EQ. 3) GO TO 10
3      W(1) = 2.0
3      Z(1) = 0.0
3      GO TO 20
3 10 CONTINUE
3      W(1) = 0.34785485
3      Z(1) = -.85113631
3 20 CONTINUE
3      TRUE = 0.0
3      DO 30 I=1,&A+1
3      TRUE = TRUE + W(I)*(EXP(-Z(I)*X*SIN(Y))*
3      $ COS(Z(I)*X*COS(Y))+EXP(-Z(I)*X*COS(Y))*
3      $ COS(Z(I)*X*SIN(Y)))
3 30 CONTINUE
3      DO 40 I=1,&B
3      TRUE = TRUE + ALPHA(I)*X**((I+I)*COS((I+I)*Y)
3 40 CONTINUE
3      RETURN
3      END
3      FUNCTION C(X)
3      C = 0.
3      IF (X .NE. 0.) C = 1./X**2
3      RETURN
3      END
3      FUNCTION D(X)
3      D = 0.
3      IF (X .NE. 0.) D = 1./X
3      RETURN
3      END

```

```

*EOR

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*****
* - - - - - P O P U L A T I O N M O D U L E D A T A - - - - - *
* - - - - - *
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MODATA

MODATA CONTAINS THE INFORMATION NEEDED TO DECODE ENCODED ELLPACK PROGRAMS AND CHECK COMPATIBILITY.

LINE 1 HAS THE NUMBER OF MODULES (NRMODS) IN I3 FORMAT. NEXT FOLLOWS NRMODS PAIRS OF LINES. THE FIRST OF EACH CONTAINS A UNIQUE INTEGER IN THE RANGE 1,...,NRMODS IN I3 FORMAT AND AN ELLPACK MODULE NAME STARTING IN COLUMN 6. THESE GIVE THE CORRESPONDENCES BETWEEN MODULE NUMBERS USED IN ENCODED PROGRAMS AND THE NAMES OF MODULES TO BE USED IN THE GENERATED ELLPACK PROGRAM. THE SECOND LINE OF THE PAIR CONTAINS A LIST OF INTEGERS IN 4X,I30I3 FORMAT OF THE MODULE NUMBERS THAT MAY IMMEDIATELY FOLLOW THIS MODULE IN ELLPACK PROGRAMS. AFTER THIS SET OF LINES THERE IS ONE LINE CONTAINING A SINGLE INTEGER IN I3 FORMAT GIVING THE NUMBER OF DISCRETIZATION MODULES (NRDIS). THIS IS FOLLOWED BY NRDIS LINES EACH CONTAINING A MODULE NUMBER IN I3 FORMAT AND 15 DIGITS STARTING IN COLUMN 5 GIVING MODULE COMPATIBILITY INFORMATION (SEE ROUTINES GENPGM AND COMPAT).

RELATED FILES: GENPGM, EGNFIL, MACFIL, OPTFIL, GRDFIL AND OUTFIL

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39
01 5-POINT STAR
   14 15 16 17 32
02 7-POINT 3D
   14 15 16 17
03 P3-C1 COLLOCATION
   14
04 P3-C1 GALERKIN
   14
05 HODIE-HELMHOLTZ
   14 16 17 32
06 HODIE-ACF
   14 16 17 32
07 HODIE-ACDEF
   14 16 17 32
08 HODIE 27-POINT 3D
09 FFT 9-POINT
10 2DEPEP
11 MARCHING ALGORITHM
12 DYAKANOV-CG
13 DYAKANOV-CG4
14 NATURAL
   20 21 22 30 31 33 34 35 36 37
15 RED-BLACK
   22 30 31 33 39
16 YALE MIN DEG
   30 31 33 34 35 36 37
17 YALE RCM
   20 21 22 30 31 33 34 35 36 37
18 BAND SOLVE (RETIRED)
19 SYMMETRIC BAND (RETIRED)
20 LINPACK BAND
21 LINPACK SPD BAND
22 SPARSE GE-PIVOTING

```

| | | |
|----|----------------------|------------------------|
| 23 | SOR | (ITPACK 1.0 - RETIRED) |
| 24 | JACOBI SI | (ITPACK 1.0 - RETIRED) |
| 25 | JACOBI CG | (ITPACK 1.0 - RETIRED) |
| 26 | SYMMETRIC SOR SI | (ITPACK 1.0 - RETIRED) |
| 27 | SYMMETRIC SOR CG | (ITPACK 1.0 - RETIRED) |
| 28 | REDUCED SYSTEM SI | (ITPACK 1.0 - RETIRED) |
| 29 | REDUCED SYSTEM CG | (ITPACK 1.0 - RETIRED) |
| 30 | YALE SPARSE | |
| 31 | YALE ENVELOPE | |
| 32 | NESTED DISSECTION | |
| | 30 31 33 34 35 36 37 | |
| 33 | SOR | |
| 34 | JACOBI SI | |
| 35 | JACOBI CG | |
| 36 | SYMMETRIC SOR SI | |
| 37 | SYMMETRIC SOR CG | |
| 38 | REDUCED SYSTEM SI | |
| 39 | REDUCED SYSTEM CG | |

```

13
01 201111110111112
02 021101210111111
03 201111011111111
04 201101210200212
05 201101010200122
06 201101010200122
07 201111010200122
08 022102010200222
09 201112110200122
10 201101210111112
11 201101210111112
12 201101210111112
13 201101210111112

```

'EOR

```

*****
*
* - - - - - P D E   P O P U L A T I O N   O P T I O N S   F I L E - - - - -
*
*****

```

OPTFIL

OPTFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE
OPTIONS SEGMENT OF AN ELLPACK PROGRAM.

OPTFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,...
ETC. THE END-OF-RECORD IS DESIGNATED BY *EOR (*EOR ON NON-CDC
INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION
OF OPTFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMAT:

LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

LINE 2: LINE 2 MUST CONTAIN THE 8 CHARACTERS OPTIONS. IN
COLUMNS 1-8, FOLLOWED ON THE SAME LINE BY ALL OF THE OPTIONS
SELECTED.

RELATED FILES: GENPGM, EONFIL, MACFIL, GRDFIL, OUTFIL AND MODATA

```

-----
*EOR
RECORD 1
OPTIONS. TIME $ MEMORY $ LEVEL=1
-----

```

```

-----
*EOR
RECORD 2
OPTIONS. TIME $ MEMORY $ LEVEL=2
-----

```

```

-----
*EOR
RECORD 3
OPTIONS. TIME $ MEMORY $ LEVEL=3
-----

```

```

-----
*EOR
RECORD 4
OPTIONS. TIME $ MEMORY $ LEVEL=4
-----

```

```

-----
*EOR
RECORD 5
OPTIONS. TIME $ MEMORY $ LEVEL=5
-----

```

```

*EOR
$
*EOR
*EOR

```

```
*****
* ELLPACK PDE POPULATION GRID FILE *
*****
```

GRDFIL

GRDFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE GRID SEGMENT OF AN ELLPACK PROGRAM.

GRDFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,... ETC. THE END-OF-RECORD IS DESIGNATED BY #EOR ('EOR ON NON-CDC INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION OF GRDFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMAT:

LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

REMAINING LINES: THE REMAINING LINES OF THE RECORD CONTAIN THE GRID SEGMENT EXACTLY AS IT WILL APPEAR IN THE GENERATED ELLPACK PROGRAM. TO SPECIFY AN ELLPACK CONTINUATION LINE, TYPE A '.' (DOT) IN COLUMN 2. THE INFORMATION OF THIS RECORD IS COPIED DIRECTLY INTO THE GRID SEGMENT OF THE GENERATED ELLPACK PROGRAM. FOR PORTABILITY PURPOSES, THE END-OF-RECORD IS DETECTED BY THE PRESENCE OF A '-' (DASH) IN COLUMN 1.

RELATED FILES: GENPGM, EQNFIL, MACFIL, OPTFIL, OUTFIL AND MODATA

```
-----
'EOR
RECORD 1
      UNIFORM X = 5   $   UNIFORM Y = 5
-----
'EOR
RECORD 2
      UNIFORM X = 8   $   UNIFORM Y = 8
-----
'EOR
RECORD 3
      UNIFORM X=5 $ NGRIDY=12, 0.0, 0.123, 0.24633, 0.479532,
      . 0.6978401, 0.80823, 1.0, 1.35794, 1.354323, 2.09094,
      . 2.45785, 3.0
-----
'EOR
$
'EOR
'EOR
```

```
*****
*                                     *
* - - - - - ELLPACK PDE POPULATION OUTPUT FILE - - - - - *
*                                     *
*****
```

OUTFIL

OUTFIL CONTAINS INFORMATION WHICH MAY BE USED TO GENERATE THE OUTPUT SEGMENT OF AN ELLPACK PROGRAM.

OUTFIL IS DIVIDED UP INTO RECORDS WHICH ARE NUMBERED 0, 1, 2,... ETC. THE END-OF-RECORD IS DESIGNATED BY #EOR ('EOR ON NON-CDC INSTALLATIONS).

RECORD 0 CONTAINS A DESCRIPTION OF THE PURPOSE AND ORGANIZATION OF OUTFIL. RECORDS 1, 2, 3,... HAVE THE FOLLOWING FORMAT:

LINE 1: LINE 1 CONTAINS THE RECORD NUMBER.

REMAINING LINES: THE REMAINING LINES OF THE RECORD CONTAIN THE OUTPUT SEGMENT EXACTLY AS IT WILL APPEAR IN THE GENERATED ELLPACK PROGRAM. TO SPECIFY AN ELLPACK CONTINUATION LINE, TYPE A '.' (DOT) IN COLUMN 2. THE INFORMATION OF THIS RECORD IS COPIED DIRECTLY INTO THE OUTPUT SEGMENT OF THE GENERATED ELLPACK PROGRAM. FOR PORTABILITY PURPOSES, THE END-OF-RECORD IS DETECTED BY THE PRESENCE OF A '-' (DASH) IN COLUMN 1.

RELATED FILES: GENPGM, EQNFIL, MACFIL, OPTFIL, GRDFIL AND MODATA

```
-----
'EOR
RECORD 1  TABLE-SOLUTION $ MAX-SOLUTION $ MAX-ERROR
-----
'EOR
RECORD 2  TABLE-SOLUTION $ PLOT-SOLUTION
-----
'EOR
RECORD 3  PLOT-TRUE
-----
'EOR
RECORD 4  TABLE-ERROR $ MAX-ERROR $ MAX-SOLUTION
-----
'EOR
RECORD 5  TABLE-TRUE $ TABLE-SOLUTION $ TABLE-ERROR
-----
'EOR
RECORD 6  TABLE-TRUE $ TABLE-SOLUTION $ TABLE-ERROR
          PLOT-TRUE $ PLOT-SOLUTION $ PLOT-ERROR
-----
'EOR
RECORD 7  TABLE-ERROR $ MAX-ERROR
          PLOT-TRUE $ PLOT-SOLUTION $ PLOT-ERROR
-----
'EOR
$
'EOR
'EOR
```

```

SUBROUTINE TEST(LOOP)
TEST IS CALLED AT THE END OF THE STANDARD MODULE SEQUENCE IN
THE PDE PERFORMANCE EVALUATION TESTING. IT COMPUTES VARIOUS
PERFORMANCE MEASURES ABOUT THE RUN AND WRITES IT ONTO TAPE4.

THIS ROUTINE IS BASED UPON THE SEPT 1978 VERSION OF ELLPACK 77.

ELLPACK 77 INTERFACE

LOGICAL DIM2,DIM3,POISON,LAPLAC,CONSTC,SELFAD,CROST,DIRICH,
$ NEUMAN,MIXED,UNIFRM,DEBUG,TIMER,HOMOEQ,HOMOBC,SYMMET,
$ FATAL,CLOCKW,RECTAN
REAL AX,BX,AY,BY,AZ,BZ,HX,HY,HZ,CUXX,CUXY,CUYX,
$ CUX,CUY,CU,CUXZ,CUYZ,CUZZ,CUZ,EPSGRD
INTEGER IROT(6),HORZ,VERT,BOTH,INTER,STAR,ONE,MINUS,XXX,EXTER,
$ PERIOD,CORNER

COMMON / PROBL / DIM2,DIM3,POISON,LAPLAC,CONSTC,SELFAD,HOMOEQ,
$ CROST,HOMOBC,DIRICH,NEUMAN,MIXED,UNIFRM
COMMON / PROBR / AX,BX,AY,BY,AZ,BZ,HX,HY,HZ
COMMON / PROBI / NGRIDX,NGRIDY,NGRIDZ
COMMON / CPDE / CUXX,CUXY,CUYX,CUX,CUY,CU,CUXZ,CUYZ,CUZZ,CUZ
COMMON / CONTRL / DEBUG,TIMER,SYMMET,FATAL,RECTAN
COMMON / INTEGS / NUMBEQ,NUMCOE,NROW,NCOL,NBAND,IROT,LEVEL,
$ INITL,INDIS,INSOL,MINPUT,
$ MOUTPT,MEMORY,ININD,NGRDZX,NGRDYZ,
$ NGRDZZ,MXNEQZ,MXNCQZ,NROWDZ,NCOLDZ
COMMON / REALS / ERRMAX,SOLMAX,TRUMAX,RESMAX,TIMES(1)
COMMON / BNDRY / IPIECE,NBOUND,NBNDPT,CLOCKW
COMMON / SYMCON / HORZ,VERT,BOTH,INTER,STAR,ONE,BLANK,MINUS,
$ XXX,EXTER,PERIOD,CORNER
COMMON / NUMCON / EPSGRD
COMMON /GRIDXZ/ GRIDX(1)
COMMON /GRIDYZ/ GRIDY(1)
COMMON /GRIDZZ/ GRIDZ(1)
COMMON /COEFZZ/ COEF(1)
COMMON /IDCOZZ/ IDCOEF(1)
COMMON /TABLZZ/ TABLE(1)
COMMON /UNKNZZ/ UNKNWN(1)
COMMON /NDXUZZ/ NDXUNK(1)
COMMON /BCTYZZ/ BCTYPE(1)
COMMON /INUNZZ/ INUNDX(1)
COMMON /NDXEZZ/ NDxEQ(1)
COMMON /IGRIZZ/ IGRID(1)

REAL ERRL2,RESMAX,RESL2
INTEGER BCTYPE

DATA NRITNS /0/, INSOL/0/, NUMBEQ/0/
COMMON /ITCOM1/ NRITNS
THIS IS THE NUMBER OF ITERATIONS FROM ITPACK

NGRDZX = NGRIDX
NGRDYZ = NGRIDY
NGRDZZ = NGRIDZ

COMPUTE L-2 DISCRETE NORM AT THE NODES

RNODES = 1.0/FLOAT(NGRIDX*NGRIDY*NGRIDZ)
ERRL2 = 0.
ERR = 0.0
DO 100 IX=1,NGRIDX
DO 100 IY=1,NGRIDY
DO 100 IZ=1,NGRIDZ
E = ERROR(GRIDX(IX),GRIDY(IY),GRIDZ(IZ),NGRDZX,
$ NGRDYZ,NGRDZZ,GRIDX,GRIDY,GRIDZ,UNKNWN,
$ MXNEQZ,NDXUNK,TABLE,COEF,IDCOEF,MXNCQZ,
$ BCTYPE,INUNDX,NDxEQ,IGRID)

ERRL2 = ERRL2 + E*E
ERR = AMAX1(ABS(E),ERR)

100 CONTINUE
ERRL2 = SQRT(ERRL2)*RNODES

```

[illegible]

| | | |
|------|---|------|
| C | IF (UNIFORM) GO TO 370 | TEST |
| C | | TEST |
| C | CASE OF NON-UNIFORM GRID | TEST |
| | HMAX = 0.0 | TEST |
| | DO 330 I=1,NX | TEST |
| | DX = GRIDX(I+1)-GRIDX(I) | TEST |
| | HMAX = AMAX1(DX,HMAX) | TEST |
| 330 | CONTINUE | TEST |
| | DO 340 I=1,NY | TEST |
| | DY = GRIDY(I+1)-GRIDY(I) | TEST |
| | HMAX = AMAX1(DY,HMAX) | TEST |
| 340 | CONTINUE | TEST |
| | IF (DIM2) GO TO 360 | TEST |
| | DO 350 I=1,NZ | TEST |
| | DZ = GRIDZ(I+1)-GRIDZ(I) | TEST |
| | HMAX = AMAX1(DZ,HMAX) | TEST |
| 350 | CONTINUE | TEST |
| 360 | CONTINUE | TEST |
| | GO TO 380 | TEST |
| C | | TEST |
| C | CASE OF UNIFORM GRID | TEST |
| 370 | CONTINUE | TEST |
| | HMAX = AMAX1(HX,HY) | TEST |
| | IF (DIM3) HMAX = AMAX1(HZ,HMAX) | TEST |
| 380 | CONTINUE | TEST |
| C | | TEST |
| C | WRITE SUMMARY OF ELLPACK RUN ON SAVE FILE | TEST |
| C | | TEST |
| | WRITE(4,1000) NGRIDX,NGRIDY,HMAX,NUMBEQ,ERR,ERRMAX,ERRL2, | TEST |
| | \$ RESMAX,RESMXR,RESL2,SOLMAX,NRITNS,MEMORY,TLTIME, | TEST |
| | \$ (TIMES(I),I=1,NRMODL) | TEST |
| 1000 | FORMAT(1X,2I4,1X,E10.2,1X,I5,2X,7E9.2,1X,I3,1X,I5,1X,4F6.2) | TEST |
| C | | TEST |
| | RETURN | TEST |
| | END | TEST |
| 'EOR | | |

| | | | | |
|---|--|---|----------------------|-------|
| C | REAL | FUNCTION | QUADR(X,AUX,VALUX,N) | QUADR |
| C | | | | QUADR |
| C | ELLPACK | 78 | OUTPUT MODULE | QUADR |
| C | FUNCTION | QUADR | | QUADR |
| C | PURPOSE | | | QUADR |
| C | TO PERFORM 1-D EXTRAPOLATION USING N POINTS | | | QUADR |
| C | AT THE POINT X. | | | QUADR |
| C | PARAMETERS | | | QUADR |
| C | AUX | - VECTOR OF ARGUMENT VALUES | | QUADR |
| C | VALUX | - VECTOR OF FUNCTION VALUES CORRESPONDING | | QUADR |
| C | | TO AUX. | | QUADR |
| C | N | - NUMBER OF INTERPOLATION POINTS | | QUADR |
| C | METHOD | | | QUADR |
| C | DIVIDED DIFFERENCES ARE USED TO COMPUTE THE | | | QUADR |
| C | EXTRAPOLATED VALUE. | | | QUADR |
| C | $P(X) = F1 + (X-AUX(1))*F2 + (X-AUX(1))*(X-AUX(2))*F3$ | | | QUADR |
| C | HISTORY | | | QUADR |
| C | MODIFIED BY BILL WARD, MARCH, 1979. | | | QUADR |
| C | | | | QUADR |
| C | REAL | AUX(N), VALUX(N), | | QUADR |
| C | A | F1, F2, F3, C1, T2 | | QUADR |
| C | F1 | = VALUX(1) | | QUADR |
| C | F2 | = (VALUX(2) - VALUX(1)) / (AUX(2) - AUX(1)) | | QUADR |
| C | C1 | = X - AUX(1) | | QUADR |
| C | QUADR | = F1 + C1*F2 | | QUADR |
| C | IF (N .EQ. 2) GO TO 999 | | | QUADR |
| C | T2 | = (VALUX(3) - VALUX(2)) / (AUX(3) - AUX(2)) | | QUADR |
| C | F3 | = (T2 - F2) / (AUX(3) - AUX(1)) | | QUADR |
| C | QUADR | = QUADR + C1*(X - AUX(2))*F3 | | QUADR |
| C | 999 | CONTINUE | | QUADR |
| C | RETURN | | | QUADR |
| C | END | | | QUADR |
| C | *EOR | | | QUADR |

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This report contains the machine readable form of the 189 partial differen-
tial equations presented in MRC Technical Summary Report #2078 "A POPULATION OF
LINEAR, SECOND ORDER, ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS ON RECTANGLES -
PART 1." These are two large files: EQNFIL contains 189 entries which are
either complete statements of a PDE in the ELLPACK language or a reference to an
entry in MACFIL with parameter values given. MACFIL contains the 42 parameter-
ized PDE's in a form suitable for automatically substituting in parameter values.
A few other small files are given to facilitate using this problem population | | |

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