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This report contains description and program documentation of a conversational unit for univariate and multivariate analysis of data in regular or irregular two-way classification designs. The main part of this report is Chapter IV which, on the basis of detailed illustrations, describes the question-and-answer frames on a Graphics (IBM 2250) console. The user is assumed to be a "layman" in the sense that he need not be familiar with statistical analysis in computer programming techniques. He receives instructions for description of his data from the graphically displayed questions. He has a choice to make several plots of his data (for cells, rows, or columns of the design, each response variable vs. another response variable). In the univariate analysis he obtains detailed reports on means, adjusted means, and the analysis of variance tables, for each response variable. After data have been edited the user may perform a multivariate analysis and will obtain discriminant functions, union-intersection and likelihood-ratio test statistics, and correlations. He may repeat this for various subsets of response variables. Thus, this unit includes and supersedes the unit described in THEMIS report No. 13 (April, 1971). Program documentation is presented in Chapter V. The listing of the FORTRAN programs is contained in the appendix.			

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Conversational Computation

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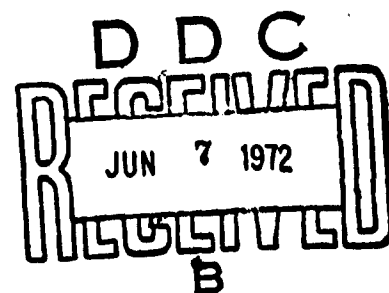
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AN INTERACTIVE MULTIVARIATE DATA ANALYSIS PROGRAM

ANNE A. BALLENGEE AND ROLF E. BARGMANN

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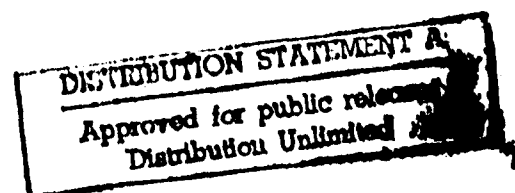


TABLE OF CONTENTS

CHAPTER	PAGE
I INTRODUCTION	1
II DESCRIPTION OF THE CONVERSATIONAL UNIT	4
III TOOLS FOR STATISTICAL ANALYSIS	7
3.1 Program ANOT	7
3.2 Program TEMAT	11
3.3 Distribution Routines	13
IV TOOLS FOR THE USER	15
4.1 User's Guide	15
4.2 Example	19
V COMPUTER PROGRAMS	57
REFERENCES	81
APPENDIX	82

CHAPTER I

INTRODUCTION

The use of the computer in the statistical analysis of experimental data is usually available only to people, or teams, who have statistical and computational experience. In particular, the experimenter who collects the physical data can rarely do the analysis on the computer without help.

The ever-increasing use of terminals, both typewriter consoles and graphic display units, appears to become a promising link between the experimenter and the analysis of his data. Of course, these terminals need to be programmed by experts in computation and statistical analysis before they can serve the function of analyzing the experimenter's data. Too often, specialists in some field with a smattering knowledge of statistics and some elementary programming experience "write their own subroutines". There are literally thousands of "least squares" and "regression" programs embodied in terminal systems. In view of the utter simplicity of this problem, most would probably work all right, a few may be inefficient (especially where factorial designs are irregular and the inexperienced statistical layman would use a "general linear model" approach for their problem setting up, say, a 20 by 20 equation system where a statistician would obtain the same result from a 3 by 3 equation system), still others probably lack precision in any but the smallest studies.

Another problem in this universal practice of laymen writing their own ad hoc program, or using a poorly understood package, is that they apply inappropriate techniques. The more advanced tools of analysis which should be used on their data are forever inaccessible to them. Our approach to this problem has been to have experienced statisticians write conversational units addressed to the experimenter with supposedly incomplete knowledge of statistics and computation. On the basis of answers given to these questions, the computational program will perform the statistical analysis warranted by the data.

In the present thesis we deal with the general complex of "analysis of variance" in one-way and two-way (irregular) classification designs, involving either univariate or multivariate responses. There exists a variety of programs for this set of analysis of which most are for use in the batch mode. One major problem, however, especially in the multivariate pass (multivariate analysis of variance, discriminant analysis) is the disturbing influence of even very few faulty data, i.e., data which may have been transcribed incorrectly or contain keypunch errors, such as misplaced decimal points, or outliers or other types of mavericks. Hence, before any meaningful analysis can be made the investigator must be sure that he has good data.

Since it may be time-consuming to perform an initial analysis of variance, then in a new run to edit the data, and thereafter to perform more analyses, a conversational approach to the problem seems to be indicated. The conversational unit available to us is an IBM 2250 Graphics console which is connected with an IBM 360 Model 65 computer. The 2250 display unit has an alphameric keyboard and a program function

keyboard to serve as input devices, and a cathode-ray tube as an output device. Thus, a communication exists between the user and the computer.

This thesis presents a brief description of the classical approach of adjusted normal equations which is employed in the analysis of variance and its multivariate extension. The user is then presented with a description example of how the program can be used. Finally, the computer programs are documented.

Special notation which will be used:

μ incidence matrix

n_{ij} cell size

$\underline{n}_{\cdot j}$ vector of column sizes

$\underline{n}_i$ vector of row sizes

n sample size

$\underline{R}$ vector of row totals

$\underline{c}$ vector of column totals

G grand total

Dn_i diagonal matrix with elements of $\underline{n}_i$ in principle diagonal

See references [2] and [3] for further explanations.

CHAPTER II

DESCRIPTION OF THE CONVERSATIONAL UNIT

The user, at the console, is asked to supply some general information about his data (title, variable names, transformations, factor names, level codes, etc.). Second, he must enter his data either from the typewriter or by a special batch run if his data are voluminous.

On each response variable, a univariate analysis of variance is then performed (assuming, in any event, an irregular two-way classification model - see Section 3.1). In addition to the usual analysis of variance and the customary F statistics, the display contains a report of means in each cell, size (incidence) of each cell, standard deviations of observations within each cell, adjusted row means, adjusted column means, and various other quantities. Some hints are given in a special instructional display as to how the user should utilize these results in order to identify faulty data.

Next, the user is given an option to view selected graphical displays of his data (data in a cell, data in a row or column, all data; each response variable against each other response variable). This enables him to detect unusual behavior of some observations. He may then go back to a display of his original data, and make any changes which he desires on the basis of the study of tables of means and the graphs. He may then, if he chooses, perform another univariate pass for further inspection.

After thus editing his data, the user may now proceed to a multivariate analysis. He is asked, specifically, which variables he wishes to include in this, or any subsequent, multivariate pass [5]. This is an important aspect of our program in that, all too often, multivariate analyses are badly distorted by some variable which should not be included in the same study (e.g., when one response variable is a mathematical function of others; if it is linear, of course, the entire analysis would be false).

The output display of the multivariate pass contains the usual quantities of multivariate analysis, i.e., the Likelihood-Ratio test statistic for each effect, the Union-Intersection statistic ("canonical R^2 as goodness-of-fit"), the discriminant function, and most important, the correlation of each response variable versus the discriminant function [2]. In addition, the display contains correlation matrices between the selected response variables based on sums of squares and products for (a) error, (b) total, (c) rows plus error, (d) columns plus error.

After viewing the multivariate analysis displays the user may perform additional univariate and multivariate analyses; he may see his displays again and do additional editing. He may continue until he is satisfied that he has viewed his data from every conceivable angle.

In closing it is important to note that the CPU time needed for the analyses is quite short (a few seconds only even for the multivariate pass of extensive sets of data). Our console, as most other conversational terminals, operates in a time shared mode under a special monitor

[4]. Thus, the user has the ability to spend considerable time in front of the console, without requesting computer time any longer than he would have in batch mode. In fact, by employment of programs designed for speed [1] the computer time is of one or more orders of magnitude shorter than that required for other statistical packages.

A more detailed description of the flow of the analysis is presented in Chapter 4.

CHAPTER III

TOOLS FOR STATISTICAL ANALYSIS

In this chapter, we describe those subprograms which employ special statistical techniques of analysis. The other subprograms which deal with standard mathematical algorithms (inversion, eigenvectors, numerical integration) or data processing, are summarized in Chapter 5.

3.1 Program ANOT

Analysis of Irregular Two-Way Classification Designs

The model for an irregular two way design with interaction is

$$E(y_{ijk}) = \mu + \alpha_i + \beta_j + \delta_{ij}$$

where y_{ijk} is the k^{th} observation in the ij^{th} cell,

$$i = 1, \dots, r$$

$$j = 1, \dots, c$$

$k = 1, \dots, n_{ij}$, n_{ij} is the number of observation in the ij^{th} cell. If $n_{ij} = 0$, the ij^{th} cell is empty. For convenience in arithmetic, let $r \leq c$.

Let the incidence matrix be as follows:

$$N = \begin{bmatrix} n_{11} & n_{12} & \dots & n_{1c} \\ n_{21} & n_{22} & \dots & n_{2c} \\ \vdots & \vdots & \ddots & \vdots \\ n_{r1} & n_{r2} & \dots & n_{rc} \\ n_{.1} & n_{.2} & \dots & n_{.c} \end{bmatrix} \begin{matrix} n_{1.} \\ n_{2.} \\ \vdots \\ n_{r.} \\ n \end{matrix}$$

If the incidence matrix is proportional, i.e. $n_{ij} = (n_{i.} \cdot n_{.j})/n$, an abbreviated, unadjusted analysis can be performed which is well described in elementary texts.

As it now stands, the model is indeterminate, and no reasonable analysis can be made. Thus, it is necessary to make certain assumptions about the model or to impose certain conditions to make main effects "estimable". Let us impose the following $r + c - 1$ conditions:

$$\sum_i n_{ij} \delta_{ij} = 0 \text{ for all } j$$

$$\sum_j n_{ij} \delta_{ij} = 0 \text{ for all } i$$

These conditions minimize, in effect, the contribution of the interaction.

With these conditions, the normal equations become as follows:

$$nm + \underline{n}_{i.} \underline{a} + \underline{n}_{.j} \underline{b} = G$$

$$\underline{n}_{i.} m + D_{n_{i.}} \underline{a} + N \underline{b} = \underline{R}$$

$$\underline{n}_{.j} m + N' \underline{a} + D_{n_{.j}} \underline{b} = \underline{C}$$

Now there are $r + c + 1$ equations in $r + c + 1$ unknowns.

By making the $r + c - 1$ conditions on our original model, we now have a new and more restricted model. Different conditions would have led to different models and hence different analyses.

To solve the equations, we can apply two constraints. Note that the constraints are applied to the estimates of the α and β effects and are only for arithmetic convenience in solving the set of singular equations. Different choices of a pair of constraints would have led to the same analysis.

After some elementary manipulations, we obtain the r "adjusted normal equations",

$$C\bar{a} = \bar{Q}.$$

The typical elements of C are as follows:

$$c_{ii} = n_i \cdot \sum_{j=1}^c n_{ij}^2 / n_{.j}$$

and

$$c_{ik} = - \sum_{j=1}^c n_{ij} n_{kj} / n_{.j}, \quad i \neq k.$$

The typical element of $\bar{Q}$ is

$$Q_i = R_i \sum_{j=1}^c n_{ij} C_j / n_{.j}$$

which is an adjusted row total.

C is symmetric and singular; there are r equations in r unknowns; and the rank of C is $r-1$. We still have one constraint which we can apply. Let $a_r = 0$. Hence, we now have $r-1$ equations in $r-1$ unknowns. Thus, we obtain the solutions $a_1, a_2, \dots, a_{r-1}$, and $a_r = 0$.

The effects, as such, are not estimable but effect contrasts are. Since additions of a constant to a contrast does not change the contrast, we can add a constant k to our solutions a_i , $i=1, \dots, r$, for mere convenience of representation of the same results.

Had the C matrix been "orthogonal", an estimate of the i^{th} row effect could have been R_i/n_i , i.e., the i^{th} row mean, an easily interpretable quantity. This "effect estimate" would satisfy the constraints $\sum n_i a_i^* = G$, the grand total. It is obtained from an a_i based upon another constraint, by addition of a constant k , $a_i^* = a_i + k$, where

$$k = (G - \sum_{i=1}^r n_i a_i) / n.$$

Thus, in the non-orthogonal case, it seems convenient, for purposes of interpretation, to use $a_i^* = a_i + k$ where k is defined as above. These a_i^* will be called "adjusted row means". Note that, for the statistician, this would be somewhat inconvenient. He prefers sums or weighted sums of effects to add to zero, so that he may add these in the model equation without having to subtract constants (in our case, the grand mean). To the experimenter, however, a mean is much more useful than effect estimates which are preferable for mathematical convenience. To repeat, these are merely different representations of identical results.

Similarly, for column effects, we calculate, initially,

$$b_j = \frac{C_j - \sum_{i=1}^r n_{ij} a_i}{n_{.j}} - \frac{G}{n}$$

For the "adjusted column means", let $b_j^* = b_j + k$ where

$$k = \frac{G - \sum_{j=1}^c n_{.j} b_j}{n}$$

3.2 Program TENAT

Multivariate Analysis of Variance

The likelihood ratio statistic is

$$-m \log(|E|/|H+E|)$$

where $m = \text{d.f. error} + 1/2(\text{d.f. hypothesis} - \text{number of responses} - 1)$,

$|E|$ is the determinant of the matrix of sums of squares and products for error,

H is the matrix of "adjusted" sums of squares and products for each hypotheses (subtotals, interaction, rows, columns, in turn).

The first two terms of the Bernoulli expansion of the distribution, which would be in error by a term of order $1/m^4$, are employed to state at what level of significance the null hypothesis would be rejected. In the (hopefully frequent) case that this level is below 10^{-5} , the result is displayed as zero. Large values (.20 or larger) are desirable only in the interaction test. From time to time, the display for one effect is replaced by the message "MATRIX NOT GRAMIAN". This can have two reasons:

(a) There is linear dependence between the response variables, e.g., one may be the sum of the others. In this case, the multivariate analysis is obviously faulty. A variable should be excluded in the next run.

(b) The approach to the null-hypothesis situation is too close. This is the generalization of the case which produces negative variance-component estimates in univariate analysis. If this happens in an Interaction test, the result is quite desirable. If it happens in a main effect, it contributes nothing. If the "MATRIX NOT GRAMIAN" display occurs in a main effect it simply means that H_0 is to be accepted, and that no interpretation of discriminant functions or main effect differences should be attempted.

In the special case where the hypothesis has only one degree of freedom (2 levels in a factor) the likelihood-ratio test, just as the union-intersection test, reduces to an F statistic (more commonly known as "Hotelling's T^2 - with some minor variation in constants"). In these cases, the F statistic and the associated degrees of freedom are reported. The user would have to compare with F tables to decide on acceptance or rejection of the hypothesis. In our interactive system we have a "Calculator" mode which enables him to look up, i.e., actually compute, the probability levels.

The program also calculates the union-intersection statistic, i.e., the largest characteristic root of $E^{-1}H$ (same definitions as above). The right and left eigenvectors associated with this matrix are also computed and reported, the former being a representation of the discriminant function, the latter being used as a basis for calculating correlations of response variables versus the discriminant functions [2]. The parameters needed for entering the Roy-Heck charts are displayed. There is a practice to use the Beta statistic $SSH/(SSH + SSE)$, usually called R^2 , as a measure of goodness of fit of a univariate analysis of variance

model. To satisfy users who like this measure, the corresponding multivariate index ("canonical R^2 ") is reported. It is, in fact, the largest characteristic root of $(H + E)^{-1}H$.

3.3 Distribution Routines

FUNCTION GAMX(X,DF)

$$P(a,x) = \text{GAMX}(x,a) = \frac{1}{\Gamma(a)} \int_0^x e^{-y} y^{a-1} dy$$

If $DF < 200$, the probabilities are evaluated by a sum of Poisson terms

$$\frac{x^a e^{-x}}{\Gamma(a+1)} \quad \text{where } a = DF, DF+1, \dots$$

If $DF > 200$, the evaluation is by cubic approximation

$$\text{Gam}(X,DF) = \text{YORMX}(Y) \quad \text{where } Y = \left[\sqrt[3]{X/DF} - 1 + 1/9DF \right] \sqrt{9DF}$$

FUNCTION CHIX(X,DF)

$$P(\gamma,x) = \text{CHIX}(X,DF) = \frac{1}{2^{\gamma/2} \Gamma(\gamma/2)} \int_0^x y^{\gamma/2-1} e^{-y/2} dy$$

Since the chi-square distribution is a special case of the gamma distribution, the probabilities are evaluated by the use of the GAMX subroutine where

$$\text{CHIX}(X,DF) = \text{GAMX}(X/2.,DF/2.)$$

FUNCTION YORMX(X)

$$P(x) = YORMX(X) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-t^2/2} dt$$

If $|x| < 2.5$, the evaluation of the probabilities employs the Hastings form; otherwise, the Laplace continued fraction is used.

CHAPTER IV

TOOLS FOR THE USER

4.1 User's Guide

The program SPOOK is designed to provide the user with an analysis of irregular data matrices. A univariate analysis (i.e., every score or variable is analyzed separately) is performed, followed by, if desired, a multivariate analysis (where all variables are analyzed as a set).

The univariate analysis may be either a one-way or a two-way classification design. A one-way design is such that the individual experimental units (e.g., individuals, plots of land, animals, etc.) are classified by only one characteristic or factor. A two-way design is based upon the individual experimental units being classified by two characteristics or factors. Each experimental unit is then assigned to one, and only one, category for each factor. Examples of factors would be sex, age, weight, height, etc. Since the conversational unit is designed for two factors, a one-way classification requires special treatment. In this instance, the user should state, when asked, a dummy name (or no name at all) for the first factor and he should further declare that it has just one level. The second factor should then be his only factor.

Each factor must be such that levels may be designated. The designation of levels may be in the form of consecutive numbers such as

a to b or, if the data are continuous, records which fall below a_1 could be regarded as belonging to level 1, records falling between a_1 and a_2 as belonging to level 2, etc. Thus, the levels of a factor such as sex could be designated as 1,2 while the levels of a factor such as age could be designated as

5 - 9 years	level 1	("end code" here is 9)
10 - 14 years	level 2	("end code" here is 14)
15 - 19 years	level 3	("end code" here is 19)
20 - 25 years	level 4	("end code" here is 25).

There can be up to twelve levels for each factor.

For each experimental unit, there may be from one through ten responses to different variables. Examples of response variables would be a test score (or average) in English, a test score in arithmetic, and a test score in science, or the number of situps, number of pushups, time in 100-yard dash, and distance in broad jump. In these examples the experimental units would be individuals, and the factors may be sex, age, school type, etc.

A name or code (maximum of four characters) should be assigned to each factor and each response variable. The naming will be used for identification in the output. In addition to the names, a title might be desired.

Once having collected his data, the user could have a table such as Table 4.1 for quick reference. With such a table he will be able to give answers to the questions asked by the computer.

If the data are voluminous, and punched on cards, the user is advised to refer to the description of BUILD in Chapter 5 so that a

prior batch run can be made to store the data. Because preparation of the input may appear complicated to those with limited programming background, a user who finds the description difficult may wish to consult a somewhat more experienced programmer for the first run. Once the batch run has been made, the input portion of SPOOK is omitted, and the user may proceed as if he had entered his data from the console.

EFFECTIVENESS OF TEACHING

	MALE			FEMALE		
	ENG	ARIT	SCIE	ENG	ARIT	SCIE
PUBLIC	55.1	55.6	46.8	57	47.4	44.8
	56.1	53.2	41.7	55.6	46.3	39.9
	55.9	49.5	38.1	58	51.2	50
	54.4	58.9	39.6	55.9	50.3	39.4
				59.7	49.5	43.1
PRIVATE	52.8	59.4	47.1	55.6	54.8	42.7
	53.6	65.6	42.1	61.7	53	47.1
	53.9	59.2	42.3	56.1	60.8	45.2
	53.8	58.2	45.2	60.3	67.6	49.2
BOARDING	56.7	62.3	49.8	61.8	52.6	48.4
	58.2	64.6	47	55.6	69.9	49.3
	59.6	52.8	49.2	62.3	62.4	50.4
				59.9	54.3	46.2
				60.7	59.4	48.6

Table 4.1

4.2 Example

This section is intended to familiarize the user both with the IBM 2250 display unit and the program SPOOK.

The 2250 display unit is centered around a cathode-ray tube on which computer-programmed information is displayed. Thus, a visual communication exists between the user and the computer. The unit also has an alphameric keyboard similar to a typewriter keyboard. There are 44 keys and a space bar giving 62 standard characters. Special keys of interest to the user are the "ALT" and the "5" keys. When these two keys are depressed simultaneously, the end of a response is signalled. This combination will often be referred to as "end of block" or "EOB". The user should also note the "BACKSPACE" key. This moves the cursor back one space and as long as EOB has not been signalled the user can correct his typed input. To the left of the alphameric keyboard is a program function keyboard which consists of 32 lighted keys numbered 0 - 31. All keys, except key 0, are available to the user. At different points in the program, different keys will have significance, and thus be lighted to help the user remember them.

When the user first sits down in front of the console, he should depress any key (not key 0). Once the instructions appear he should type \$LINK SPOOK and then signal EOB ("ALT" and "5" depressed simultaneously).

Even though each frame should be self-explanatory, a typical set of data was constructed and subjected to the program to illustrate the use of SPOOK. The data are shown in Table 4.1. Since one purpose of

this program is to provide a quick means of editing the data, the example will try to illustrate one way to hunt faulty ones.

The first display is shown in Figure 4.1. Several instructions which are of particular importance are as follows: key 30 restarts the program, key 31 will terminate the program, key 2 will allow the user to reenter data, and any remaining key (again, not key 0) will allow him to continue once he has seen the display of his data. The one instruction which needs all the emphasis it can receive is "CAUTION: DO NOT TRY TO SPEED UP THE PROGRAM BY ANSWERING QUESTIONS BEFORE THEY ARE ASKED. THIS WILL ONLY CREATE PROBLEMS." We know there are users who anticipate and answer the next question. They must contain themselves, since all keyboard responses are placed in a queue, and each question expects some response. Once the user gets "out of phase", the best solution is to press key 31 to terminate and then to reenter the program. Even the restart option (key 30) may not correct the situation.

Because the example is being created at the console, key 1 is depressed to begin the question and answer session. The first query is for a study title. The study title is entirely optional and is used to head the output. It may consist of up to 60 characters. The display following the entry of the title is shown in Figure 4.2. The next question is "HOW MANY RESPONSE VARIABLES DO YOU HAVE?" The number 3 is entered and the following message is displayed to the user: "YOU HAVE 3 RESPONSE VARIABLES." As always, to indicate approval, any one of the unused program function keys is depressed.

The next set of questions asks the user for a name (four letters are recognized) for each of the response variables. The purpose of naming each response variable is so that the data will be entered as the user wishes and also so that the user can identify each in the output. Once the names "ENG ARIT SCIE" are displayed and the user has indicated approval, he is asked for a transformation code for each response variable. The query and the user's reply is displayed to him as in Figure 4.3.

Next, the names of the two factors and the number of levels for each is required. Again the naming of the factors is for identification in the output, but if the first factor has more levels than the second factor, the two will be exchanged in the analysis and hence the naming is especially helpful. In this study, the first factor is SEX and has 2 levels, and the second is TYPE and has 3 levels. If there is only one factor (one-way classification analysis) the user should give a dummy name to the "first" factor (or just leave the name blank) and indicate the number of levels (below) as 1. The second factor is then his only one.

Figure 4.4 shows the next display. Since, in our example, all levels are discrete (rather than selected partitions on a continuous scale) and since they further have natural codes 1-2, 1-2-3, key 1 has been depressed. Had key 2 been depressed to indicate continuous levels, Figure 4.5 would have appeared asking for the "end codes" of the levels of each factor. The display in Figure 4.6 is the next one to appear in either case.

Figure 4.7 shows the instructions for entering data. Note that key 2 is no longer used for reentry of data. Instead, the user types "BACK" and the number of entries which he wishes to go back. Each time this option is used the appropriate number of lines will be erased starting at the bottom of the display. Thus, one cannot change, at this stage, an entry without also reentering all of the following entries. Key 3 will be depressed when the user has entered all of the data. Once key 3 is depressed the user is forced into the univariate analysis. Hence, he should be sure that the data displayed on the console is what is desired at that point.

Depending upon the number of users concurrently on the central processor, waiting time for results may take several minutes even though the central processing time is only a matter of a second or two. Hence, displays similar to the one in Figure 4.8 keep the user posted on progress and allow him to stop the calculations if he wishes. Once key 2 is depressed the program will proceed to the output having performed univariate analyses only on the named variables.

As the display in Figure 4.9 indicates, the user has complete control over what portions of the output he views. Once the user reaches the instructions which follow each set of output, he is not bound to follow them at that point. He can still depress key 3 to decrement the page number and hence continue viewing the analyses more extensively.

Page 1L (Figure 4.10) gives some hints on how to begin looking at the preliminary output. Once the user has checked the F-ratios, adjusted means, and cell means and standard deviations of the univariate analyses

and if he finds nothing abnormal, he should still proceed to the plots of the response variable pairs and to the raw data. Plotting rows, columns, and cells may indicate faulty data. At the plotting segment he should check the upper and lower limits of each variable. This is another good way of checking on faulty data. Because of the many steps in bringing data to be analyzed, faulty data or outliers can easily occur: data can be transcribed incorrectly or have keypunch errors. Thus, the first analysis should never be the last!

Figures 4.11 - 4.16 show the output from this initial run. Let us look first at the variable ENG. The F-values are nonsignificant but a careful inspection does not stop with the ANOVAR table. Looking at the adjusted means, one sees that the means of the second level of each factor seems to be quite out of range. The next place that merits inspection is the table of means and standard deviations. "Deviation from a trend in rows or columns" is a mild way of reporting what is happening in the (2,2) cell. This clearly indicates that the quickest way to find out what is happening is to go to the plotting segment of the program. But, first look at the ARIT and SCIE variables. There is nothing to indicate faulty data in these variables. The data in the two variables should still be investigated by plots and by looking at the raw data.

Figure 4.17 shows the first display once the plotting segment is entered. To begin, the (2,2) cell is what we are interested in, and the best method is to plot ENG against each of the other variates.

Figures 4.18 and 4.19 indicate that entry number 17 is the outlier.

Note the upper and lower limits on the ENG variable. Figures 4.20 - 4.22 show plots of other data. After other plots have been investigated for faulty data which did not show in the analysis, depression of key 5 passes control of the program to a display of the raw data. Now, changes can be made. Inspection of entry number 17 shows a misplaced decimal point (a quite common mistake). Depression of key 2 allows the correction to be made as shown in Figure 4.23. Once the correction is made, depression of key 6 will allow the user to see plots again.

Here, it should be emphasized that while the user is in the plotting segment key 5 will take him to the raw data and key 29 will allow him to see the previous univariate analyses. While he views the raw data, key 6 will allow him to see plots (these new plots will include any changes made) and key 29 will allow him to see the previous univariate results. Once the user has performed his first univariate analysis pass, he can always depress key 5 to see raw data or key 6 to see plots. This allows him to go back and forth as often as he wishes in order to make changes. Hence, if he made a change in the data and saw in the plots that he still did not like it, another change could easily be made.

In our example, continuation to a new univariate analysis is now indicated. Figures 4.24 and 4.25 show the new output for the variable ENG. Here, both factors are significant and outliers are no longer indicated. Thus, in the example, the faulty data point did produce obvious changes in the univariate analysis. On the other hand, even where faulty data make no obvious changes in the univariate analysis they could still influence the multivariate analysis in an unpredictable manner.

Once an edited analysis has successfully been made, the user may indicate a multivariate analysis by the depression of key 4. Once the multivariate option has been indicated, the user is given the opportunity to delete any of the response variables. After having studied the univariate results, the user may wish to exclude some of the variables from the multivariate pass. For example, a variable which shows an insignificant F-value even for subtotals serves no good purpose in the multivariate analysis and may dilute it. As each response variable name is displayed on the screen, the user should depress key 1 to include the variable in the multivariate analysis or key 2 to exclude it from the analysis. Once the user has made a decision on each name, he will be given the opportunity to revise his list if he should have made a mistake.

In the example we will include all the variables in the multivariate pass. This will give sample output as seen in Figures 4.27 - 4.30. The multivariate output includes likelihood ratio tests, union-intersection tests, weights of the discriminant functions, correlation between each variable and the discriminant function, E matrix of sums of squares and cross products for error, E^{-1} , and correlation matrices based on E and $H + E$ for each H (see Section 3.2).

At the end of the multivariate output is a message instructing the user to depress key 31 if he wishes to terminate or key 4 for another multivariate analysis which might be indicated to investigate new combinations of response variables. Once again the user is still free to depress key 3 to go back to continue study of the output. Although the data should have been edited completely before the

multivariate analysis, the user may still depress key 6 to see plots or depress key 5 to see raw data.

OUTPUT AREA

THIS PROGRAM IS DESIGNED TO PERFORM AN ANALYSIS OF IRREGULAR DATA. YOU MAY HAVE A MAXIMUM OF 10 RESPONSE VARIABLES AND A MAXIMUM OF 2 FACTORS. YOUR DESIGN MAY BE QUITE UNBALANCED, AND WHOLE CELLS MAY BE MISSING. TRANSFORMATIONS CAN BE MADE. FOR EACH PAIR OF FACTORS, AN ANALYSIS OF VARIANCE IS PERFORMED FOR EACH RESPONSE VARIABLE, SEPARATELY. ONCE YOU SEE THESE UNIVARIATE ANALYSES YOU WILL BE GIVEN THE OPPORTUNITY TO SEE PLOTS OF YOUR DATA AND THE RAW DATA AGAIN. THUS, YOU WILL BE ABLE TO EDIT YOUR DATA AND RUN THE ANALYSES AGAIN.

TO BEGIN YOU MUST ANSWER QUESTIONS BY USING THE TYPEWRITER KEYBOARD DIRECTLY IN FRONT OF YOU. TO SIGNAL YOUR COMPLETION OF QUESTIONS, FIRST DEPRESS THE "ALT" KEY, AND WHILE HOLDING IT DOWN, DEPRESS THE "5" KEY. THIS SEQUENCE WILL LATER BE REFERRED TO AS "EOB". ONCE YOU ANSWER QUESTIONS, THE ANSWERS WILL BE DISPLAYED BACK TO YOU. IF YOU ARE NOT SATISFIED, PRESS KEY 2 TO REENTER DATA; OTHERWISE, THE PROGRAM WILL CONTINUE BY YOUR PRESSING ANY KEY.

AT ANY TIME YOU MAY RESTART BY PRESSING KEY 30 OR TERMINATE BY PRESSING KEY 31.

CAUTION: DO NOT TRY TO SPEED UP THE PROGRAM BY ANSWERING QUESTIONS BEFORE THEY ARE ASKED. THIS WILL ONLY CREATE PROBLEMS.

IF YOU HAVE PREVIOUSLY USED THIS PROGRAM OR ENTERED YOUR DATA THROUGH BATCH MODE, PRESS KEY 2 TO SEE YOUR DATA.

PRESS KEY 1 TO PROCEED.

REPLY AREA

Figure 4.1

OUTPUT AREA

IF YOU DESIRE TO HAVE A TITLE TO HEAD YOUR OUTPUT, ENTER IT NOW.
IF YOU DO NOT DESIRE A TITLE, LEAVE THE RESPONSE AREA BLANK.

YOUR TITLE IS
EFFECTIVENESS OF TEACHING

REPLY AREA

Figure 4.2

OUTPUT AREA

FOR EACH RESPONSE VARIABLE ENTER A TRANSFORMATION CODE FROM THE FOLLOWING LIST:

CODE	TRANSFORMATION
0,1	NO TRANSFORMATION
2	$\text{LOGE}(X)$ ($X > 0$)
3	$\text{LOGE}(1+X)$ ($X > -1$)
4	$\text{SQRT}(X)$ ($X \geq 0$)
5	$1/X$ ($X > 0$)
6	$\text{ARCSIN}(2X-1)$ ($0 < X < 1$)
7	VARIANCE-STABILIZING TRANSFORMATION FOR PROPORTIONS AVAILABLE (NOW: NO TRANSFORMATION)

SEPARATE ALL ANSWERS BY COMMAS.

ENG	ARIT	SCIE
1	1	1

 REPLY AREA

Figure 4.3

OUTPUT AREA

YOUR FACTORS SHOULD BE IN DISCRETE LEVELS AS 1, 2, ..., 12. BUT
IF YOUR DATA IS CONTINUOUS, GROUPING CAN BE DONE FOR YOU. BUT
IF YOUR LEVELS ARE ALREADY DISCRETELY DEFINED, PRESS KEY 1.
IF YOUR DATA IS CONTINUOUS, PRESS KEY 2.

REPLY AREA

Figure 4.4

OUTPUT AREA

TO GROUP THE DATA, ASSIGN EACH LEVEL OF THE FACTOR AN "END CODE"
OR AN IDENTIFIER; EG, IF ONE OF THE FACTORS IS AGE RANGING FROM
5 YEARS TO 25 YEARS, WE MAY WISH TO ASSIGN AGES TO LEVELS AS

5-9 YEARS	LEVEL 1
10-14 YEARS	LEVEL 2
15-19 YEARS	LEVEL 3
20-25 YEARS	LEVEL 4

THEN THE END CODE FOR LEVEL 1 WOULD BE 9, THE END CODE FOR
LEVEL 2 WOULD BE 14, ETC.
THIS DATA WOULD BE ENTERED AS 9,14,19,25

WHAT ARE THE "END CODES" FOR THE 2 LEVELS OF FACTOR SEX ?
WHAT ARE THE "END CODES" FOR THE 3 LEVELS OF FACTOR TYPE?

REPLY AREA

Figure 4.5

OUTPUT AREA

THE "END CODES" FOR THE 2 LEVELS OF FACTOR SEX
1 2
THE "END CODES" FOR THE 3 LEVELS OF FACTOR TYPE
1 2 3

REPLY AREA

Figure 4.6

OUTPUT AREA

NOW YOU MUST SUPPLY THE DATA. YOU WILL NEED TO INDICATE THE LEVELS OF THE FACTORS AND THE RESPONSE OF EACH VARIABLE.

EXAMPLE: 2,7,412,34,5

INDICATES FACTOR 1 IS AT LEVEL 2, FACTOR 2 IS AT LEVEL 7,

THE RESPONSE FOR VARIABLE 1 IS 412, THE RESPONSE FOR

VARIABLE 2 IS 34, AND THE RESPONSE FOR VARIABLE 3 IS 5.

IF YOU WANT TO OMIT DATA ON A PARTICULAR RANDOM VARIABLE, REPLACE IT BY -999.

EXAMPLE: 2,7,412,-999,5

INDICATES THAT THE DATA FOR THE SECOND RESPONSE VARIABLE IS OMITTED.

WHEN YOU HAVE ENTERED ALL DATA, PRESS KEY 3.

SHOULD YOU REALIZE YOU HAVE A MISTAKE IN YOUR DATA, TYPE "BACK" AND THE NUMBER OF ENTRIES YOU WISH TO GO BACK.

WHEN YOU ARE READY TO ENTER YOUR DATA, PRESS KEY 1.

REPLY AREA

Figure 4.7

OUTPUT AREA

THE ANALYSES ON THE FOLLOWING VARIABLES ARE NOW COMPLETE.
ENG ARIT

PRESS KEY 1 TO CONTINUE WITH CALCULATIONS OR KEY 2 TO STOP
CALCULATIONS AT THIS STAGE.

REPLY AREA

Figure 4.8

OUTPUT AREA

KEYBOARD FUNCTIONS:

- 1 ALTERNATE PORTION OF CURRENT PAGE.
- 2 INCREMENT PAGE NUMBER.
- 3 DECREMENT PAGE NUMBER.
- 30 RESTART PROGRAM.
- 31 TERMINATE PROGRAM.

PRESS KEY 1 TO PROCEED TO THE FIRST PAGE OF YOUR UNIVARIATE RESULTS.

REPLY AREA

Figure 4.9

OUTPUT AREA

PAGE 1L

AT THIS POINT YOU SHOULD INSPECT YOUR UNIVARIATE RESULTS VERY CAREFULLY.

IS THERE A LARGE INTERACTION VERSUS ERROR F-RATIO?
THIS MAY INDICATE THE PRESENCE OF OUTLIERS OR FAULTY DATA.

CHECK THE TABLE OF CELL TOTALS OF VARIABLES WITH LARGE F-RATIOS
FOR LARGE STANDARD DEVIATIONS OR FOR A CELL MEAN WHICH DEVIATES
IRREGULARLY FROM A TREND IN ROWS OR COLUMNS.

AFTER YOU HAVE CHECKED THESE RESULTS YOU CAN CHECK AND EDIT
YOUR DATA.

REPLY AREA

Figure 4.10

OUTPUT AREA

PAGE 2L

EFFECTIVENESS OF TEACHING

VARIABLE (ENG) TABLE OF MEANS

ROWS = IN EACH BLOCK, ROW 1 DENOTES C O L U M N S = TYPE
 SEX CODED CELL MEANS, ROW 2 DENOTES
 LEV. 1 2 3 C O D E D L E V E L S

1 5.537E 01 5.352E 01 5.817E 01 5.546E 01
 7.798E-01 5.000E-01 1.450E 00
 2 5.724E 01 5.842E 01 6.006E 01 5.859E 01
 1.671E 00 3.635E 00 2.664E 00

COL. 5.641E 01 5.597E 01 5.935E 01 5.721E 01
 9 8 8 25

ESTIMATES OF SEX ADJUSTED MEANS, ORDERED

5.847E 01 5.561E 01

ESTIMATES OF TYPE ADJUSTED MEANS, ORDERED

5.916E 01 5.642E 01 5.615E 01

ANALYSIS OF VARIANCE FOR VARIABLE ENG

SOURCE OF VARIATION	D.F.	SUM OF SQUARES
SEX (ROWS)	1	5.019498E 01
TYPE (COLS)	2	4.413355E 01
SEX * TYPE (INTERACTION)	2	1.227552E 01
SUBTOTALS	5	1.170524D 02
ERROR	19	7.397502D 01
TOTAL	24	1.910274D 02

REPLY AREA

Figure 4.11

OUTPUT AREA

PAGE 2R

AND EFFECTS (SEX) VERSUS (TYPE) .

CELL SIZE, AND ROW 3 DENOTES STANDARD DEVIATION.

MEAN SQUARE	F VS. ERROR	F VS. INTERACTION
1.175292E 04	1.207E 00	1.065E 00
1.127447E 04	1.158E 00	1.022E 00
1.103074E 04	1.133E 00	
1.078300E 04	1.107E 00	
9.739313E 03		
9.956746E 03		
ROOT MEAN SQUARE ERROR =	9.868796E 01	
ROOT MEAN SQUARE INTERACTION =	1.050273E 02	

 REPLY AREA

Figure 4.12

OUTPUT AREA

PAGE 3L

EFFECTIVENESS OF TEACHING

VARIABLE (ARIT) TABLE OF MEANS

ROWS =
 SEX IN EACH BLOCK, ROW 1 DENOTES CELL MEANS, ROW 2 DENOTES
 CODED C O L U M N S = TYPE
 LEV. 1 2 3 C O D E D L E V E L S

1 5.430E 01 6.060E 01 5.990E 01 5.812E 01
 4 4 3 11
 3.962E 00 3.374E 00 6.255E 00

2 4.894E 01 5.905E 01 5.972E 01 5.568E 01
 5 4 5 14
 2.038E 00 6.604E 00 6.910E 00

COL. 5.132E 01 5.982E 01 5.979E 01 5.675E 01
 9 8 8 25

ESTIMATES OF SEX ADJUSTED MEANS, ORDERED

1 2
 5.816E 01 5.564E 01

ESTIMATES OF TYPE ADJUSTED MEANS, ORDERED

3 2 1
 5.995E 01 5.967E 01 5.131E 01

ANALYSIS OF VARIANCE FOR VARIABLE ARIT

SOURCE OF VARIATION	D.F.	SUM OF SQUARES
SEX (ROWS)	1	3.863693E 01
TYPE (COLS)	2	4.165764E 02
SEX * TYPE (INTERACTION)	2	3.007245E 01
SUBTOTALS	5	4.833116D 02
ERROR	19	4.979627D 02
TOTAL	24	9.812743D 02

REPLY AREA

Figure 4.13

OUTPUT AREA

PAGE 3R

AND EFFECTS (SEX) VERSUS (TYPE)

CELL SIZE, AND ROW 3 DENOTES STANDARD DEVIATION.

MEAN SQUARE	F VS. ERROR	F VS. INTERACTION
3.863693E 01	1.474E 00	2.570E 00
2.082882E 02	7.447E 00	1.385E 01
1.503622E 01	5.737E-01	
9.666231E 01	3.688E 00	
2.620856E 01		
4.088643E 01		
ROOT MEAN SQUARE ERROR =		5.119430E 00
ROOT MEAN SQUARE INTERACTION =		3.877657E 00

 REPLY AREA

Figure 4.14

OUTPUT AREA

PAGE 4L

EFFECTIVENESS OF TEACHING

VARIABLE (SCIE) TABLE OF MEANS

ROWS =
 SEX
 CODED
 LEV. 1 2 3

IN EACH BLOCK, ROW 1 DENOTES CELL MEANS, ROW 2 DENOTES
 C O L U M N S = TYPE
 C O D E D L E V E L S

1 4.155E 01 4.417E 01 4.867E 01 4.445E 01
 4 4 3 11
 3.798E 00 2.410E 00 1.474E 00
 2 4.344E 01 4.605E 01 4.858E 01 4.602E 01
 5 4 5 14
 4.297E 00 2.767E 00 1.543E 00

COL.
 4.260E 01 4.511E 01 4.861E 01 4.533E 01
 9 8 8 25

ESTIMATES OF SEX ADJUSTED MEANS, ORDERED

2 1
 4.589E 01 4.461E 01

ESTIMATES OF TYPE ADJUSTED MEANS, ORDERED

3 2 1
 4.853E 01 4.519E 01 4.261E 01

ANALYSIS OF VARIANCE FOR VARIABLE SCIE

SOURCE OF VARIATION	D.F.	SUM OF SQUARES
SEX (ROWS)	1	9.946443E 00
TYPE (COLS)	2	1.482998E 02
SEX * TYPE (INTERACTION)	2	5.036934E 00
SUBTOTALS	5	1.686363D 02
ERROR	19	1.714142D 02
TOTAL	24	3.400505D 02

REPLY AREA

Figure 4.15

OUTPUT AREA

PAGE 4R

AND EFFECTS (SEX) VERSUS (TYPE)

CELL SIZE, AND ROW 3 DENOTES STANDARD DEVIATION.

MEAN SQUARE	F VS. ERROR	F VS. INTERACTION
9.946443E 00	1.102E 00	3.949E 00
7.414990E 01	8.219E 00	2.944E 01
2.518467E 00	2.792E-01	
3.372726E 01	3.738E 00	
9.021797E 00		
1.416877E-01		

ROOT MEAN SQUARE ERROR = 3.003631E 00
 ROOT MEAN SQUARE INTERACTION = 1.586967E 00

 REPLY AREA

Figure 4.16

OUTPUT AREA

AT THIS STAGE YOU MAY LOOK AT PLOTS OF YOUR DATA POINTS. YOU HAVE THE CHOICE OF SEEING A CELL, A ROW, A COLUMN, OR ALL YOUR DATA. TO INDICATE YOUR CHOICE OF POINTS, TYPE IN THE LEVELS OF BOTH FACTORS. IF YOU WISH TO SEE ALL LEVELS OF A FACTOR TYPE "0" FOR THE LEVEL.

EXAMPLE: 2,2 INDICATES BOTH LEVELS AT 2.
0,4 INDICATES THE 4TH COLUMN.
3,0 INDICATES THE 3RD ROW.
0,0 INDICATES ALL POINTS.

WHICH SET OF POINTS DO YOU WISH TO SEE?

WHICH TWO RESPONSE VARIABLES DO YOU WISH TO SEE?
PLEASE ENTER THE FIRST, EOB, AND THE SECOND, EOB.

REPLY AREA

Figure 4.17

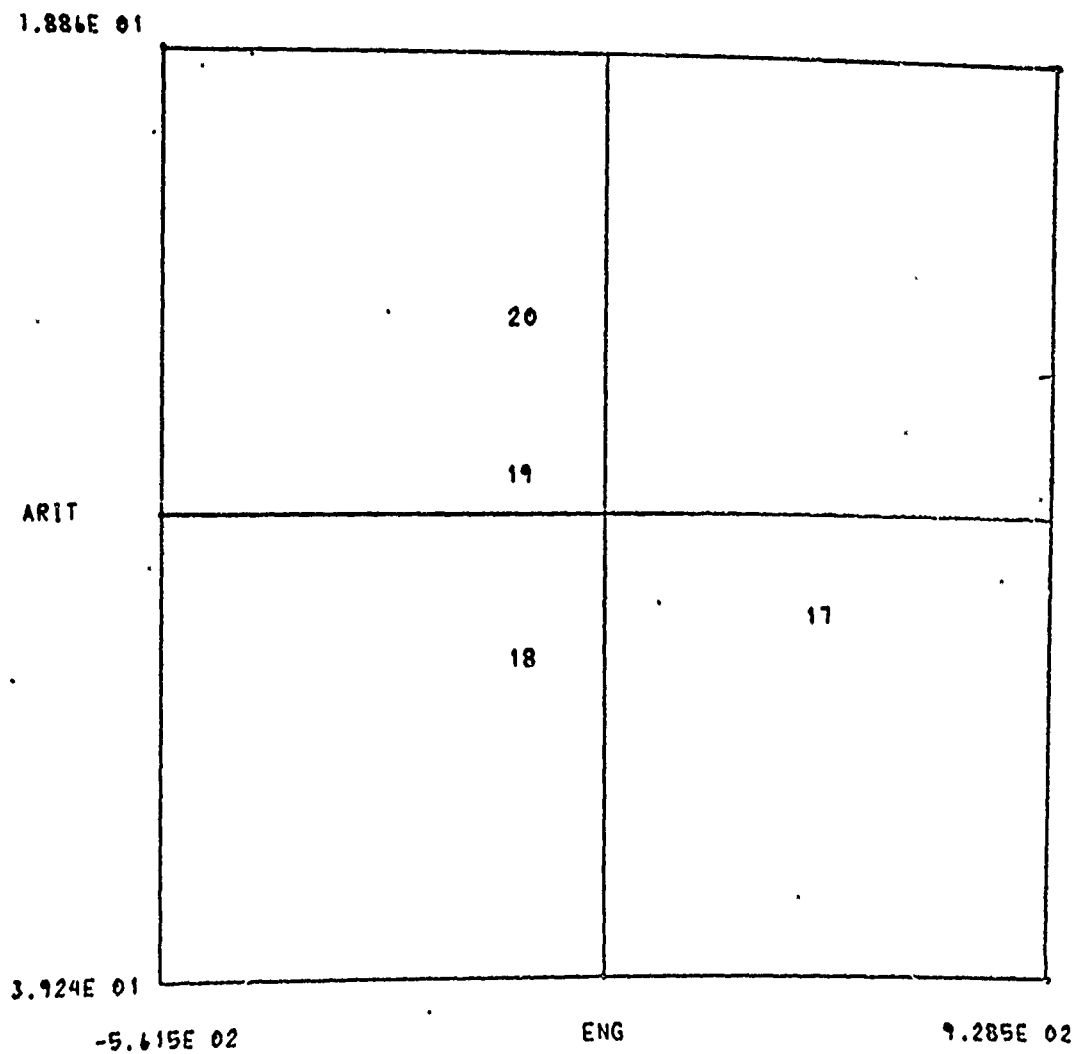


Figure 4.18

.435E 01

SCIE

.775E 01

-5.615E 02

ENG

9.285E 02

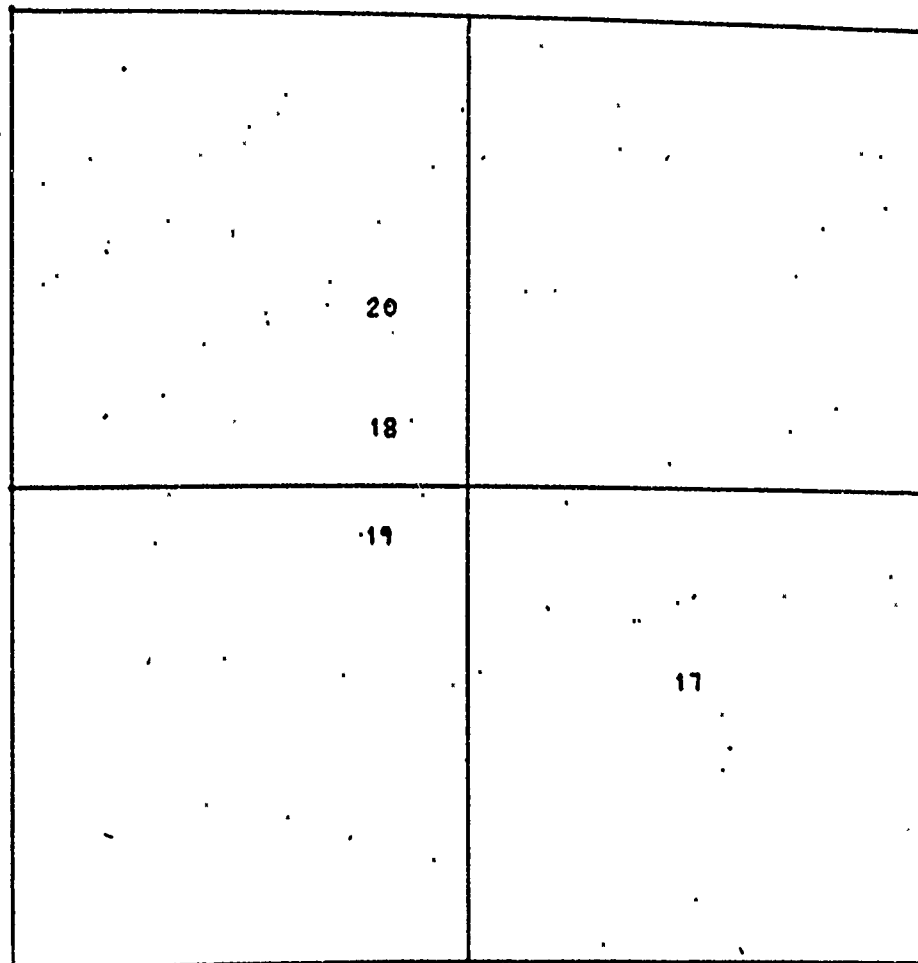


Figure 4.19

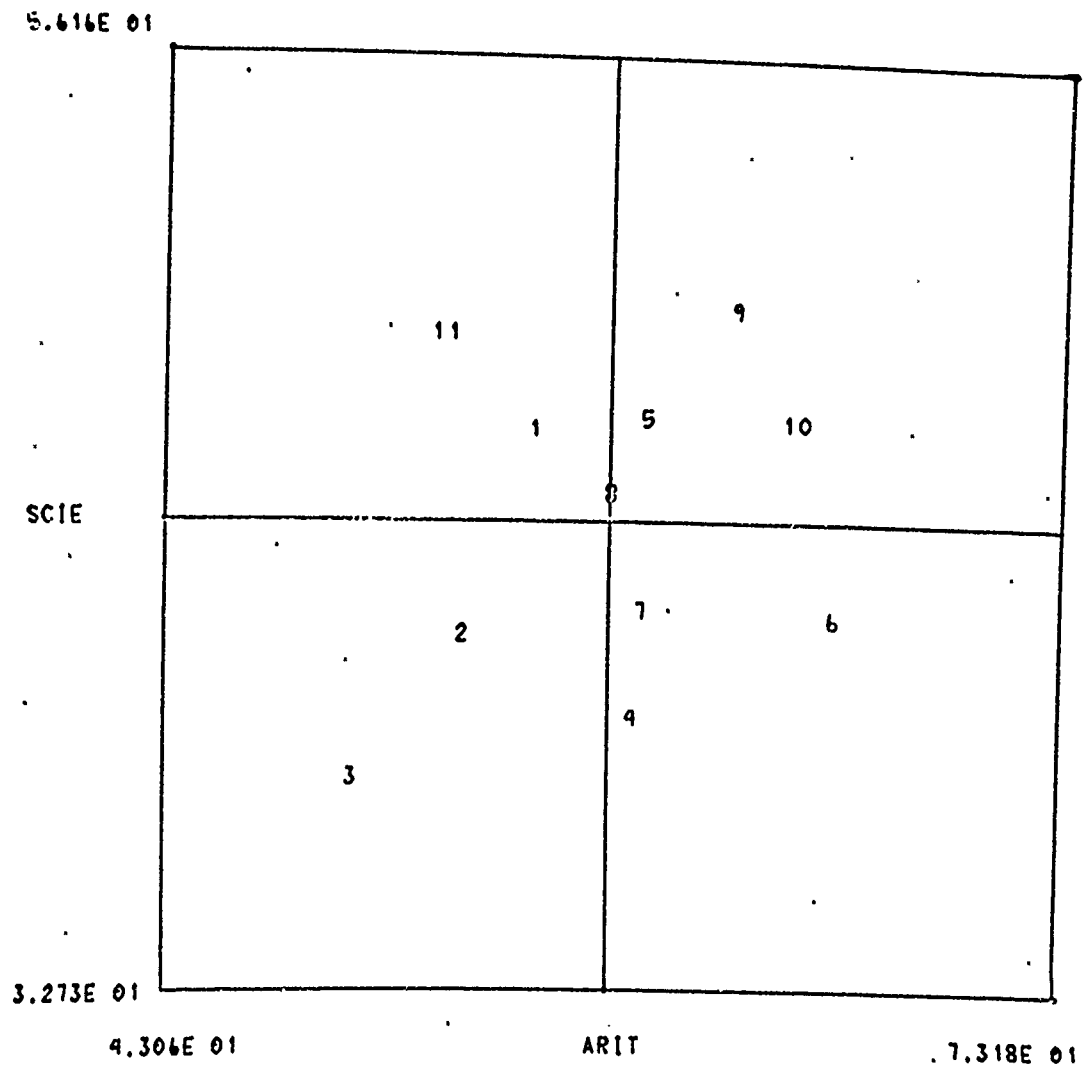


Figure 4.20

5.446E 01

SCFE

3.074E 01

3.934E 01

ARIT

6.330E 01

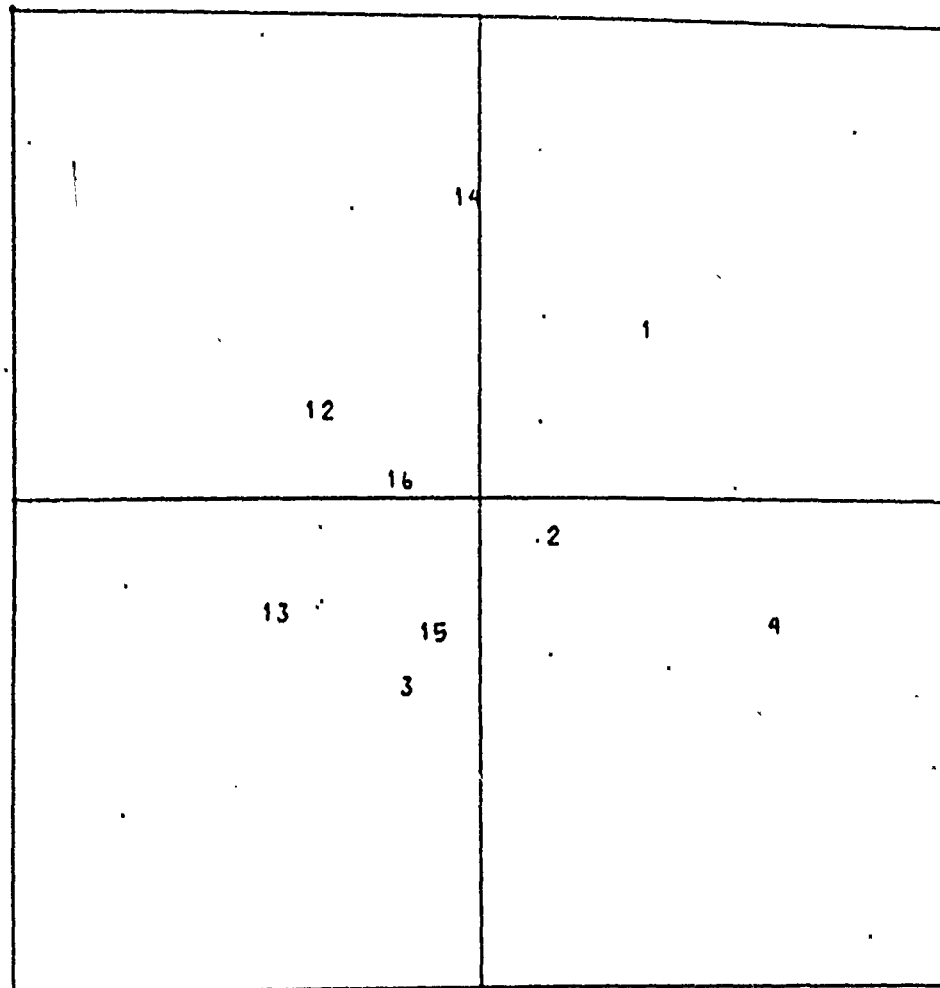


Figure 4.21

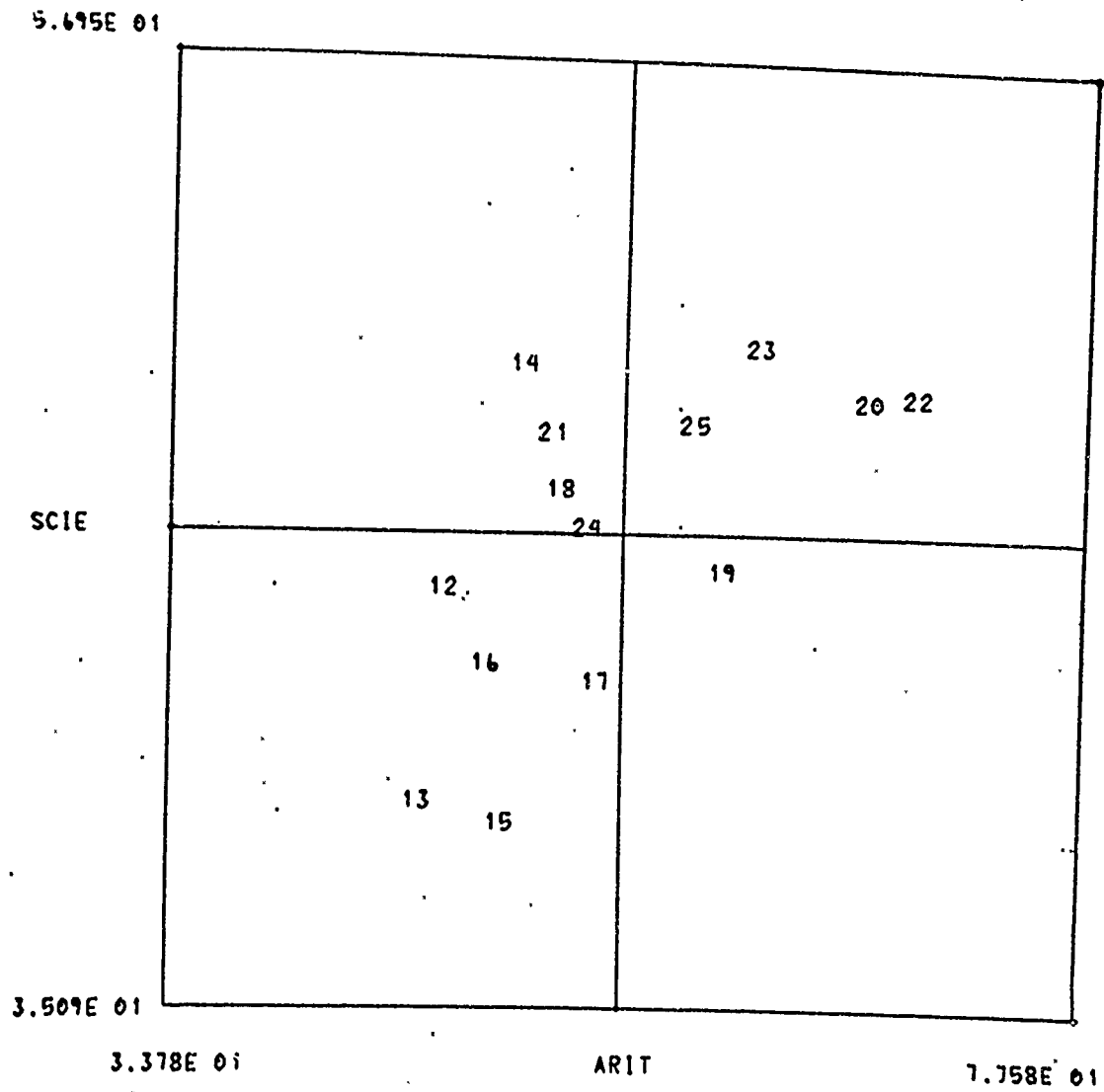


Figure 4.22

			OUTPUT AREA			
SEX TYPE			ENG	ARIT	SCIE	
1	1	1	5.510E 01	5.560E 01	4.680E	01
2	1	1	5.610E 01	5.320E 01	4.170E	01
3	1	1	5.590E 01	4.950E 01	3.810E	01
4	1	1	5.440E 01	5.890E 01	3.960E	01
5	1	2	5.280E 01	5.940E 01	4.710E	01
6	1	2	5.360E 01	6.560E 01	4.210E	01
7	1	2	5.390E 01	5.920E 01	4.230E	01
8	1	2	5.380E 01	5.820E 01	4.520E	01
9	1	3	5.670E 01	6.230E 01	4.980E	01
10	1	3	5.820E 01	6.460E 01	4.700E	01
11	1	3	5.960E 01	5.280E 01	4.920E	01
12	2	1	5.700E 01	4.740E 01	4.480E	01
13	2	1	5.560E 01	4.630E 01	3.990E	01
14	2	1	5.800E 01	5.120E 01	5.000E	01
15	2	1	5.590E 01	5.030E 01	3.940E	01
16	2	1	5.970E 01	4.950E 01	4.310E	01
17	2	2	5.560E 02	5.480E 01	4.270E	01
18	2	2	6.170E 01	5.300E 01	4.710E	01
19	2	2	5.610E 01	6.080E 01	4.520E	01
20	2	2	6.030E 01	6.760E 01	4.920E	01
21	2	3	6.180E 01	5.260E 01	4.840E	01
22	2	3	5.560E 01	6.990E 01	4.930E	01
23	2	3	6.230E 01	6.240E 01	5.040E	01
24	2	3	5.990E 01	5.430E 01	4.620E	01
25	2	3	6.070E 01	5.940E 01	4.860E	01

 REPLY AREA

Figure 4.23

OUTPUT AREA

PAGE 2L

EFFECTIVENESS OF TEACHING

VARIABLE (ENG) TABLE OF MEANS

ROWS = SEX CODED LEV. 1 2 3 IN EACH BLOCK, ROW 1 DENOTES CELL MEANS, ROW 2 DENOTES C O L U M N S = TYPE C O D E D L E V E L S

1 5.537E 01 5.352E 01 5.817E 01 5.546E 01

7.798E-01 5.000E-01 1.450E 00

2 5.724E 01 1.835E 02 6.006E 01 9.433E 01

1.671E 00 2.483E 02 2.664E 00

COL. 5.641E 01 1.185E 02 5.935E 01 7.723E 01

ESTIMATES OF SEX ADJUSTED MEANS, ORDERED

9.655E 01 5.264E 01

ESTIMATES OF TYPE ADJUSTED MEANS, ORDERED

1.212E 02 5.661E 01 5.650E 01

ANALYSIS OF VARIANCE FOR VARIABLE ENG

SOURCE OF VARIATION	D.F.	SUM OF SQUARES
SEX (ROWS)	1	1.175292E 04
TYPE (COLS)	2	2.254894E 04
SEX * TYPE (INTERACTION)	2	2.206148E 04
SUBTOTALS	5	5.391499D 04
ERROR	19	1.850470D 05
TOTAL	24	2.389620D 05

REPLY AREA

Figure 4.24

OUTPUT AREA

PAGE 2R

AND EFFECTS (SEX) VERSUS (TYPE)

CELL SIZE, AND ROW 3 DENOTES STANDARD DEVIATION.

MEAN SQUARE	F VS. ERROR	F VS. INTERACTION
5.019498E 01	1.289E 01	8.178E 00
2.236678E 01	5.745E 00	3.644E 00
6.137757E 00	1.576E 00	
2.341048E 01	6.013E 00	
3.893421E 00		
7.959476E 00		

ROOT MEAN SQUARE ERROR = 1.973175E 00
 ROOT MEAN SQUARE INTERACTION = 2.477449E 00

REPLY AREA

Figure 4.25

OUTPUT AREA

YOUR RESPONSE VARIABLE NAMES WILL APPEAR BELOW ONE AT A TIME.
PRESS KEY 1 IF YOU WISH TO INCLUDE THE VARIABLE OR KEY 2 IF
YOU WISH TO DELETE THE VARIABLE.

ENG
ARIT
SCIE

THE ABOVE VARIABLES ARE THE ONES YOU DECIDED TO INCLUDE.
IF YOU AGREE, PRESS KEY 1; IF YOU WOULD LIKE TO TRY AGAIN,
PRESS KEY 2.

REPLY AREA

Figure 4.26

OUTPUT AREA

PAGE 4L

EFFECTIVENESS OF TEACHING

MULTIVARIA

MATRIX E AFTER ELIMINATION OF FA

ENG	7.3975E 01	ARIT	-6.2622E 01	SCIE	3.1886E 01
ARIT	-6.2622E 01	ARIT	4.9796E 02	SCIE	6.7739E 01
SCIE	3.1886E 01	ARIT	6.7739E 01	SCIE	1.7141E 02

STEPWISE LOG DETERMINANTS

ENG	4.3037E 00	ARIT	1.0402E 01	SCIE	1.5325E 01
-----	------------	------	------------	------	------------

CORRELATIONS BASED ON E

ENG	1.0000E 00	ARIT	-3.2628E-01	SCIE	2.8316E-01
ARIT	-3.2628E-01	ARIT	1.0000E 00	SCIE	2.3186E-01
SCIE	2.8316E-01	ARIT	2.3186E-01	SCIE	1.0000E 00

SUBTOTALS (ALL EFFECTS) SEX AND

LIKELIHOOD RATIO TEST STATISTIC, CHI-SQUARE = 0.3737E 02 WITH
SIGNIFICANT AT LEVEL 0.126E-02

MATRIX H+E

ENG	1.9106E 02	ARIT	-3.9992E 01	SCIE	1.3580E 02
ARIT	-3.9992E 01	ARIT	9.8129E 02	SCIE	2.4725E 02
ENG		ARIT		SCIE	

REPLY AREA

Figure 4.27

OUTPUT AREA

PAGE 5L

SCIE 1.3580E 02 2.4725E 02 3.4008E 02

CORRELATIONS BASED ON H+E

	ENG	ARIT	SCIE
ENG	1.0000E 00	-9.2361E-02	5.3272E-01

	ENG	ARIT	SCIE
ARIT	-9.2361E-02	1.0000E 00	4.2799E-01

	ENG	ARIT	SCIE
SCIE	5.3272E-01	4.2799E-01	1.0000E 00

STANDARDIZED ROY STATISTIC OR SQUARE OF A CANONICAL CORRELATION =
 READ HECK CHARTS WITH S = 3 M = 0.5 N = 7.5

WEIGHT OF DISCRIMINANT FUNCTION

	ENG	ARIT	SCIE
	4.6257E-02	1.2249E-02	8.4362E-03

CORRELATIONS BETWEEN DISCRIMINANT FUNCTION AND ORIGINAL VARIABLES

	ENG	ARIT	SCIE
	7.3635E-01	3.6639E-01	6.2056E-01

INTERACTION SEX * TYPE

LIKELIHOOD RATIO TEST STATISTIC, CHI-SQUARE = 0.5889E 01 WITH
 SIGNIFICANT AT LEVEL 0.437E 00

MATRIX H+E

	ENG	ARIT	SCIE
ENG	8.6326E 01	-5.6571E 01	3.5484E 01

	ENG	ARIT	SCIE
ARIT	-5.6571E 01	5.2809E 02	5.9087E 01

	ENG	ARIT	SCIE
SCIE	3.5484E 01	5.9087E 01	1.7649E 02

CORRELATIONS BASED ON H+E

REPLY AREA

Figure 4.28

OUTPUT AREA

PAGE 6L

	ENG	ARIT	SCIE
ENG	1.0000E 00	-2.6495E-01	2.8748E-01

	ENG	ARIT	SCIE
ARIT	-2.6495E-01	1.0000E 00	1.9354E-01

	ENG	ARIT	SCIE
SCIE	2.8748E-01	1.9354E-01	1.0000E 00

STANDARDIZED ROY STATISTIC OR SQUARE OF A CANONICAL CORRELATION =
 READ HECK CHARTS WITH S = 2 M = .0.0 N = 7.5

WEIGHT OF DISCRIMINANT FUNCTION

	ENG	ARIT	SCIE
	5.1753E-02	1.5122E-02	-1.6132E-02

CORRELATIONS BETWEEN DISCRIMINANT FUNCTION AND ORIGINAL VARIABLES

	ENG	ARIT	SCIE
	6.6301E-01	3.4509E-01	-1.6703E-02

SEX EFFECTS

TEST STATISTIC F = 3.8465 WITH 3. AND 17. D.F.

WEIGHT OF DISCRIMINANT FUNCTION

	ENG	ARIT	SCIE
	9.4707E-02	-7.1749E-04	1.0651E-03

CORRELATIONS BETWEEN DISCRIMINANT FUNCTION AND ORIGINAL VARIABLES

	ENG	ARIT	SCIE
	9.9981E-01	-3.3809E-01	2.9237E-01

TYPE EFFECTS

LIKELIHOOD RATIO TEST STATISTIC, CHI-SQUARE = 0.2271E 02 WITH
 SIGNIFICANT AT LEVEL 0.920E-03

MATRIX H+E

 REPLY AREA

Figure 4.29

OUTPUT AREA

PAGE 7L

	ENG	ARIT	SCIE
ENG	1.1871E 02	9.0370E-01	1.0189E 02
	ENG	ARIT	SCIE
ARIT	9.0370E-01	9.1454E 02	2.7959E 02
	ENG	ARIT	SCIE
SCIE	1.0189E 02	2.7959E 02	3.1971E 02

CORRELATIONS BASED ON H+E

	ENG	ARIT	SCIE
ENG	1.0000E 00	2.7427E-03	5.2303E-01
	ENG	ARIT	SCIE
ARIT	2.7427E-03	1.0000E 00	5.1707E-01
	ENG	ARIT	SCIE
SCIE	5.2303E-01	5.1707E-01	1.0000E 00

STANDARDIZED ROY STATISTIC OR SQUARE OF A CANONICAL CORRELATION =
 READ HECK CHARTS WITH S = 2 M = 0.0, N = 7.5

WEIGHT OF DISCRIMINANT FUNCTION

	ENG	ARIT	SCIE
	3.4649E-02	1.5876E-02	1.3041E-02

CORRELATIONS BETWEEN DISCRIMINANT FUNCTION AND ORIGINAL VARIABLES

	ENG	ARIT	SCIE
	4.7968E-01	6.1658E-01	7.0105E-01

 REPLY AREA

Figure 4.30

CHAPTER V

COMPUTER PROGRAMS

The computer programs were written in FORTRAN IV for the IBM 360 Model 65 and operate under Graphics Monitor System (GMS). Extensive use is made of the COMFORT and COMLOT graphics subroutine packages. The computational routines are from the MUDAID program, thus for more complete documentation, the reader is referred to A FORTRAN II PROGRAM FOR MUDAID: Multivariate, Univariate, and Discriminant Analysis of Irregular Data.

A load module under GMS is limited to 140K of core storage, and thus to reduce the size of the program an overlay structure was utilized. A main program or root was developed to control the flow of the program, and the remaining subroutines of the program were divided into segments which were not needed in core at the same time. Hence, several subroutines use the same core storage at different times. The overlay structure and listing of the job control cards are found at the end of this chapter.

This program uses five different data sets. Unit 11 (NW1) is a sequential file and is used to store the transformed data. Unit 12 (NW2) is also a sequential file and is used to store intermediate results and to pass them between overlays. Units 16, 17, and 38 are all direct access files. Units 16 (N1) and 17 (N2) each have 1980 records of 80 characters in length, are written under format control, and the associated variables are, respectively, IREC1 and IREC2. N1 and N2 are used to display output.

Unit 38 (N3) has 510 records of 80 characters in length, is written either with or without format control, and the associated variable is IREC3. N3 is used to store raw data for display and also to store selected common variables. N3 may be built within SPOOK or through the batch use of BUILD.

The main program serves as "traffic controller" to call the various subroutines. The order in which the subroutines is called depends largely on the variable N which is the number of the program function key depressed by the user. The main program also initially sets the variable MULT = 1 which forces the user to proceed through the univariate pass.

MAINA

This subroutine serves as control for the INPUT and PMATX subroutines. Once the multivariate option is indicated, MAINA only calls the subroutine PMATX.

INPUT

This subroutine is the main conversation unit of the entire program. By asking questions of the user, INPUT receives the raw data and provides the initial processing and storing of the data for future use.

In the general instructions, the user finds that key 30 can be depressed at any time to restart the program and that key 31 is the "panic button", i.e., any time it is depressed the program terminates. Each time the user answers a question, the answer will be displayed back to him and then he must either depress key 2 to recenter his response or any other key (not 30 or 31) to continue with the program. If an answer does not

fulfill the specific requirements, it will be displayed with an error message asking for the reentry of the response. Here, the program begins by asking the user if he has used the program previously or if he has entered his data by the use of the program BUILD. If the answer to this question is yes, the user is instructed to press program function key 2 to branch to statement 1001; otherwise, depression of key 1 will allow him to continue with the program and building of data.

The first query is for a study name header. This can be any combination of characters up to 60 characters in length. The title is optional and is used only for the heading of the output.

Beginning in statement 213 the user is asked for the number of response variables in his study. This number may range from one up to and including ten. If the number is not in this range, an error message is displayed asking for reentry of the response. In the 215 loop the user is asked to give each response variable a four character name or code so that he will be able to identify each variable in the output.

Each response variable can have a transformation assigned to it by the user selecting a code from the following list:

<u>Code</u>	<u>Transformation</u>
0, 1	no transformation
2	$\log_e(x)$ ($x > 0$)
3	$\log_e(1+x)$ ($x > -1$)
4	$\sqrt{x}$ ($x \geq 0$)
5	$1/x$ ($x > 0$)
6	$\arcsin(2x-1)$ ($0 < x < 1$)
7	available (now: no transformation)

A check is made to insure that the codes selected by the user are from the above list; if not, an error message appears. If the data assigned to a variable is "illegal" for the particular transformation, the data in question will then be set to -999 and thus later be ignored in the processing of data. An example of "illegal data" would be the square root or $\log_e$ of a negative number.

Because of limited space in the conversational mode, the user is limited to only two factors. As with the response variables, in loop 226 the user is asked to give each factor a four character name or code. Each factor may have a maximum of twelve levels. If the user has continuous data, the data will be encoded into levels by the user supplying "end codes". If one of the factors is age ranging from 5 to 25 years and is to be grouped as follows:

5 - 9 years	level 1
10 - 14 years	level 2
15 - 19 years	level 3
20 - 25 years	level 4

the end codes would be 9, 14, 19, and 25. Loop 844 provides the encoding of the levels.

The last of the conversational segment is the entering of the data. The user is asked to indicate the level of each factor and the response of each variable. If the data on a particular variable is to be omitted, the user is instructed to enter -999 and thus the data will be later ignored.

Immediately after each set of data is entered, the raw data is displayed back and is also placed on direct access unit 38 for future

use in the 1001 segment of INPUT. Then the 106 loop places the factor levels into the coded levels, the 102 loop processes the variable responses through the appropriate transformations, and the data is stored on NW1 for future use.

Program function key 2 is no longer used to reenter data. Instead, the user types "BACK" and the number of entries he wants to go back. Then in the 380 loop the appropriate number of entries is removed from the screen, and NW1 and N3 are reset to the appropriate places. If only the work "BACK" is entered, only one entry is removed.

When all the data have been entered, the user depresses key 3 to indicate this. Control is then passed back to MAINA to begin the calculations.

The last segment of the INPUT routine begins at statement 1001 and is not accessible to the user until he has either seen the univariate results or has previously entered his data. The raw data are displayed from N3 and the segment allows the user to edit his data. To delete a record, the user types "DROP" and the subject number. The variable responses are then replaced by -999 which is always ignored in the calculations. To add data, the user gives the next subject number and the new record. The variable NSUBJ (number of data records) is then incremented. To change a record, the user types the record number and the new record. At this stage, changes are made only on the N3 unit. Once all the changes to the data are made, new transformations may be indicated. The data are then read from N3, reprocessed through the 106 and 102 loops, and stored on NW1 before the subroutine is left.

While in this segment of INPUT, the user may return to his previous univariate analysis output by depression of key 29 or to the plots of his data by depression of key 6.

A flow chart of this subroutine is included at the end of this chapter.

PMATX

This subroutine processes the data stored by INPUT on NW1. An initial decision is made depending on the value of the variable MULT. If MULT = 1, a univariate analysis is made; if MULT = 0, a multivariate analysis is made.

In the univariate pass (statements 511 - 600), the data are first checked for omitted data (-999). If missing data are found, the observation is ignored. PMATX stores on NW2 the following arrays: NN which consists of the incidence matrices, SUBT which is the array of cell totals, DSS which is the array of sums of squares in each cell, and DSQU which is the vector of the sum of squares of all observations for each variable, the latter being in double precision.

In the multivariate pass (statements 510 - 520), the number of variables to be used (NLUV) is first calculated by counting the nonzero elements in LUV. NLUV and NVBL are then exchanged. This exchange retains the value of NVBL so that the multivariate pass can be executed as many times as desired as if it were the first. Here, if missing data are found in any part of the record (signalled by ISET(13)), the entire record is eliminated. Also, if the LUV element for a variable is 0, the data for this variable are ignored. Once each record has been

processed through statement 505, the LUV vector is restored to its original values so that correct values will be obtained in all records.

For this multivariate pass, PMATX also stores, on NW2, DSSCP which is a matrix of sums of squares and cross products.

MAINC

For each response variable, the arrays DSSCP, NN, DSS, SUBT, and the vector DSQU are read from NW2. Because NN, DSS, and SUBT are read when needed, the storage areas are equivalenced thus reducing the size of the subroutine. An incidence matrix NN1 is constructed from NN; a matrix of sums of squares SS is constructed from DSS; a matrix of subtotals SUB is constructed from SUBT; and a variable DSQV which is the sum of squares of all observations is produced from the vector DSQU. MAINC then calls ANOT which performs the univariate analysis of each variable. After ANOT returns control, intermediate results once again are stored on NW2.

ANOT

This subroutine is called from MAINC once for each response variable. ANOT performs the univariate analysis by the use of adjusted normal equations.

If the number of rows is greater than the number of columns, exchanges are made in NR and NC, NX (incidence matrix), SQRX (cell sum of squares matrix), SUBX (cell totals matrix), and the variable IFLAG is set to 1. If any rows or columns are empty, a compacting routine then eliminates the rows or columns from NX, SQRX, and SUBX. Calculations of

the number of observations in each row (NIDOT), unadjusted row totals (R), number of observations in each column (NDOTJ), unadjusted column totals (C), grand total (G), total number of observations (NN), grand mean (GM), corrected sum of squares for total (SSTO), sum of squares for subtotals (SSB), sum of squares for error (SSE) are completed. In loop 60 the matrix CX of the "adjusted normal equations" and vector Q (vector of "adjusted row totals") are calculated. Loop 288 calculates the adjusted column totals (QB). The adjusted normal equations and adjusted row totals are reduced by one so the EQSYM inverts an $(r-1) \times (r-1)$ matrix. Estimates of row effects (RE) and column effects (CE) are both obtained by statement 216. Loop 92 obtains the cell standard deviations.

The analysis of variance begins with statement 215. Sums of squares, mean squares, F-ratios, and estimates of adjusted means (ordered) are all completed by statement 246.

The table for each variable which includes cell means, the number of observations in each cell, the standard deviation for each cell, unadjusted row and column means, estimates of row and column effects, and an analysis of variance table containing sums of squares, mean squares, degrees of freedom, F versus error, and F versus interaction is then placed on N1 and N2.

If the rows and columns were exchanged originally, they are exchanged again. ANOT then calls INTER before returning control to MAINC. ANOT returns to MAINC the estimates of row effects (RE), estimates of column effects (CE), the adjusted row totals (Q), and the adjusted column totals (QB). MAINC then stores these results on NW2.

A description of the algorithms employed is given in Section 3.1.

EQSYM

This subroutine solves the adjusted normal equations by the inversion of an $(r-1) \times (r-1)$ matrix where r is the number of levels of the factor with the least number of levels.

INTER

This subroutine is called from ANOT just before control is returned to MAINC. It displays a message to the user indicating the variables on which analysis has been completed. The user then has the choice of pressing program function key 1 to continue with calculations or key 2 to stop calculations. If key 2 is depressed, the variable NVBL (number of response variables) is reset to the variable IV (the number of the last response variable on which analysis has been completed). Control is then returned to ANOT.

OUTPUT

This subroutine is to display to the user the direct access units 16 and 17 on which all output was placed. Since a normal printout page is 131 characters wide and the maximum number of characters on the screen is 74 characters, unit 16 contains the left side of a page and statements 15 - 17 control the display while unit 17 contains the right side of a page and statements 25 - 27 control its display.

The user may see his output by using three program function keys: key 1 alternates the portion of the current page, key 2 increments the page number, and key 3 decrements the page number.

When the user finishes with his univariate results he determines where control is passed by the use of the program function keys: if he wants to continue to his multivariate results, he presses key 4 which passes control to subroutine DELETE; if he wants to see and edit his data, he presses key 5 which passes control to the 1001 statement of the INPUT subroutine; if he wants to see plots of his data, he presses key 6 which passes control to the subroutine PLOT.

When the user finishes with his multivariate results, he is asked to depress program function key 31 to terminate the program or key 4 to perform another multivariate analysis. Although the option is not mentioned on the display, the user may do exactly as he could when he completed the univariate passes; i.e., key 5 will pass control to the 1001 statement of INPUT and key 6 will pass control to PLOT.

PLOT

This subroutine allows the user to see his data of any two response variables plotted. In the general instructions, he is told to indicate combination of all levels of a factor by "0". Thus, when he gives the set of points which he wishes to see

2,2	indicates the (2,2) cell
0,4	indicates the 4th column
3,0	indicates the 3rd row
0,0	indicates all data

if the rows are factor 1. A check is made to insure that the user has requested a "legal" display; i.e., if the 4th column does not

exist for his data the user will be given an error message and asked to reenter his data. The user enters his two variable names, and once again a check is made on whether the names match those given in INPUT.

Loop 75 scans the raw data on NW1, picks out the appropriate points, and begins calculations of the means and standard deviations for the two variables. Immediately after the 75 loop, if the particular plot has one or fewer points, the user is given an error message and is asked to reenter a new set of levels. The upper and lower limits for each variable are calculated as the mean $\pm$ three sigma limits.

The plot displays the record number of the points. Thus, the user can quickly pick out which records he is seeing.

Once the user has seen the plot, control of the program depends upon his choice of the program function keys: key 1 will allow him to see additional plots, key 5 will allow him to return to the 1001 statement of INPUT to see and edit his data, and key 29 will allow him to return to the previous univariate analysis. As always, key 30 will allow the user to restart the program and key 31 will allow him to terminate the program.

DELETE

This subroutine is called from the root when the user has decided to continue with the multivariate option. Initially, the variable MULT is set to 0 to indicate the multivariate pass in future subroutines.

Each response variable name is displayed, and the user is asked to press program function key 1 to include the variable or key 2 to delete the variable. If key 1 is depressed, LUV(IK) = 1K, MNLUV(IK) = 1K,

and $TNAM(IK) = VNAM(IK)$. If key 2 is depressed, $LUV(IK) = 0$, $MNLUV(IK) = 0$, $TNAM(IK) = BLANK$, and the name is erased from the screen. If the user is satisfied with the final list, beginning with statement 50 the $TNAM$ array is then compressed so that it contains only the names of the response variables to be included in the multivariate analysis. Control is then returned to the root.

MAINB

This subroutine is not called until the multivariate option is entered. $NW2$ is backspaced one record, the incidence matrix $NN1$ is read, and the $NW2$ is rewound. $DSSCP$ is read, and the NN , $SUBT$, DSS , and $DSQU$ are all bypassed by dummy read statements. $MAINB$ then uses the results from $ANOT$ to build the input for $GENHE$ which generates the H and E matrices (see Section 3.2). Once control is returned from $GENHE$, $MAINB$ stores the results on $NW2$.

GENHE

This subroutine uses the adjusted row effect estimates, adjusted row totals, adjusted column effect estimates, adjusted column totals, the subtotal matrices, and the incidence matrix to compute the elements of the H matrices (sums of squares and products for hypotheses) and the E matrix (sums of squares and products for error).

MAINE

Here the data which will be needed by $TEMAT$ are read from $NW2$. This subroutine also controls the intermediate output of results.

Before control is finally returned to the root, MAINE exchanges the values of NVBL and NLUV so that subsequent multivariate passes can have the original value of NVBL. This allows the user to use several different combinations of variables.

TEMAT

See Section 3.2.

TRI

This subroutine obtains the triangular matrix T such that $TT' = A$ where A is a symmetric Gramian matrix. If A is singular, T will be rectangular such that the number of columns is equal to the rank of A .

FACE

This subroutine is called from TEMAT and it obtains the largest root and associated eigenvector of a symmetric matrix.

WRIR

This subroutine is called from both MAINB and TEMAT. WRIR writes the symmetric matrices or vectors. The argument $NN = 0$ indicates vectors and $NN = 1$ indicates a symmetric matrix. Row and column numbers are replaced by names given to response variables (VNAME).

INSLD

This subroutine is called by EQSYM, MAINB, and TEMAT. INSLD obtains the inverse or conditional inverse of a Gramian matrix. It also obtains stepwise log-determinants, but if the matrix is singular these are just dummy values.

CHIX, GAMX, and YORMX

See Section 3.3.

ELGGM

This subroutine evaluates $\log_e \Gamma(x)$.

BUILD

This program is for the user of SPOOK who has voluminous data which are punched on cards. The user runs this batch program, and the needed data are stored on direct access unit 38 from where SPOOK obtains them.

Input cards must be prepared as follows:

Card 1:	Title: up to 60 alphameric characters beginning in column 1
Card 2:	Variable Designation and Transformations (see transformation codes under INPUT; blanks will be read as 0)
Col 1	blank
Col 2-3	number of response variables (≤ 10)
Col 4-7	4-character name for variable 1

Col 8 transformation code for variable 1
 Col 9-12 4-character name for variable 2
 Col 13 transformation code for variable 2

Col 49-52 4-character name for variable 10

Col 53 transformation code for variable 10

Card 3: Col 5 number of variable FORMAT cards (1-5)
 remaining columns may be blank or not; they will be
 ignored

Cards 4,5: One card for each of the two factors

Col 1 blank

Col 2-5 4-character name for factor

Col 6-8 blank

Col 9-10 number of levels (≤ 12)

Col 11 ignored by program; may or may not be
 filled

Col 12-14 "end code" for level 1 (see explanation
 under INPUT)

Col 15 ignored

Col 16-18 "end code" for level 2

Col 55 ignored

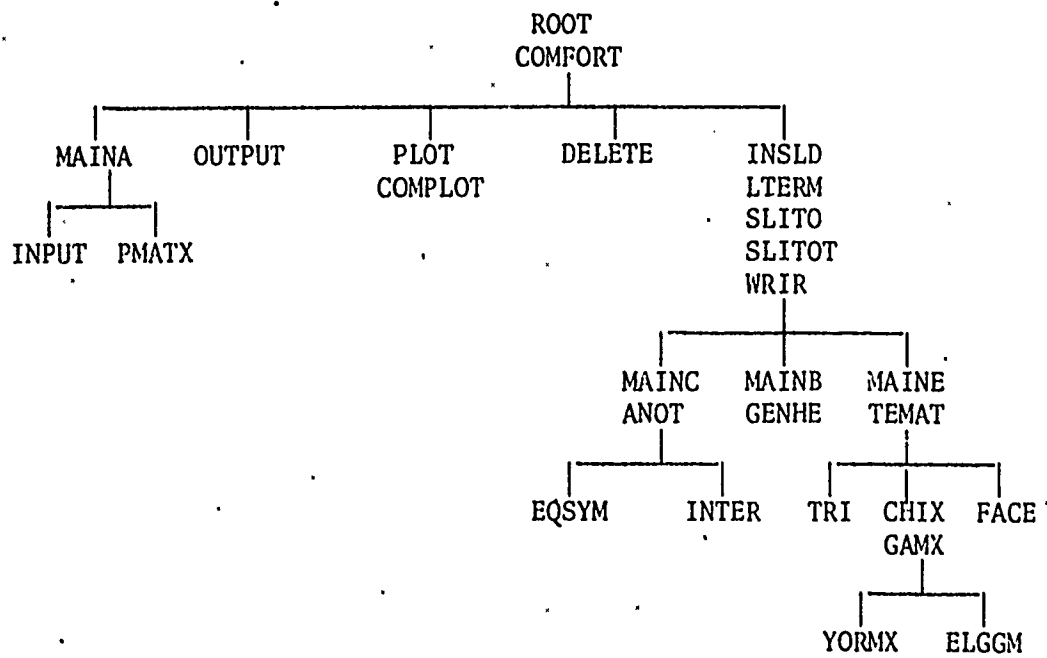
Col 56-58 "end code" for level 12

Cards 6-10: Variable FORMAT cards (number of cards must correspond to Col 5 of card 3); state the format for each record in usual FORTRAN FORMAT statement form; use all 80 columns of each card; start the first (or only) card with (, i.e., omit the word FORMAT; end the statement with); the factor levels are read first; hence, if the factor levels do not precede the variable responses, use T format.

Remaining cards are the data cards.

The output from this program is a list of the raw data as it will appear on the console when SPOOK is entered.

Overlay Structure



Job Control Cards for the Overlay Structure

ENTRY MAIN

OVERLAY ONE

INSERT MAINA

OVERLAY TWO

INSERT INPUT

OVERLAY TWO

INSERT PMATX

OVERLAY ONE

INSERT OUTPUT

OVERLAY ONE

INSERT PLOT, COM PLOT

OVERLAY ONE

INSERT DELETE

OVERLAY ONE

INSERT INSLD, LTERM, SLITO, SLITOT, WRIR

OVERLAY TWO

INSERT MAINC, ANOT

OVERLAY THREE

INSERT EQSYM

OVERLAY THREE

INSERT INTER

OVERLAY TWO

INSERT MAINB, GENIE

OVERLAY TWO

INSERT MAINE, TEMAT

OVERLAY THREE

INSERT TRI

OVERLAY THREE

INSERT FACE

OVERLAY THREE

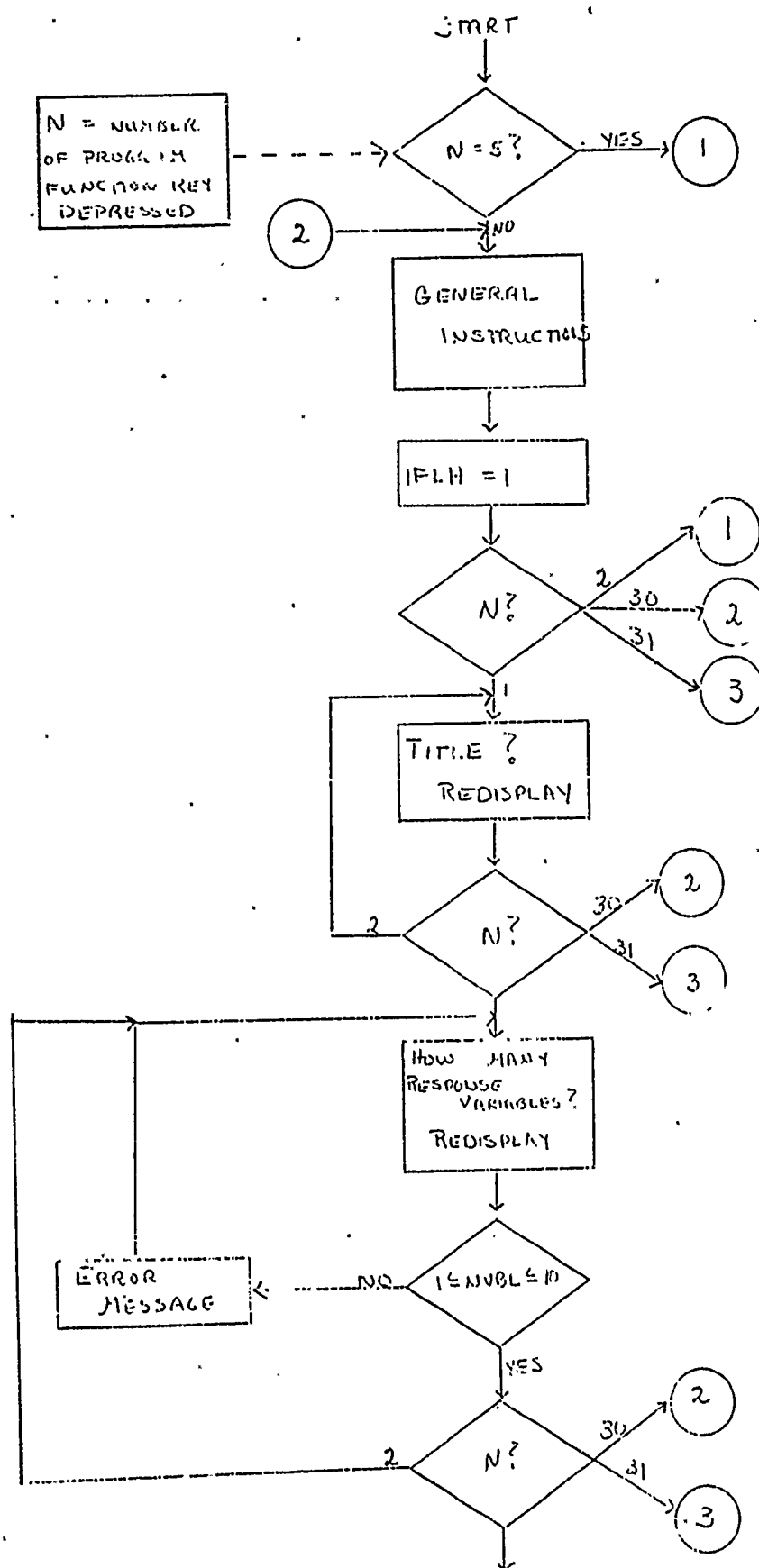
INSERT CHIX, GAMX

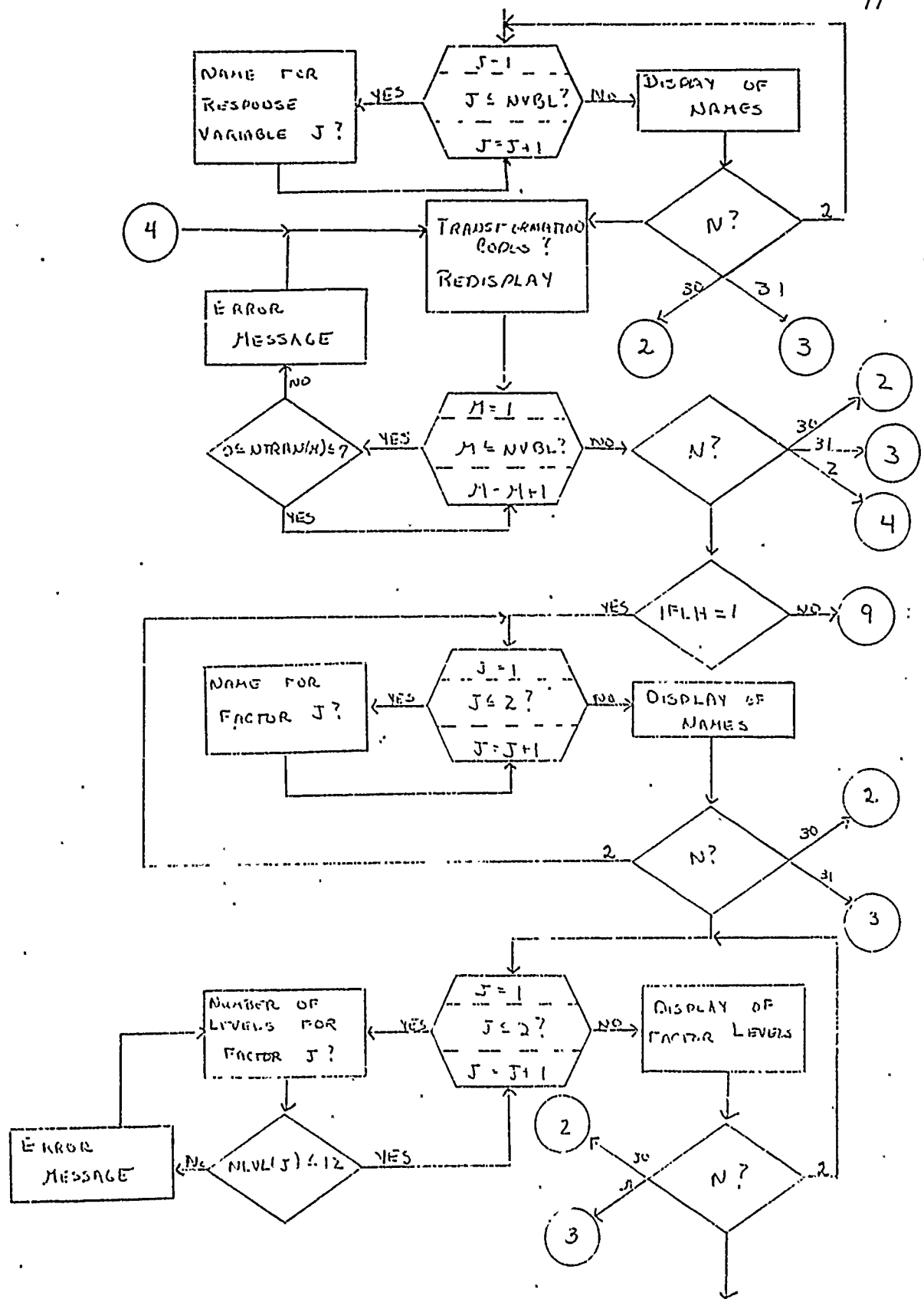
OVERLAY FOUR

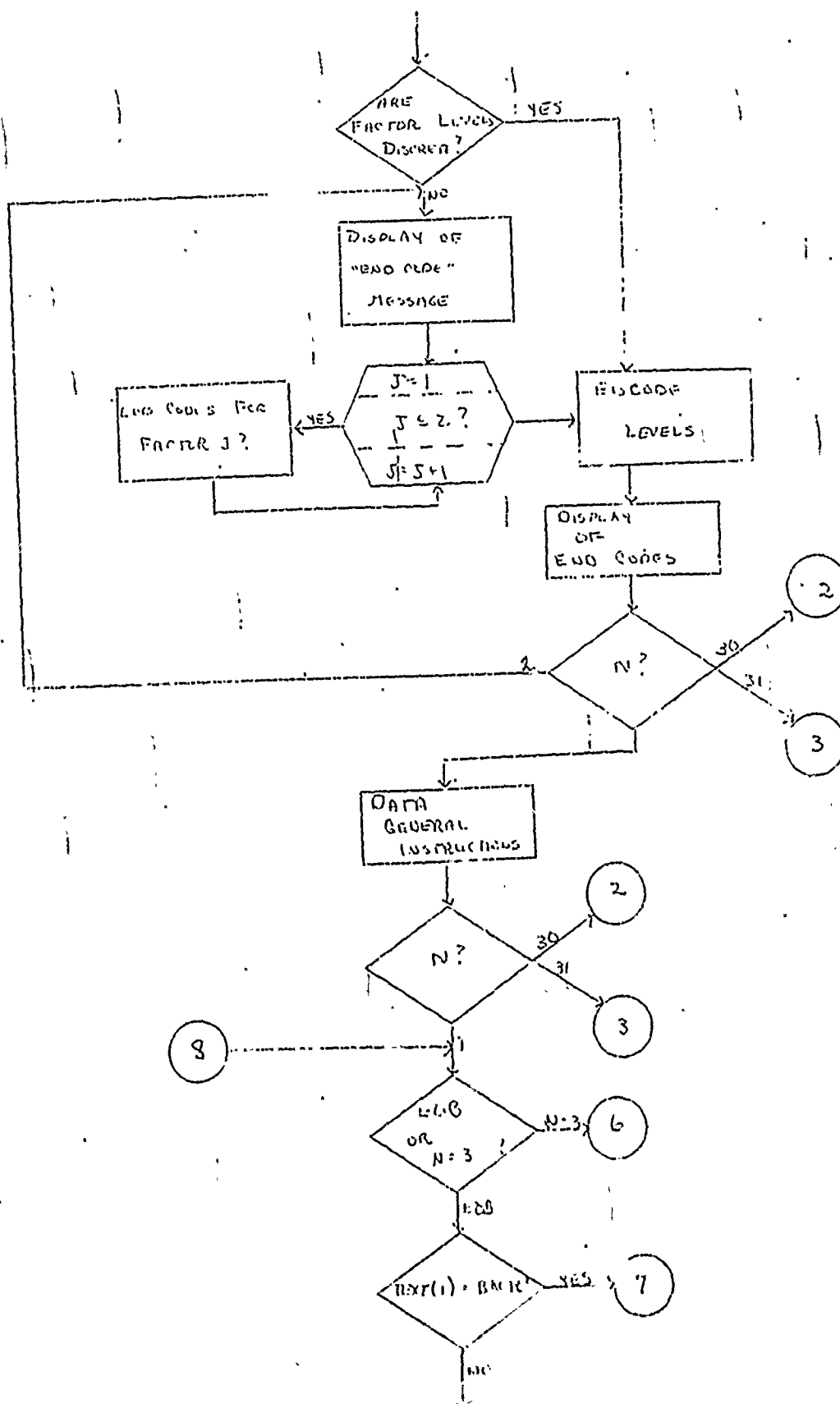
INSERT YORMX

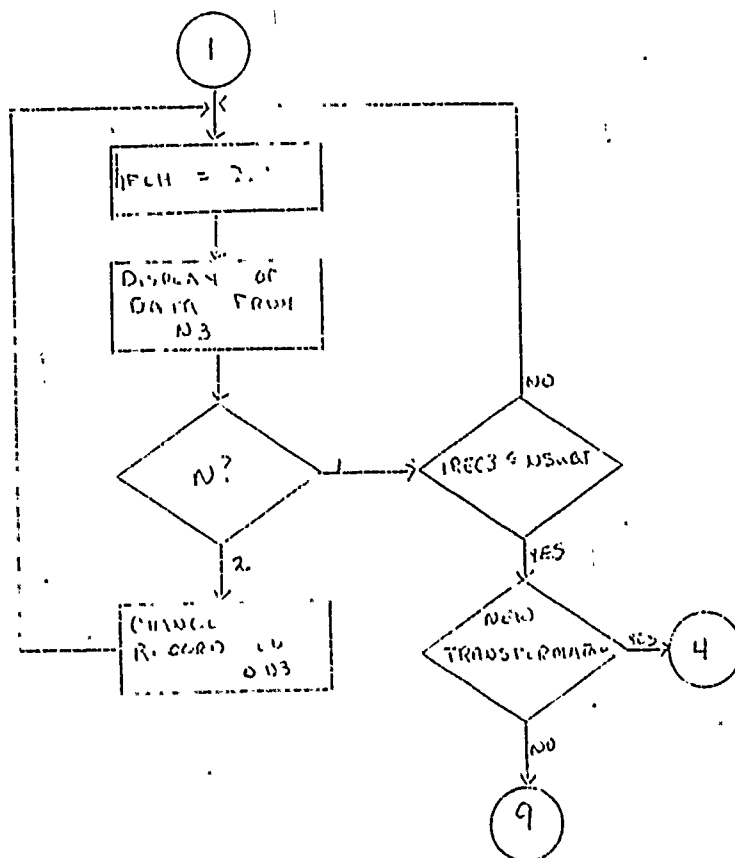
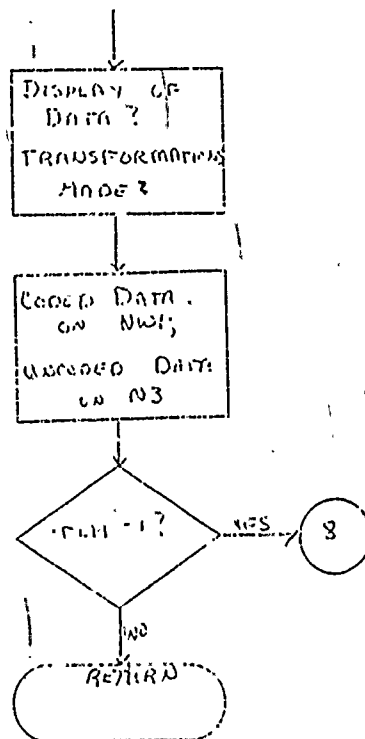
OVERLAY FOUR

INSERT ELGGM









3

↓
STOPReproduced from
best available copy.

6

MESSAGE
GIVEN TO
COMPUTATIONS

RETURN

7

MESSAGE
GIVEN
TO
COMPUTATIONS
MESSAGE
GIVEN
TO
COMPUTATIONS

8

REFERENCES

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APPENDIX

COMPUTER LISTINGS

FERTRAN IV G LEVEL 19

MAIN

DATE = 71253

13/23/64

```

C
C
C   THIS PROGRAM -- BUILD -- IS DESIGNED TO ALLOW THE USER
C   OF SPOCK TO ENTER HIS DATA THRU BATCH MODE.
C   THE DATA IS STORED ON DIRECT ACCESS UNIT 38
C   FROM WHERE SPOCK OBTAINS IT.
C
C
0001   DIMENSION TTL(15),VNAM(10),FNAME(2),NLVL(2),NEND(2,12),LEVEL(2,12),
0002   INTRAN(10),ISET(2),FMT(100),X(10)
0003   CFFINE FILE 38(510,80,L,IREC3)
0004   N3=38
0005   READ(5,25)(TTL(I),I=1,15)
0006   READ(5,26) NVBL,(VNAM(I),NTRAN(I),I=1,10)
0007   103 READ(5,27)NFMT
0008   DO 104 J=1,2
0009   READ(5,28)FNAME(J),NNN,(NEND(J,I),I=1,NNN)
0010   100 NLVL(J)=NNN
0011   DO 114 K=1,2
0012   JJ=NLVL(K)
0013   IF(NEND(K,JJ)) 999,999,844
0014   999 CONTINUE
0015   DO 114 LMN=1,JJ
0016   READ(K,LMN)=LMN
0017   998 CONTINUE
0018   844 CONTINUE
0019   NFMT=NFMT*2J
0020   READ(5,29)(FMT(I),I=1,NFMT)
0021   IREC3=502
0022   WRITE(N3'(IREC3))TTL,VNAM,FNAME,NLVL,NEND,LEVEL,NTRAN,NVBL
0023   IREC3=1
0024   WRITE(6,583)(FNAME(I),I=1,2),(VNAM(I),I=1,5)
0025   IF(NVBL.GT.5)WRITE(N3'(IREC3,483)(FNAME(I),I=1,2),(VNAM(I),I=1,5)
0026   IF(NVBL.GT.5)WRITE(N3'(IREC3,484)(VNAM(I),I=6,10)
0027   IF(NVBL.GT.5)WRITE(6,584)(VNAM(I),I=6,10)
0028   NSUBJ=0
0029   200 READ(5,FMT,END=201)(ISET(I),I=1,2),(X(K),K=1,NVBL)
0030   NSUBJ=NSUBJ+1
0031   WRITE(N3'(IREC3,396)NSUBJ,ISET(1),ISET(2),(X(K),K=1,NVBL)
0032   WRITE(6,496) NSUBJ,ISET(1),ISET(2),(X(K),K=1,NVBL)
0033   GO TO 200
0034   201 IREC3=510
0035   WRITE(N3'(IREC3)NSUBJ
0036   STOP
0037   25 FORMAT(15A4)
0038   26 FORMAT(13,10(A4,11))
0039   27 FORMAT(4X,11)
0040   28 FORMAT(1X,A4,2X,13,12(1X,13))
0041   29 FORMAT(20A4)
0042   396 FORMAT(3I3,1P5E12.3/9X,1P5E12.3)
0043   483 FORMAT(4X,2A4,5(4X,A4,4X))
0044   484 FORMAT(12X,5(4X,A4,4X))
0045   496 FORMAT(1H0,3I3,1P5E12.3/1H0,9X,1P5E12.3)
0046   583 FORMAT(1H1,4X,2A4,5(4X,A4,4X))
0047   584 FORMAT(1H0,12X,5(4X,A4,4X))
0048   END

```

FORTRAN IV G LEVEL 19

MAIN

DATE = 71253

13/24/17

```

0001      COMMON N, LUVLY, ITYPE, TTL(15), VNAME(10), FNAME(2), NLVL(2), NEND(2,17),
          1 LEVEL(2,12), NRA, NCA, NRD, NCB, JAB(8), N1, N2, NVBL, NFACT, NG12, MUL1,
          2 NSUBJ, NLUV, NR1, NR2, NT, ISPC, N12, NJ2, KOUNT, NDIAG, IREC1, IREC2, IREC3
          3, NTRAM(10), TRAM(10), LUV(10), RNLUV(10)
0002      DEFINE FIL: 16(1580,80,E,IREC1),17(1580,80,(,IREC2),
          138(510,80,L,IREC3)
0003      MUL1=1
0004      1 CALL MAINA
0005      IF(N.EQ.6)GO TO 5
0006      IF(N.EQ.2)GO TO 3
0007      CALL MAINC
0008      IF(N.EQ.30)GO TO 1
0009      IF(MUL1.EQ.0)GO TO 7
0010      3 CALL OUTPUT
0011      IF(N.EQ.5.OR.N.EQ.30)GO TO 1
0012      IF(N.EQ.4)GO TO 4
0013      IF(N.EQ.6)GO TO 5
0014      5 CALL PLOT
0015      IF(N.EQ.20)GO TO 3
0016      IF(N.EQ.30.OR.N.EQ.5)GO TO 1
0017      4 CALL DELETE
0018      IF(N.EQ.30)MUL1=1
0019      GO TO 1
0020      7 CALL MAINB
0021      CALL MAIND
0022      GO TO 3
0023      9 STOP
0024      END

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FORTRAN IV G LEVEL 19

MAIN

DATE = 71253 13/24/17

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0001      SUBROUTINE MAIN
0002      COMMON N,IOVLY,I TYPE,ITL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
        1LEVEL(2,12),HRA,NCA,NRA,NCB,JAB(8),N1,N2,NVBL,NFACT,N612,MULT,
        2NSUBJ,NLUV,N1,N2,N3,ISEQ,NIZ,NJZ,KOUNT,NDIAG,IREF1,IREF2,IREF3
        3,NTRAN(10),TWAM(10),LUV(10),MNLUV(10)
0003      NI=1
0004      NJ=2
0005      IF(MULT.EQ.0.AND.N.NE.5)GO TO 902
0006      NW1 = 11
0007      NW2 = 12
0008      950 ISEQ = 0
0009      IFAC=0
0010      CALL INPUT
0011      IF(N.EQ.6.OR.N.EQ.29)GO TO 99
0012      902 CALL PHAIX(NI,NJ)
0013      110 NIZ = NI
0014      NJZ = NJ
0015      99 RETURN
0016      END

```

FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0001      SUBROUTINE INPUT
0002      EXTERNAL PRINT, ECHINT
0003      COMMON N, IGVLY, ITYPE, TTL(15), VNAME(10), FNAME(2), NLVL(2), NEND(2,12),
1 LEVEL(2,12), GRA-MCA, NR8, NCB, JAB(8), N1, N2, NVBL, NFACT, NG12, MULT,
2 NSUBJ, NLUV, RW1, RW2, NT, ISEC, N1Z, N1Z, KOUNT, NDIAG, IREC1, IREC2, IREC3
3, NTRAN(10), TNAME(10), LUV(10), HMLUV(10)
0004      DIMENSION SETUP(13), ISET(13), TEXT(15), XT(16), TEXT2(18),
1 TEXT3(20)
0005      EQUIVALENCE (SETUP(1), ISET(1)), (TEXT2(1), TEXT3(1))
0006      DOUBLE PRECISION CNP, DN(12)
0007      DATA CSIZE/'B'/
0008      DATA BLANK/' '/
0009      DATA BACK/'BACK'/
0010      DATA CROP/'CROP'/
0011      CALL GRINIT(CSIZE)
0012      CALL GCECB(FCBIN)
0013      NC2=72
0014      MASK1=1610612739
0015      MASK2=1073741827
0016      MASK3=268435459
0017      MASK4=1644167175
0018      MASK5=536870915
0019      K3=38
0020      NT=12
0021      NC=66
0022      NFACT=2
0023      NG12=1
0024      NDIAG=14
0025      NOLH=4
0026      CUT1=-979.
0027      371 FORMAT(18A4)
0028      IF(N.EQ.5) GO TO 1001
0029      CALL GCPFK(MASK1, PRINT)
0030      REWIND RW1
0031      REWIND NT
0032      211 FORMAT(15A4)
0033      IF(LH=)
C
C
0034      NSTEP=1
0035      203 CALL GFRAS(100)
0036      CALL GROPLY(' ', 20, 6400)
0037      CALL GROPLY(' ', 20, 6400)
0038      CALL GROPLY('THIS PROGRAM IS DESIGNED TO PERFORM AN ANALYSIS OF IR
1 REGULAR DATA.', 66, 6400)
0039      CALL GROPLY('YOU MAY HAVE A MAXIMUM OF 10 RESPONSE VARIABLES AND A
2 MAXIMUM OF', 64, 6400)
0040      CALL GROPLY('2 FACTORS. YOUR DESIGN MAY BE QUITE UNBALANCED, AND
3 WHOLE CELLS', 64, 6400)
0041      CALL GROPLY('MAY BE MISSING. TRANSFORMATIONS CAN BE MADE. FOR EA
4 CH PAIR OF', 63, 6400)
0042      CALL GROPLY('FACTORS, AN ANALYSIS OF VARIANCE IS PERFORMED FOR EAC
5 H RESPONSE', 63, 6400)
0043      CALL GROPLY('VARIABLE, SEPARATELY. ONCE YOU SEE THESE UNIVARIATE
1 ANALYSIS YOU', 65, 6400)
0044      CALL GROPLY('WILL BE GIVEN THE OPPORTUNITY TO SEE PLOTS OF YOUR DA

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FORTRAN IV G LEVEL 15

INPUT

DATE = 71253

13/24/17

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0045      1TA AND THE',63,8400)
          CALL GROPLY('RAH DATA AGAIN.  THUS, YOU WILL BE ABLE TO EDIT YOUR
1CATA AND RUN',65,8400)
0046      CALL GROPLY('THE ANALYSES AGAIN.',19,8400)
0047      CALL GROPLY(' ',20,8400)
0048      CALL GROPLY('TO BEGIN YOU MUST ANSWER QUESTIONS BY USING THE TYPE W
TRICK',58,8400)
0049      CALL GROPLY('KEYBOARD DIRECTLY IN FRONT OF YOU.  TO SIGNAL YOUR CO
MPLETION',61,8400)
0050      CALL GROPLY('OF QUESTIONS, FIRST DEPRESS THE "ALT" KEY, AND WHILE
SHOLDING IT',63,8400)
0051      CALL GROPLY('DOWN, DEPRESS THE "5" KEY.  THIS SEQUENCE WILL LEI
PF',55,8400)
0052      CALL GROPLY('REFERRED TO AS "E0B".  ONCE YOU ANSWER QUESTIONS, TH
I ANSWERS',61,8400)
0053      CALL GROPLY('WILL BE DISPLAYED BACK TO YOU.  IF YOU ARE NOT SATISF
LIED, PRESS',63,8400)
0054      CALL GROPLY('KEY 2 TO REENTER DATA; OTHERWISE, THE PROGRAM WILL C
ONTINUE ',61,8400)
0055      CALL GROPLY('BY YOUR PRESSING ANY KEY.',25,8400)
0056      CALL GROPLY(' ',1,8400)
0057      CALL GROPLY('AT ANY TIME YOU MAY RESTART BY PRESSING KEY 3, OR TE
MINATE BY',62,8400)
0058      CALL GROPLY('PRESSING KEY 31.',16,8400)
0059      CALL GROPLY(' ',20,8400)
0060      CALL GROPLY(' ',1,8400)
0061      CALL GROPLY('CAUTION: DO NOT TRY TO SPEED UP THE PROGRAM BY MISS
IRING',57,8400)
0062      CALL GROPLY('QUESTIONS BEFORE THEY ARE ASKED.  THIS WILL ONLY CRE
ATE PROBLEMS.',65,8400)
0063      CALL GROPLY(' ',1,8400)
0064      CALL GROPLY(' ',1,8400)
0065      CALL GROPLY('IF YOU HAVE PREVIOUSLY USED THIS PROGRAM OR ENTERED Y
OUR DATA',61,8400)
0066      CALL GROPLY('THROUGH BATCH MODE, PRESS KEY 2 TO SPE YOUR DATA.',40
1,8400)
0067      CALL GROPLY(' ',1,8400)
0068      CALL GROPLY('PRESS KEY 1 TO PROCEED.',23,8400)
0069      205 CALL GWAIT
0070      IF (N.EQ. 30) GO TO 205
0071      IF (N.EQ.31) GO TO 210
0072      IF (N.EQ.21) GO TO 1001
0073      IF (N.EQ. 1) GO TO 206
0074      GO TO 205

C
0075      206 CALL GERAS(100)
0076      NSTFP=2
0077      CALL GROPLY(' ',20,8400)
0078      CALL GROPLY(' ',20,8400)
0079      CALL GROPLY('IF YOU DESIRE TO HAVE A TITLE TO HEAD YOUR OUTPUT, EN
TER IT NOW.',64,8400)
0080      CALL GROPLY('IF YOU DO NOT DESIRE A TITLE, LEAVE THE RESPONSE A.F.
2 BLANK.',56,8400)
0081      811 CALL GWAIT
0082      IF (I1TYPE.NE.3) GO TO 402
0083      212 CALL GROPLY(TIL,NC)

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FORTRAN IV G LEVEL 15

INPUT

DATE = 71253

13/24/17

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0084      CALL GRDPLY('          ',20,6400)
0085      CALL GRDPLY('YOUR TITLE IS',13,6400)
0086      234 CALL GRDPLY('TTL,NC,3400)
0087      214 CALL GWAIT
0088      IF (N.EQ.2) GC TC 212
0089      IF (N.EQ.30) GC TO 203
0090      IF (N.EQ.31) GO TO 210

C
0091      213 CALL GERAS(100)
0092      NSTEP=3
0093      CALL GRDPLY('          ',20,6400)
0094      CALL GRDPLY('          ',20,6400)
0095      208 CALL GRDPLY('HOW MANY RESPONSE VARIABLES DO YOU HAVE?',40,6400)
0096      812 CALL GWAIT
0097      IF (IYPE.NE.3) GO TO 402
0098      CALL XBLANK(TEXT,NC)
0099      297 CALL GRDPLY(TEXT,NC)
0100      INDEX=0
0101      CALL INX(TEXT,INDEX,NC,DNP,6401)
0102      NVBL=DNP+.01
0103      WRITE(NCUM,15C)NVBL
0104      150 FORMAT('YOU HAVE',13,' RESPONSE VARIABLES.',2HX)
0105      CALL FFICH(TEXT2,NCF,6400)
0106      CALL GRDPLY('          ',20,6400)
0107      CALL GRDPLY(TEXT2,NCF,6400)
0108      IF (1.LE. NVBL .AND. NVBL .LE.10) GO TO 204
0109      CALL GRDPLY('          ',20,6400)
0110      CALL GRDPLY('THE NUMBER OF RESPONSE VARIABLES MUST BE AT LEAST 1 A
1ND NO',58,6400)
0111      CALL GRDPLY('GREATER THAN 10. PLEASE REENTER.',33,6400)
0112      GC TO 812
0113      204 CALL GWAIT
0114      IF (N.EQ.30) GO TO 203
0115      IF (N.EQ.31) GO TO 210
0116      IF (N.EQ.2) GC TO 213

C
0117      201 CALL GERAS(100)
0118      NSTEP=4
0119      DO 215 J=1,NVBL
0120      217 WRITE(NT,216)J
0121      216 FORMAT('ENTER A FOUR LETTER NAME FOR RESPONSE VARIABLE',13,11X)
0122      BACKSPACE NT
0123      READ(NT,211)TEXT
0124      CALL GRDPLY('          ',20,6400)
0125      CALL GRDPLY(TEXT,NC,6400)
0126      803 CALL GWAIT
0127      IF (IYPE.NE.3) GC TC 402
0128      CALL GRDPLY(TEXT,NC)
0129      CALL GERAS(2)
0130      215 VNAME(J) = TEXT(1)
0131      IF (NVBL.EQ.10) GO TO 157
0132      IA=NVBL+1
0133      DO 153 I=IA,10
0134      153 VNAME(I)=BLANK
0135      157 WRITE(NCUM,155)(VNAME(I),I=1,10)
0136      155 FORMAT(10(2X,A4))

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0137      CALL FETCH(TEXT2,NCF,6400)
0138      CALL GRDPLY('          ',20,6400)
0139      CALL GRDPLY('          ',20,6400)
0140      CALL GRDPLY('YOUR NAMES ARE',14,6400)
0141      CALL GRDPLY(TEXT2,NCF,6400)
0142      160 CALL GWAIT
0143      IF (N.EQ.30) GO TO 203
0144      IF (N.EQ.31) GO TO 210
0145      IF (N.EQ.2) GO TO 201

C
0146      224 CALL GERAS(100)
0147      NSTFP=5
0148      CALL GRDPLY('          ',20,6400)
0149      CALL GRDPLY('FOR EACH RESPONSE VARIABLE ENTER A TRANSFORMATION CODE:
1E FROM THE',63,6400)
0150      CALL GRDPLY('FOLLOWING LIST:',15,6400)
0151      CALL GRDPLY('          ',20,6400)
0152      CALL GRDPLY('    CODE    TRANSFORMATION',25,6400)
0153      CALL GRDPLY('    0,1    NO TRANSFORMATION',29,6400)
0154      CALL GRDPLY('    2      LOGE(X)    (X>0)',27,6400)
0155      CALL GRDPLY('    3      LOGE(1+X)  (X>-1)',30,6400)
0156      CALL GRDPLY('    4      SORT(X)   (X>=0)',28,6400)
0157      CALL GRDPLY('    5      1/X      (X>0)',23,6400)
0158      CALL GRDPLY('    6      ARCSIN(2X-1) (0<X<1)',34,6400)
0159      CALL GRDPLY('          VARIANCE-STABILIZING TRANSFORMATION FOR P
1PROPORTIONS',63,6400)
0160      CALL GRDPLY('    7      AVAILABLE (NO: NO TRANSFORMATION)',46,
16400)
0161      CALL GRDPLY('          ',20,6400)
0162      CALL GRDPLY('SEPARATE ALL ANSWERS BY COMMAS.',31,6400)
0163      CALL GRDPLY('          ',20,6400)
0164      804 CALL GWAIT
0165      IF(IITYPE.NE.3)GO TO 402
0166      290 CALL GRDPLY(TEXT,NC)
0167      CALL INK(TEXT,NC,5,IER,DN(1),DN(2),DN(3),DN(4),DN(5))
0168      IF(IER.NE.0)GO TO 401
0169      IF(NVBL.LE.5)GO TO 219
0170      CALL INK(TEXT,NC,5,IER,DN(6),DN(7),DN(8),DN(9),DN(10))
0171      IF(IER.NE.0)GO TO 401
0172      219 CONTINUE
0173      GO 173 IJK=1,10
0174      173 NTRAN(IJK)=DN(IJK)
0175      WRITE(NDUM,55)(VNAME(I),I=1,10)
0176      CALL FETCH(TEXT2,NCF,6400)
0177      CALL GRDPLY(TEXT2,NCF,6400)
0178      174 WRITE(NDUM,175)(NTRAN(M),M=1,NVBL)
0179      175 FORMAT(10(14,2X))
0180      CALL FETCH(TEXT2,NCF,6400)
0181      CALL GRDPLY(TEXT2,NCF,6400)
0182      DO 298 M=1,NVBL
0183      IF (NTRAN(M).GE.0 .AND. NTRAN(M).LE.7) GO TO 298
0184      WRITE(NT,299)NTRAN(M)
0185      299 FORMAT('A TRANSFORMATION OF',13,' IS ILLEGAL. REENTER ALL DATA.',
17X)
0186      BACKSPACE NT
0187      READ(NT,211)TEXT

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0188      CALL GRDPLY(TEXT,NC,2400)
0189      CALL GRDPLY('          ',20,2400)
0190      GO TO 204
0191 298 CONTINUE
0192      169 CALL GWAIT
0193      IF (N.EQ.2) GO TO 224
0194      IF (N.EQ.30) GO TO 203
0195      IF (N.EQ.31) GO TO 210
0196      237 GO TO (225,260),IFLH
C
0197      225 CALL GERAS(100)
0198      NSTEP=7
0199      DO 226 J=1,2
0200      229 WRITE(NDUM,227)J
0201      227 FORMAT('ENTER A FOUR LETTER NAME FOR FACTOR',13,22X)
0202      CALL FETCH(TEXT2,NCF,2400)
0203      CALL GRDPLY('          ',20,2400)
0204      CALL GRDPLY(TEXT2,NCF,2400)
0205      805 CALL GWAIT
0206      IF (IIFY.NE.3) GO TO 402
0207      CALL GRDPLY(TEXT,NC)
0208      CALL GERAS(2)
0209      226 FNAME(J)=TEXT(1)
0210      WRITE(NDUM,326)FNAME(1),FNAME(2)
0211      326 FORMAT(2(2X,A4),40X)
0212      CALL FETCH(TEXT2,NCF,2400)
0213      CALL GRDPLY('          ',20,2400)
0214      CALL GRDPLY('          ',20,2400)
0215      CALL GRDPLY('YOUR NAMES ARE',14,2400)
0216      CALL GRDPLY(TEXT2,NCF,2400)
0217      327 CALL GWAIT
0218      IF (N.EQ.30) GO TO 203
0219      IF (N.EQ.31) GO TO 210
0220      IF (N.EQ.2) GO TO 225
C
0221      228 CALL GERAS(100)
0222      NSTEP=8
0223      CALL GRDPLY('          ',20,2400)
0224      CALL GRDPLY('          ',20,2400)
0225      CALL GRDPLY('YOU MAY HAVE UP TO 12 LEVELS PER FACTOR.',40,2400)
0226      CALL GRDPLY('          ',20,2400)
0227      DO 241 J=1,2
0228      243 WRITE(NDUM,240)FNAME(J)
0229      240 FORMAT('HOW MANY LEVELS DO YOU HAVE FOR FACTOR ',A4,'?',16X)
0230      CALL FETCH(TEXT2,NCF,2400)
0231      CALL GRDPLY(TEXT2,NCF,2400)
0232      806 CALL GWAIT
0233      IF (IIFY.NE.3) GO TO 402
0234      291 CALL GRDPLY(TEXT,NC)
0235      CALL XBLANK(TEXT,NC)
0236      INDEX=0
0237      CALL INX(TEXT,INDEX,NC,DNP,2401)
0238      NLVL(J)=DNP+.01
0239      IF (NLVL(J).LE.12) GO TO 241
0240      CALL GRDPLY('NUMBER OF LEVELS CANNOT EXCEED 12. TRY AGAIN.',46,
12400)

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0241      GO TO 806
0242      241 CONTINUE
0243      WRITE(NDUH,330)FNAME(1),NLVL(1),FNAME(2),NLVL(2)
0244      330 FDMAT('FACTOR ',A4,' HAS ',I3,' LEVELS, AND FACTOR ',A4,' HAS ',I3,
          1' LEVELS.',3X)
0245      CALL FETCH(TEXT2,NCF,8400)
0246      CALL GRDPLY('          ',20,8400)
0247      CALL GRDPLY(TEXT2,NCF,8400)
0248      242 CALL WAIT
0249      IF (N.EQ.30) GO TO 203
0250      IF (N.EQ.31) GO TO 210
0251      IF (N.EQ.2) GO TO 228
C
0252      331 CALL GFRAS(100)
0253      DO 340 K=1,2
0254      DO 340 I=1,12
0255      NEND(I,K)=0
0256      340 CONTINUE
0257      NSTEP=9
0258      CALL GRDPLY('          ',20,8400)
0259      CALL GRDPLY('          ',20,8400)
0260      CALL GRDPLY('YOUR FACTORS SHOULD BE IN DISCRETE LEVELS AS 1,2,...,
          112. BUT ',61,8400)
0261      CALL GRDPLY('IF YOUR DATA IS CONTINUOUS, GROUPING CAN BE DONE FOR
          1YOU. ',57,8400)
0262      CALL GRDPLY('IF YOUR LEVELS ARE ALLREADY DISCRETELY DEFINED, PRESS
          1KEY 1. ',59,8400)
0263      CALL GRDPLY('IF YOUR DATA IS CONTINUOUS, PRESS KEY 2. ',40,8400)
0264      245 CALL WAIT
0265      IF (N.EQ.30) GO TO 203
0266      IF (N.EQ.31) GO TO 210
0267      IF (N.EQ.1) GO TO 247
0268      IF (N.EQ.2) GO TO 246
0269      GO TO 245
C
0270      246 CALL GFRAS(100)
0271      NSTEP=10
0272      CALL GRDPLY('          ',20,8400)
0273      CALL GRDPLY('          ',20,8400)
0274      CALL GRDPLY('TO GROUP THE DATA, ASSIGN EACH LEVEL OF THE FACTOR AN
          1 "END CODE" ',64,8400)
0275      CALL GRDPLY('OR AN IDENTIFIER; EG, IF ONE OF THE FACTORS IS AGE R
          1ANCING FROM ',64,8400)
0276      CALL GRDPLY('5 YEARS TO 25 YEARS, WE MAY WISH TO ASSIGN AGES TO LE
          1VELS AS ',60,8400)
0277      CALL GRDPLY('      5- 9 YEARS      LEVEL 1 ',25,8400)
0278      CALL GRDPLY('      10-14 YEARS     LEVEL 2 ',25,8400)
0279      CALL GRDPLY('      15-19 YEARS     LEVEL 3 ',25,8400)
0280      CALL GRDPLY('      20-25 YEARS     LEVEL 4 ',25,8400)
0281      CALL GRDPLY('THEN THE END CODE FOR LEVEL 1 WOULD BE 9, THE END COD
          1E FOR ',58,8400)
0282      CALL GRDPLY('LEVEL 2 WOULD BE 14, ETC. ',25,8400)
0283      CALL GRDPLY('THIS DATA WOULD BE INTERED AS      9,14,19,25 ',42,8400)
0284      CALL GRDPLY('          ',20,8400)
0285      DO 250 J=1,2
0286      NL=NLVL(J)

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FORTRAN IV G LEVEL 19

INPUT

DATE = 7.1253

13/24/17

```

0287      256 WRITE(NDUM,251)NLVL(J),FNAME(J)
0288      251 FORMAT('WHAT ARE THE "END CODES" FOR THE',I3,' LEVELS OF FACTOR ',
      1,A4,'?',2X)
0289      CALL FEICH(TEXT2,NCF,6400)
0290      CALL GRDPLY(TEXT2,NCF,6400)
0291      807 CALL GWAIT
0292      IF(IITYPE.NE.3)GO TO 402
0293      293 CALL GRDPLY(TEXT,NC)
0294      CALL INK(TEXT,NC,8,IER,DN(1),DN(2),DN(3),DN(4),DN(5),DN(6),DN(7),
      1DN(8))
0295      IF(IER.NE.0)GO TO 401
0296      IF(NL.LE.8)GO TO 357
0297      CALL INK(TEXT,NC,4,IER,DN(9),DN(10),DN(11),DN(12))
0298      IF(IER.NE.0)GO TO 401
0299      357 DO 252 I=1,NL
0300      252 NEND(J,I)=CN(I)
0301      250 CONTINUE
      C
0302      247 CALL GERAS(100)
0303      DO 844 K=1,NFACT
0304      JJ = NLVL(K)
0305      IF(NEND(K,JJ)) 999,999,844
0306      999 CONTINUE
0307      DO 998 LMN = 1,JJ
0308      NEND(K,LMN) = LMN
0309      998 CONTINUE
0310      844 CONTINUE
0311      CALL GRDPLY('',20,6400)
0312      CALL GRDPLY('',20,6400)
0313      DO 350 J=1,2
0314      NL=NLVL(J)
0315      WRITE(NDUM,345)NLVL(J),FNAME(J)
0316      345 FORMAT('THE "END CODES" FOR THE',I3,' LEVELS OF FACTOR ',A4,12X)
0317      CALL FEICH(TEXT2,NCF,6400)
0318      CALL GRDPLY(TEXT2,NCF,6400)
0319      352 WRITE(NDUM,356) (NEND(J,I),I=1,NL)
0320      356 FORMAT(12(I3,1X),12X)
0321      CALL FEICH(TEXT2,NCF,6400)
0322      350 CALL GRDPLY(TEXT2,NCF,6400)
0323      360 CALL GWAIT
0324      IF(N.EQ.30) GO TO 203
0325      IF(N.EQ.31) GO TO 210
0326      IF(N.EQ.2) GO TO 246
      C
      C
0327      285 CALL GERAS(100)
0328      CALL GCPFK(MASK2,PFINT)
0329      NSTEP=11
0330      CALL GRDPLY('',20,6400)
0331      CALL GRDPLY('',20,6400)
0332      CALL GRDPLY('NOW YOU MUST SUPPLY THE DATA. YOU WILL NEED TO INDIC
      1ATE THE',60,6400)
0333      CALL GRDPLY('LEVELS OF THE FACTORS AND THE RESPONSE OF EACH VARIA
      1LE',56,6400)
0334      CALL GRDPLY('EXAMPLE: 2,7,412,34,5',28,6400)
0335      CALL GRDPLY('INDICATES FACTOR 1 IS AT LEVEL 2, FACTOR 2 IS AT

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0336      1 LEVEL 7,*,62,6400)
          CALL GRDPLY(' THE RESPONSE FOR VARIABLE 1 IS 412, THE RESPONSE
0337      1 FCR*,57,6400)
          CALL GRDPLY(' VARIABLE 2 IS 34, AND THE RESPONSE FOR VARIABLE
13 IS 5,*,60,6400)
0338      CALL GRDPLY('IF YOU WANT TO OMIT DATA ON A PARTICULAR RANDOM VARIA
1BLE,*,57,6400)
0339      CALL GRDPLY('REPLACE IT BY -999,*,19,6400)
0340      CALL GRDPLY(' EXAMPLE: 2,7,412,-999,5,*,30,6400)
0341      CALL GRDPLY(' INDICATES THAT THE DATA FOR THE SECOND RESPONSE'
1,52,6400)
0342      CALL GRDPLY(' VARIABLE IS OMITTED,*,25,6400)
0343      CALL GRDPLY(' *,1,6400)
0344      CALL GRDPLY('WHEN YOU HAVE ENTERED ALL DATA, PRESS KEY 3,*,44,6400)
1)
0345      CALL GRDPLY(' *,20,6400)
0346      CALL GRDPLY('SHOULD YOU REALIZE YOU HAVE A MISTAKE IN YOUR DATA, I
TYPE "BACK",*,63,6400)
0347      CALL GRDPLY('AND THE NUMBER OF ENTRIES YOU WISH TO GO BACK,*,46,
16400)
0348      CALL GRDPLY(' *,20,6400)
0349      CALL GRDPLY('WHEN YOU ARE READY TO ENTER YOUR DATA, PRESS KEY 1,*,
151,6400)
0350      IREC=512
0351      WRITE(N3,IREC3)TTL,VNAM,FNAM,NLVL,NLWD,LEVEL,NTRAN,NVHL
0352      IREC=1
0353      WRITE(N3,IREC3,403)BLANK,(FNAM(I),I=1,2),(VNAM(I),I=1,5)
0354      483 FORMAT(3A4,5(4X,A4,4X))
0355      KODE=0
0356      KOUNT=0
0357      269 CALL GWAIT
0358      IF (N.EQ.30) GO TO 203
0359      IF (N.EQ.31) GO TO 210
0360      IF (N.EQ.1) GO TO 482
0361      GO TO 269

C
0362      482 CALL GERAS(100)
0363      CALL GRDPLY(' *,20,6400)
0364      WRITE(NDUM,463)BLANK,(FNAM(I),I=1,2),(VNAM(I),I=1,5)
0365      CALL FETCH(TEXT2,NCF,6400)
0366      CALL GRDPLY(TEXT2,NCF,6400)
0367      IF (NVHL.LE.5) GO TO 485
0368      WRITE(NDUM,484)(VNAM(I),I=6,10)
0369      WRITE(N3,IREC3,484) (VNAM(I),I=6,10)
0370      484 FORMAT(12X,5(4X,A4,4X))
0371      CALL FETCH(TEXT2,NCF,6400)
0372      CALL GRDPLY(TEXT2,NCF,6400)
0373      485 CONTINUE
0374      CALL GRDPLY(' *,20,6400)
0375      NSTEP=12
0376      CALL GCPFK(MASK3,PFINT)
0377      SETUP(13)=0.0
0378      294 KOUNT=KOUNT+1
0379      808 CALL GWAIT
0380      IF(ITYPE.EC.1.AND.N.EQ.3)GO TO 390
0381      IF(ITYPE.NC.3)GO TO 402

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0382      508 CALL GRPLY(TEXT,NC)
0383      IF(TEXT(1).EQ.BACK) GO TO 380
0384      CALL INK(TEXT,NC,7,IER,DN(1),DN(2),DN(3),DN(4),DN(5),DN(6),DN(7))
0385      IF(IER.NE.0) GO TO 507
0386      IF(NVBL.LE.5) GO TO 260
0387      CALL INK(TEXT,NC,5,IER,DN(8),DN(9),DN(10),DN(11),DN(12))
0388      IF(IER.NE.0) GO TO 507
0389      260 ISET(1)=DN(1)
0390      ISET(2)=DN(2)
0391      DO 261 IZ=1,10
0392      261 X(IZ)=DN(IZ+2)
0393      IF(KCODE.NE.0) CALL GBKSP(KCODE)
0394      IF(NVBL.LT.5) WRITE(NDUN,370) KOUNT, (ISET(I), I=1,2), (X(I), I=1,NVBL)
0395      IF(NVBL.GE.5) WRITE(NDUN,370) KOUNT, (ISET(I), I=1,2), (X(I), I=1,5)
0396      370 FORMAT(14,2(13,1X),1P5E12.3)
0397      CALL FETCH(TEXT2,NCF,6400)
0398      374 CALL GRPLY(TEXT2,NCF,6500)
0399      IF(NVBL.LE.5) GO TO 101
0400      WRITE(NDUN,375) (X(I), I=6,NVBL)
0401      375 FORMAT(12X,5(2X,1P5E10.3))
0402      CALL FETCH(TEXT2,NCF,6400)
0403      378 CALL GRPLY(TEXT2,NCF,6502)
0404      396 FORMAT(313,1P5E12.3/9X,1P5E12.3)
0405      101 KODE=0
0406      WRITE(ND,IREC3,396) KOUNT, ISET(1), ISET(2), (X(KQ), KQ=1,NVBL)
C
0407      621 DO 106 K=1,NFACT
0408      JJ=NLVL(K)
0409      107 DO 108 J=1,JJ
0410      IF(ISET(K)-NENC(K,J)) 109,109,108
0411      109 ISL(K)=J
0412      GO TO 106
0413      108 CONTINUE
0414      ISET(K)=JJ
0415      106 CONTINUE
0416      DO 102 K=1,NVBL
0417      IF(X(K) - CUTL) 103,10,103
0418      103 KK=NYTRAN(K)+1
0419      GO TO(1,1,2,3,4,5,6,7),KK
0420      1 SETUP(K+2)=X(K)
0421      GO TO 102
0422      2 IF(X(K)) 10,10,11
0423      10 SETUP(K+2)=0.1L
0424      SETUP(13)=1.0
0425      GO TO 102
0426      11 SETUP(K+2)=ALOG(X(K))
0427      GO TO 102
0428      3 IF(X(K)+1.0) 10,10,12
0429      12 SETUP(K+2)=ALOG(X(K)+1.0)
0430      GO TO 102
0431      4 IF(X(K)) 10,13,13
0432      13 SETUP(K+2)=SQRT(X(K))
0433      GO TO 102
0434      5 IF(X(K)) 10,10,14
0435      14 SETUP(K+2)=1.0/X(K)
0436      GO TO 102

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0437      6      IF(X(K)*(1.-X(K)))10,15,15
0438      15      SETUP(K+2)=AR SIN(2.*X(K)-1.
0439      GO TO 102
0440      7      SETUP(K+2)=X(K)
0441      C      *****DUMMY SIMULATION*****
0441      102     CONTINUE
0442      IREX=IREC3
0443      IREC3=910
0444      IF(IFLH.EQ.1)WRITE(N3'IREX')KOUNT
0445      IF(IFLH.EQ.2)WRITE(N3'IREC3')NSUBJ
0446      IREC3=IREX
0447      WRITE (NW1) SETUP
0448      SETUP(13)=0.0
0449      GO TO (294,664), IFLH
0450      C
0450      390     CALL GERAS(100)
0451      NSUBJ=KOUNT-1
0452      CALL GCPFK(MASK2,PFINT)
0453      CALL GRDPLY(' ',1,6400)
0454      CALL GRDPLY(' ',1,6400)
0455      CALL GRDPLY('HOW THAT YOU HAVE ENTERED ALL OF YOUR DATA, YOU CAN P
0456      PRESS KEY 1',63,6400)
0456      CALL GRDPLY('TO CONTINUE. COMPUTATIONS MAY TAKE SEVERAL MINUTES.
0456      1 BE PATIENT ',65,6400)
0457      391     CALL GWAIT
0458      IF (N.EQ.30) GO TO 205
0459      IF (N.EQ.1) GO TO 801
0460      IF (N.EQ.31) GO TO 210
0461      GO TO 391
0462      801     CONTINUE
0463      802     REWIND NW1
0464      CALL GERAS(100)
0465      CALL GRRLSE
0466      RETURN
0467      C
0467      400     GO TO(203,206,213,201,224,237,225,228,241,246,285,210,604),NSTEP
0468      401     CALL GRDPLY('FORMAT ERROR. REENTER DATA.',28,6400)
0469      IF (NSTEP.EQ.12)KCODE=KCODE+1
0470      GO TO(210,210,812,210,804,210,210,806,210,807,210,808,809),NSTEP
0471      402     IF(ITYPE.EQ.1.AND.N.EQ.30)GO TO 203
0472      IF(ITYPE.EQ.1.AND.N.EQ.31)GO TO 210
0473      CALL GRDPLY('YOU SHOULD BE IN A POSITION REQUIRING EOB SEQUENCE.',
0473      151,6400)
0474      IF (NSTEP.EQ.12)KCODE=KCODE+1
0475      GO TO (210,811,812,803,804,210,805,806,210,807,210,808,809),NSTEP
0476      380     INDEX=4
0477      IF(TEXT(2).NE.BLANK) GO TO 384
0478      NBACK=1
0479      GO TO 382
0480      384     CALL INX(TEXT,INDEX,NC,DNP,6503)
0481      NBACK=DNP+.01
0482      382     NBACK=NBACK
0483      IF(NVBL.LE.5) GO TO 385
0484      NBACK=2*NBACK
0485      385     CALL GOKSP(NBACK)

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0486      COUNT=COUNT-NBACK-1
0487      DO 383 I=1,NBACK
0488 383   PACKSPACE NW1
0489      IREC3=IREC3-ANEACK
0490      GO TO 294
0491 500   CALL GERAS(1)
0492      GO TO 374
0493 502   CALL GERAS(1)
0494      GO TO 378
0495 503   CALL GROPLY('FORMAT ERROR. PLEASE TRY AGAIN.',32,6504)
0496      GO TO 508
0497 504   CALL GERAS(1)
0498      GO TO 503
0499 507   CALL GROPLY('FORMAT ERROR. REENTER DATA.',28,6509)
0500      KODE=KODE+1
0501      GO TO 508
0502 509   CALL GERAS(1)
0503      GO TO 507
0504 210   CALL GERAS(100)
0505      CALL GKKLSE
0506      STOP
C
C
0507 1001  REWIND NW1
0508      CALL GCPFK(NASK4,PFINT)
0509      IF ILM=2
0510      IREC3=507
0511      READ(IN3,IREC3)TTL,VNAM,FNAM,HLVL,NEND,LEVEL,NTRAN,NVBL
0512      IREC3=510
0513      READ(IN3,IREC3)ASUBJ
0514      IREC3=1
0515      INCR=1
0516      IF (NVBL.GT.5) INCR=2
0517 604   IQ=0
0518      KSTEP=13
0519      IREC=IREC3
0520      CALL GERAS(100)
0521 5959  FCPMAT(20A4)
0522 603   DO 610 IY=1,INCR
0523      READ(IN3,IREC3,5959)TEXT3
0524      IQ=IQ+1
0525 610   CALL GROPLY(TFX12,HC2,6400)
0526      IF (IQ.LT.40.AND.IREC3.LE.INCR*NSUBJ+INCR)GO TO 603
0527      CALL GROPLY(' ',1,6400)
0528      CALL GROPLY('PRESS KEY 1 TO CONTINUE OR KEY 2 TO CHANGE DATA.',48,
0529      16400)
0529      CALL GROPLY('IF, AT ANY TIME, YOU WISH TO RETURN TO YOUR PREVIOUS'
0530      ',52,6400)
0530      CALL GROPLY('UNIVARIATE ANALYSIS OUTPUT, PRESS KEY 29.',41,6400)
0531      CALL GROPLY('IF YOU WISH TO SEE THE PLOTS OF YOUR DATA, PRESS KEY
0532      16.',55,6400)
0532 602   CALL GWAIT
0533      IF (N.IQ.6)GO TO 660
0534      IF (N.EQ.29)GO TO 602
0535      IF (N.IQ.30)GO TO 203
0536      IF (N.EQ.31)GO TO 210

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/57

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0537      IF (N.EQ.1.AND.IREC3.GT.ISCR*NSUBJ)GO TO 670
0538      IF (N.EQ.1) GO TO 604
0539      IF (N.EQ.7)GO TO 606
0540      GO TO 602
0541      606 CALL GEXSP(4)
0542      CALL GRDPLY('IF YOU WISH TO DELETE AN ENTIRE RECORD, TYPE "DROP" A
      IND ITS',59,6400)
0543      CALL GRDPLY('RECORD NUMBER.',14,6400)
0544      CALL GRDPLY('IF YOU WISH TO MAKE CHANGES IN A RECORD, TYPE ITS REC
      LORD NUMBER',63,6400)
0545      CALL GRDPLY('AND THE NEW RECORD IN THE ORIGINAL FORMAT. SEPARATE
      IALL NUMBERS',64,6400)
0546      CALL GRDPLY('BY CCHMAS.      YOU MAY NOW ENTER YOUR CHANGES.',46,
      16400)
0547      809 CALL GWAIT
0548      IF (N.EQ.29)GO TO 802
0549      IF (I1TYPE.NE.3)GO TO 402
0550      625 CALL GHRPLY(TEXT,NC)
0551      CALL XBLANK(TEXT,NC)
0552      IF (TEXT(1).EQ.DRGP)GO TO 614
0553      INDEX=0
0554      NVX=NVBL+3
0555      DO 611 KS=1,NVX
0556      KSS=KS
0557      CALL INX(TEXT,INDEX,NC,DNP,6401)
0558      SETUP(KS)=DNP
0559      611 CONTINUE
0560      DO 616 KS=1,NVBL
0561      X(KS)=SETUP(KS+3)
0562      628 IRC=SETUP(1)
0563      IF (IRC.GT.NSUBJ)NSUBJ=NSUBJ+1
0564      ISET(1)=SETUP(2)
0565      ISET(2)=SETUP(3)
0566      629 IREC3=(IRC-1)*INCR+1+INCR
0567      WRITE(N3,IREC3,396)IRC,ISET(1),ISET(2),(X(KT),KT=1,NVBL)
0568      630 IREC3=IRECX
0569      GO TO 604
0570      614 INDEX=4
0571      CALL INX(TEXT,INDEX,NC,DNP,6401)
0572      IRC=DNP
0573      ISET(1)=0
0574      ISET(2)=0
0575      DO 626 JQ=1,NVBL
0576      626 X(JQ)=OUTL
0577      GO TO 629
0578      660 REWIND N41
0579      IREC3=INCR+1
0580      NVBX=NVBL+3
0581      KCCT=0
0582      664 IF (KCCT.GE.NSUBJ)GO TO 802
0583      KCCT=KCCT+1
0584      READ(N3,IREC3,396)((ISET(IR),IR=1,3),(SETUP(IV),IV=4,NVBX)
0585      ISET(1)=ISET(2)
0586      ISET(2)=ISET(3)
0587      DO 661 KB=1,NVBL
0588      661 X(KB)=SETUP(KB+3)

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FORTRAN IV G LEVEL 19

INPUT

DATE = 71253

13/24/17

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0589      GO TO 421
0590      670 CALL GENAS(100)
0591      CALL GROPLY(' ',1,6400)
0592      CALL GROPLY('IF YOU WOULD LIKE TO INDICATE NEW TRANSFORMATIONS FOR
              1',53,6400)
0593      CALL GROPLY('ANY OF YOUR RESPONSE VARIABLES, PRESS KEY 2.',44,
              16400)
0594      CALL GROPLY('IF YOU WISH TO CONTINUE TO YOUR UNIVARIATE ANALYSIS,'
              1,52,6400)
0595      CALL GROPLY('PRESS KEY 1.',12,6400)
0596      675 CALL GWAIT
0597      IF (N.EQ.30) GO TO 203
0598      IF (N.EQ.31) GO TO 210
0599      IF (N.EQ.1) GO TO 660
0600      IF (N.EQ.2) GO TO 224
0601      GO TO 675
0602      END

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FORTRAN IV G LEVEL 19

PMATX

DATE = 71253

13/24/17

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0001      SUBROUTINE PMATX(NI,NJ)
          C
          C      GENERATES INCIDENCE MATRICES AND SUBTOTALS MATRICES
          C      FOR A FACTOR PAIR, FOR ALL RESPONSE VARIABLES.
          C
          C      AN INITIAL DECISION IS MADE ON THE VALUE OF MULT
          C      IF MULT = 0      DO THE MULTIVARIATE ANALYSIS
          C      IF MULT = 1      DO UNIVARIATE ANALYSES
          C
0002      COMMON N,ICVLY,ITYPE,ITL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,17),
          C      ILEVEL(2,12),HRA,NCA,NRB,NCD,JAB(8),M1,N2,NVBL,AFAC,NG12,MULT,
          C      2NSUBJ,NLUV,MN1,MN2,NT,ISEC,NIZ,NJZ,RCOUNT,NDIAG,IREC1,IREC2,IREC3
          C      3,NTRAN(10),THAN(10),LUV(10),HNLUV(10)
0003      DOUBLE PRECISION A,B,C,DSQU,DSSCP
0004      DIMENSION OSCU(10),DSSCP(10,10),SETUP(13),DSS(12,12,10),SUBT(12,12
          C      1,10),ISET(13),NN(12,12,10)
          C      EQUIVALENCE (SETUP(1),ISET(1))
          C      REWIND NHJ
          C      IF (NSUBJ.GT.500) GO TO 99
          C      CUTL=-999.
0009      DO 500 K=1,10
0010      ESQU(K) = 0.000
0011      DO 500 I = 1,12
0012      DO 500 J = 1,12
0013      NN(I,J,K) = 0.0
0014      DSS(I,J,K) = 0.0
0015      SUBT(I,J,K) = 0.0
0016      500 CONTINUE
0017      DO 1500 II=1,10
0018      DO 1500 JJ=1,10
0019      1500 DSSCP(II,JJ) = 0.00
0020      IF (MULT) 511,510,511
          C
          C      UNIVARIATE PROCEDURE
          C      511 CONTINUE
0021      DO 600 I=1,NSUBJ
0022      READ (NHJ) SETUP
0023      MI = ISET(MI)
0024      MJ = ISET(MJ)
0025      DO 501 K = 1,NVBL
0026      CK=SETUP(K+2)
0027      IF (CK-CUTL) 503,501,503
0028      503 NN(MI,MJ,K) = NN(MI,MJ,K) + 1
0029      SUBT(MI,MJ,K) = SUBT(MI,MJ,K) + SETUP(K+2)
0030      DSS(MI,MJ,K) = DSS(MI,MJ,K) + SETUP(K+2)*SETUP(K+2)
0031      ESQU(K)=DSQU(K)+(DBLE(SETUP(K+2)))**2
0032      501 CONTINUE
0033      600 CONTINUE
0034      GO TO 529
          C
          C      MULTIVARIATE PROCEDURE
          C      510 CONTINUE
0036      NVBL1=NVBL-1
0037      NLUV=0
0038      DO 191 J=1,NVBL
0039

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FORTRAN IV G LEVEL 19

PHATX

DATE = 71253

13/24/17

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0040      191 IF (LUV(J).NE.0) NLUV=NLUV+1
0041      IF (LUV(NVBL).EQ.0) LUV(NVBL)=99
0042      ITEMP=NVBL
0043      NVBL=NLUV
0044      ALUV=ITEMP
0045      DO 700 I=1,NSUBJ
0046      READ (NW1) SETUP
0047      IF (SETUP(13)-1.)506,700,700
0048      506 CONTINUE
0049      DO 300 J=1,NVBL1
0050      IF (LUV(J).NE.0) GO TO 300
0051      302 DO 301 K=J,NVBL1
0052      LUV(K)=(LUV(K)+1)
0053      301 SETUP(K+2)=SETUP(K+3)
0054      IF (LUV(J).EQ.0) GO TO 302
0055      300 CONTINUE
0056      MI = ISET(MI)
0057      MJ = ISET(MJ)
0058      DO 505 K = 1,NVBL
0059      NN(MI,MJ,K) = NN(MI,MJ,K) + 1
0060      SUBT(MI,MJ,K) = SUBT(MI,MJ,K) + SETUP(K+2)
0061      DSS(MI,MJ,K) = DSS(MI,MJ,K) + SETUP(K+2)*SETUP(K+2)
0062      DO 505 LM=1,NVBL
0063      A=CBLE(SETUP(K+2))
0064      B=CBLE(SETUP(LM+2))
0065      C=DSSCP(K,LM)
0066      C=C+A*B
0067      DSSCP(K,LM)=C
0068      505 CONTINUE
0069      DO 650 IAH=1,10
0070      LUV(IAH)=MALLV(IAH)
0071      700 CONTINUE
0072      504 CONTINUE
0073      512 CONTINUE
0074      DO 520 K=1,NVBL
0075      DSQU(K)=DSSCP(K,K)
0076      520 CONTINUE
0077      529 REWIND NW1
0078      REWIND NW2
0079      WRITE(NW2) DSSCP
0080      WRITE(NW2) NN
0081      WRITE(NW2) DSS
0082      WRITE(NW2) SUBT
0083      WRITE(NW2) DSQU
0084      RETURN
0085      99 WRITE(6,98)NSUBJ
0086      98 FORMAT(' NSUBJ = ', 110)
0087      STCP
0088      END

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FORTRAN IV G LEVEL 19

NAME

DATE 7/25/53

13/24/17

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0052      READ(NW2) DSQU
0053      DSQU = DSQU1K
0054      CALL AHDOT(NH1,SUB,R,1,2,DSQU,SS,RE,CE,Q,Q0)
0055 120 CONTINUE
0056      DUMB=0.
0057      KKK=1
0058      IF(K.GT.1) GO TO 146
0059 148 WRITE(NH2) HI,NJ,K,SUB,RE,CE,Q,Q0
0060      GO TO 907
0061 146 CD 145 IX=1,KM
0062 145 READ(NW2) DUMB,DUMB,DUMB,SS,DUM,DUM,DUM,DUM
0063      GO TO 148
0064 907 CONTINUE
0065      IF(MULT.EQ.0)GO TO 350
0066 1051 KKOUN=KOUNT-2
0067      WRITE(N1,IREC1,2050)KKOUN
0068      WRITE(N1,IREC1,2003)
0069      WRITE(N1,IREC1,2051)
0070      WRITE(N1,IREC1,2052)
0071      WRITE(N1,IREC1,2053)
0072      WRITE(N1,IREC1,2054)
0073      DO 309 I=1,43
0074 309 WRITE(N2,IREC2,2003)
0075      DO 310 I=1,57
0076 310 WRITE(N1,IREC1,2003)
0077 350 WRITE(N52)NN1
0078      IF(MULT) 136,130,134
0079 136 ISEQ = 17
0080      GO TO 138
0081 130 ISEQ = 396
0082 138 RETURN
0083 2001 FORMAT(55X,'PAGE',I4,'L',16X)
0084 2003 FORMAT(A24)
0085 2041 FORMAT('AT THIS POINT YOU SHOULD INSPECT YOUR UNIVARIATE RESULTS V
      LERY',19X)
0086 2042 FORMAT('CAREFULLY.',70X)
0087 2043 FORMAT('IS THERE A LARGE INTERACTION VERSUS ERROR F-RATIO?',30X)
0088 2044 FORMAT('THIS MAY INDICATE THE PRESENCE OF OUTLIERS OR FAULTY DATA.
      ',22X)
0089 2045 FORMAT('CHECK THE TABLE OF CELL TOTALS OF VARIABLES WITH LARGE F-R
      ATIONS',17X)
0090 2046 FORMAT('FOR LARGE STANDARD DEVIATIONS OR FOR A CELL MEAN WHICH DEV
      IATES',17X)
0091 2047 FORMAT('IRREGULARLY FROM A TREND IN ROWS OR COLUMNS.',36X)
0092 2048 FORMAT('AFTER YOU HAVE CHECKED THESE RESULTS YOU CAN CHECK AND EDI
      T',21X)
0093 2049 FORMAT('YOUR DATA.',70X)
0094 2050 FORMAT('PAGE',I3,' WAS THE LAST PAGE OF YOUR UNIVARIATE RESULTS.',
      127X)
0095 2051 FORMAT('YOU NOW HAVE THE FOLLOWING OPTIONS:',45X)
0096 2052 FORMAT('PRESS KEY 4 TO CONTINUE TO YOUR MULTIVARIATE RESULTS',
      126X)
0097 2053 FORMAT(12X,'5 TO SEE AND EDIT YOUR DATA',41X)
0098 2054 FORMAT(12X,'6 TO SEE PLOTS OF YOUR DATA',41X)
0099      END

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FORTRAN IV G LEVEL 19

ANDY

DATE = 71253

13/24/17

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0001      SUBROUTINE ANDY (NN1,SUB,IV,IA,IB,DSQU,SQR,RE,CE,Q,QB)
      C
      C --- UNIVARIATE ANALYSIS OF IRREGULAR TWO-WAY FACTORIAL
      C
0002      COMMON N,ICVLY,ITYPE,TTL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
1LEVCL(2,12),PRA,MCA,KRB,HCB,JAB(8),N1,N2,NVBL,MFACT,NG12,MULT,
2NSUBJ,NLUV,MH1,MW2,NT,ISEC,HIZ,NJZ,KOUNT,NDIAG,IREC1,IREC2,IREC3
3,NTRAN(10),TRAN(10),LUV(10),NLUV(10)
0003      DOUBLE PRECISION G,GM,SG10,S,FN,DSQU,SSE,SSSB,SD,DR,DC
0004      DIMENSION CR(12),DC(12)
0005      DIMENSION SLB(12,12),R(12),C(12),Q(12),SUBX(12,12),CX(12,12),
1      RE(12),CE(12),SQR(12,12),SQRX(12,12),GD(12),
2NN1(12,12),NIGC(12),NDOTJ(12),NX(12,12),JLVA(12),JLVB(12)
0006      DIMENSION IFX(2(60))
0007      DATA BLANK/' /
0008      NR=NLVL(IA)
0009      NC=NLVL(IB)
0010      NFA=IA
0011      NFB=IB
0012      IFLAG = 0
0013      ILINK = 12
0014      ITG=0
0015      IF (NR-NC) 11,11,1
0016      DO 2 I = 1,NC
0017      DO 2 J = 1,NR
0018      NX(I,J)=NN1(J,I)
0019      SQRX(I,J)=SQR(J,I)
0020      SUBX(I,J)=SUB(J,I)
0021      ITMP=NR
0022      NR=NC
0023      NC=ITMP
0024      NFA=IB
0025      NFB=IA
0026      IFLAG = 1
0027      GO TO 13
0028      11 DO 12 I=1,NR
0029      DO 12 J=1,NC
0030      NX(I,J)=NN1(I,J)
0031      SQRX(I,J)=SQR(I,J)
0032      SUBX(I,J)=SUB(I,J)
0033      12 DO 24 I=1,NR
0034      24 JLVA(I)=NEND(NFA,I)
0035      I=1
0036      14 NSUM=0
0037      DO 16 J=1,NC
0038      NSUM=NSUM+NX(I,J)
0039      IF (NSUM) 17,17,18
0040      17 NR=NR-1
0041      IF (I-NR) 21,22,22
0042      21 DO 19 K=1,NR
0043      DO 20 L = 1,NC
0044      SQRX(K,L)=SQRX(K+1,L)
0045      SUBX(K,L)=SUBX(K+1,L)
0046      20 NX(K,L)=NX(K+1,L)
0047      19 JLVA(K)=JLVA(K+1)
0048      GO TO 23

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FORTRAN IV C LEVEL 19

ANOT

DATE = 7/253

13/24/17

0049	10 I = I+1	049
0050	23 IF(I-NR)14,14,22	050
0051	22 DO 44 J=1,NC	051
0052	44 JLV8(I)=NEP7(I)PD,J	052
0053	J=1	053
0054	34 NSUM=0	054
0055	DO 36 I=1, NR	055
0056	36 NSUM=NSUM+NX(I,J)	056
0057	IF(NSUM)37,37,38	057
0058	37 NC=NC-1	058
0059	IF(J-NC)41,42,42	059
0060	41 DO 39 K=J,NC	060
0061	DO 40 L=1, NR	061
0062	SUBX(L,K)=SUBX(L,K+1)	062
0063	SQRX(L,K)=SQRX(L,K+1)	063
0064	40 NX(L,K)=NX(L,K+1)	064
0065	39 JLV8(K)=JLV8(K+1)	065
0066	GO TO 43	066
0067	38 J=J+1	067
0068	43 IF(J-NC)34,34,42	068
0069	42 DO 50 I=1, NR	069
0070	NIDOT(I)=0	070
0071	R(I)=0.	071
0072	DR(I)=0.00	072
0073	DO 50 J=1, NC	073
0074	NIDOT(I)=NIDOT(I)+NX(I,J)	074
0075	DR(I)=DR(I)+DRLE(SUBX(I,J))	075
0076	50 R(I)=R(I)+SUBX(I,J)	076
0077	DO 51 J=1, NC	077
0078	NIDOT(J)=0	078
0079	C(J)=0.	079
0080	DC(J)=0.00	080
0081	DO 51 I=1, NR	081
0082	NIDOT(J)=NIDOT(J)+NX(I,J)	082
0083	DC(J)=DC(J)+DRLE(SUBX(I,J))	083
0084	51 C(J)=C(J)+SUBX(I,J)	084
0085	G=0.00	085
0086	GM = 0.00	086
0087	SSTO = 0.00	087
0088	NN=0	088
0089	DO 52 I=1, NR	089
0090	S = DR(I)	090
0091	G= S+G	091
0092	52 NN=NN+NIDOT(I)	092
0093	FN=0.000	093
0094	FN=NN	094
0095	GM=G/FN	095
0096	SSTO=OSQU-G*GM	096
0097	ADFTG=NN-1	097
0098	NDFSBN=-1	098
0099	SSSR=0.000	099
0100	DO 55 I=1, NR	100
0101	CO 55 J=1, NC	101
0102	J=J	102
0103	IF(NX(I,J))55,55,57	103
0104	57 S=DRLE(SUBX(I,J))	104

FORTRAN IV G LEVEL 19

AMOT

DATE # 71253

13/24/17

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0105      SSSB=SSSB+8ASADFGAT(NX(I,J))
0106      NDFS0 = NDFS0 + 1
0107      55 CONTINUE
0108      SSSB=SSSB-G*GH
0109      SSE = 0.000
0110      SSE=SSSTO-SSSB
0111      IF(SSE) 155,155,156
0112      155 SSE = 0.000
0113      156 NDFE = NDFS0 - NDFS0
0114      DO 60 I=1,NR
0115      AI = FLOAT(NIDOT(I))
0116      Q(I) = DR(I)
0117      DO 62 K=1,NR
0118      SUM = 0.
0119      DO 61 J=1,NC
0120      AKJ = FLOAT(NX(K,J))
0121      AIJ = FLOAT(NX(I,J))
0122      61 SUM = SUM - AIJ*AKJ/FLCAT(NDOTJ(J))
0123      CX(I,K) = SUM
0124      IF(I-K) 63,64,63
0125      64 CX(I,K) = CX(I,K) + AI
0126      63 CX(K,I) = CX(I,K)
0127      62 CONTINUE
0128      DO 65 JU=1,NC
0129      65 Q(I) = DBLE(Q(I))-DFLOAT(NX(I,JU))*DC(JU)/DFLOAT(NDOTJ(JU))
0130      60 CONTINUE
0131      DO 288 J=1,NC
0132      QB(J)=DC(J)
0133      DO 289 I=1,NR
0134      QB(J)=DBLE(QB(J))-DFLOAT(NX(I,J))*DR(I)/DFLOAT(NIDOT(I))
0135      288 CONTINUE
0136      NRM = NR - 1
0137      RE(NRM) = 0.
0138      IF(NRM) 100,100,70
0139      70 DO 71 I=1,NRM
0140      Q(I) = Q(I) - Q(NRM)
0141      DO 72 K=1,NRM
0142      72 CX(I,K) = CX(I,K) - CX(I,NRM) - CX(NRM,K) + CX(NRM,NRM)
0143      71 CONTINUE
0144      CALL EOSYN(CX,Q,RE,NRM)
0145      DO 114 I = 1,NRM
0146      114 Q(I) = Q(I) + Q(NRM)
0147      DO 79 I=1,NRM
0148      79 RE(NRM) = RE(NRM) - RE(I)
0149      100 DO 82 J=1,NC
0150      CE(J)=DC(J)
0151      DO 83 I=1,NR
0152      83 CE(J)=CE(J)-RE(I)*FLOAT(NX(I,J))
0153      82 CE(J) = CE(J)/FLOAT(NDOTJ(J)) - GH
0154      216 CONTINUE
0155      NSTEP=1
0156      IREC=IREC1-1
0157      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0158      1002 WRITE(N1,REC1,2004) (IT(I),I=1,8)
0159      WRITE(N2,IREC2,2005) (IT(I),I=9,15)
0160      IF(MULT.EQ.1)WRITE(N1,REC1,2006)VNAM(IV)

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FCRTRAK IV G LEVEL 19

ANOT

DATE = 71253

13/24/17

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0161      IF (MOD(I,40) .EQ. 0) WRITE(11, IREC1, 2006) TNAM(IV)
0162      WRITE(11, IREC1, 2007) FNAME(FA), FNAME(FB)
0163      WRITE(11, IREC1, 2008) FNAME(FB)
0164      WRITE(11, IREC2, 2003)
0165      WRITE(11, IREC1, 2009) FNAME(FA)
0166      WRITE(11, IREC2, 2010)
0167      WRITE(11, IREC1, 2011)
0168      WRITE(11, IREC2, 2003)
0169      IF (NC .LE. 6) GO TO 6001
0170      IF (NC .GT. 6) GO TO 6002
0171      6001 WRITE(11, IREC1, 2012) (JLV8(IK), IK=1, NC)
0172      WRITE(11, IREC2, 2003)
0173      GO TO 6003
0174      6002 WRITE(11, IREC1, 2012) (JLV8(IK), IK=1, 6)
0175      WRITE(11, IREC2, 2013) (JLV8(IK), IK=7, NC)
0176      6003 CONTINUE
0177      96 DO 92 I=1, NK
0178          R(I) = R(I)/FLOAT (NIDOT(I))
0179          DO 93 J=1, NC
0180              GN = NXX(I, J)
0181              II = (GN-1) * 201, 202, 203
0182              203 SUBX(I, J) = SUBX(I, J)/GN
0183              SUBX(I, J) = SORTIABS((SUBX(I, J)-GN*SUBX(I, J)**2)/(GN-1, J))
0184              GO TO 93
0185              202 SUBX(I, J) = 0.
0186              GO TO 93
0187              201 SUBX(I, J) = 0.
0188              SUBX(I, J) = 0.
0189              93 CONTINUE
0190              92 CONTINUE
0191              DO 96 J=1, NC
0192                  C(I) = C(I)/FLOAT (NIDOT(J))
0193                  97 CONTINUE
0194                  DO 97 I=1, NK
0195                      NG = NIDOT(I)
0196                      RG = R(I)
0197                      209 JLVX = JLVX(I) - (JLVX(I)/100)
0198                      NSTP = 2
0199                      IREC = IREC1-1
0200                      IF (MOD(IREC, 45) .EQ. 0) GO TO 1001
0201                      1003 WRITE(11, IREC1, 2003)
0202                      WRITE(11, IREC2, 2003)
0203                      NSTP = 3
0204                      IREC = IREC1-1
0205                      IF (MOD(IREC, 45) .EQ. 0) GO TO 1001
0206                      NG = NG+1
0207                      SUBX(I, NG) = RG
0208                      1004 IF (MOD(I, 6) .EQ. 0) GO TO 6004
0209                      IF (MOD(I, 6) .GT. 0) GO TO 6005
0210                      6004 WRITE(11, IREC1, 2014) JLVX, (SUBX(I, J), J=1, NC1)
0211                      WRITE(11, IREC2, 2003)
0212                      GO TO 6006
0213                      6005 WRITE(11, IREC1, 2014) JLVX, (SUBX(I, J), J=1, 6)
0214                      WRITE(11, IREC2, 2015) (SUBX(I, J), J=7, NC1)
0215                      6006 CONTINUE
0216                      NSTP = 4

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FORTRAN IV G LEVEL 19

ANOS

DATE = 71253

13/24/17

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0217      IREC=IREC1-1
0218      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0219      NX(1,NC1)=NG
0220      1005 IF (NC1.LE.6) GO TO 6007
0221      IF (NC1.GT.6) GO TO 6008
0222      6007 WRITE(N1,IREC1,2016)(NX(I,J),J=1,NC1)
0223      WRITE(N2,IREC2,2003)
0224      GO TO 6009
0225      6008 WRITE(N1,IREC1,2016)(NX(I,J),J=1,6)
0226      WRITE(N2,IREC2,2017)(NX(I,J),J=7,NC1)
0227      6009 CONTINUE
0228      NSTEP=5
0229      IREC=IREC1-1
0230      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0231      1006 IF (NC1.LE.6) GO TO 6010
0232      IF (NC1.GT.6) GO TO 6011
0233      6010 WRITE(N1,IREC1,2018)(SQRX(I,J),J=1,NC1)
0234      WRITE(N2,IREC2,2003)
0235      GO TO 6012
0236      6011 WRITE(N1,IREC1,2018)(SQRX(I,J),J=1,6)
0237      WRITE(N2,IREC2,2019)(SQRX(I,J),J=7,NC1)
0238      6012 CONTINUE
0239      207 CONTINUE
0240      NG = NK
0241      RG = GM
0242      NSTEP=6
0243      IREC=IREC1-1
0244      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0245      1007 WRITE(N1,IREC1,2003)
0246      WRITE(N2,IREC2,2003)
0247      NSTEP=7
0248      IREC=IREC1-1
0249      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0250      1008 WRITE(N1,IREC1,2020)
0251      WRITE(N2,IREC2,2003)
0252      NSTEP=8
0253      IREC=IREC1-1
0254      C(NC1)=RG
0255      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0256      1009 IF (NC1.LE.6) GO TO 6013
0257      IF (NC1.GT.6) GO TO 6014
0258      6013 WRITE(N1,IREC1,2018)(C(J),J=1,NC1)
0259      WRITE(N2,IREC2,2003)
0260      GO TO 6015
0261      6014 WRITE(N1,IREC1,2018)(C(J),J=1,6)
0262      WRITE(N2,IREC2,2015)(C(J),J=7,NC1)
0263      6015 CONTINUE
0264      NSTEP=9
0265      NDOTJ(NC1)=NG
0266      IREC=IREC1-1
0267      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0268      1010 IF (NC1.LE.6) GO TO 6016
0269      IF (NC1.GT.6) GO TO 6017
0270      6016 WRITE(N1,IREC1,2016)(NDOTJ(J),J=1,NC1)
0271      WRITE(N2,IREC2,2003)
0272      GO TO 6018

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226

227

228

FORTRAN IV G LEVEL 10

AND1

DATE = 71253

13/24/17

0273	6017	WRITE(IH*IREC1,2015)(NCOTJ(J),J=1,6)	
0274		WRITE(IH*IREC2,2017)(NCOTJ(J),J=7,NC1)	
0275	6015	CONTINUE	
	C	BEGIN ANALYSIS OF VARIANCE	239
			240
0276	215	SSRAD = 0.	241
0277		DO 221 I=1,NR	242
0278	221	SSRAD=SSRAD+RE(I)*O(I)	243
0279		VSTO = SSTO/FLOAT (NDFTO)	
0280		NDFRO = NR-1	245
0281		IF(NDFRO) 222,222,223	246
0282	222	VSRJ = 0.	247
0283		GO TO 224	248
0284	223	VSRJ = SSRAD/FLOAT (NDFRO)	249
0285	224	S = 0.00	
0286		DO 225 J=1,NC	251
0287	225	S = S + CC(J)*2/DFLOAT(NCOTJ(J))	
0288		S = S-G*GM	
0289		NDFINT = NDFRO - NDFRO - NC + 1	254
0290		IF(NDFINT) 226,226,227	255
0291	226	NDFINT = 0	256
0292		VSIHT = 0.	257
0293		GO TO 228	258
0294	227	SSINT = SSRAD - CCLE(SSRAD) - S	
0295		VSIHT = SSINT/FLCAT (NDFINT)	260
0296	228	SD = 0.00	
0297		DO 229 I=1,NR	262
0298	229	SD = SD + CR(I)*2/DFLOAT(NCOT(I))	
0299		SD = SD - G*GM	
0300		SSCAD = S-SD+CCLE(SSRAD)	
0301		NDFCOL = NR-1	266
0302		IF(NDFCOL) 230,230,231	267
0303	230	VSCOL = 0.	268
0304		GO TO 232	269
0305	231	VSCOL = SSCAD/FLOAT (NDFCOL)	270
0306	232	VSSB = VSCOL/FLCAT (NDFSB)	271
0307		IF(NDFSB) 233,233,234	272
0308	233	FRC = 0.	273
0309		VSE = 0.	
0310		FCOL = 0.	274
0311		FINT = 0.	275
0312		FSUB = 0.	276
0313		GO TO 235	277
0314	234	VSE = VSE/FLCAT (NDFE)	278
0315		FRO = VSRJ/VSE	279
0316		FCOL = VSCOL/VSE	280
0317		FINT = VSIHT/VSE	281
0318		FSUB = VSSB/VSE	282
0319	235	IF(VSIHT) 237,237,238	283
0320	237	FROI = 0.	284
0321		FCOLI = 0.	285
0322		GO TO 239	286
0323	238	FPCI = VSRJ/VSIHT	287
0324		FCOLI = VSCOL/VSIHT	288
0325	239	GAB=0.	
0326		DO 601 I=1,NR	

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FURTPAN IV G LEVEL 19

ANDY

DATE = 71253

13/24/17

0327	601	CAN=CAN+RE(I)*FLOAT(NIDOT(I))/FLOAT(NN)	
0328		CO 241 I=1,NR	
0329	241	P(I) = RE(I) * SNGLIGH) - CAN	
0330		IF (NR) 244,244,245	291
0331	245	CO 240 I=1,NR	292
0332		IP = I+1	293
0333		CO 240 J=IP,NR	294
0334		IF(R(I)-R(J)) 242,240,240	295
0335	242	TEM = R(I)	296
0336		R(I) = R(J)	297
0337		R(J) = TEM	298
0338		ITEM = JLVA(I)	299
0339		JLVA(I) = JLVA(J)	300
0340		JLVA(J) = ITEM	301
0341	240	CONTINUE	302
0342	244	NCH = NC-1	303
0343		CO 249 J=1,NC	304
0344	245	C(J)=C(J)+CAN*SNGLIGH)	
0345		IF (NCH) 246,246,247	306
0346	247	CO 250 I=1,NCH	307
0347		IP = I+1	
0348		CO 250 J=IP,NC	309
0349		IF(C(I)-C(J)) 252,250,250	310
0350	252	TEM = C(I)	311
0351		C(I) = C(J)	312
0352		C(J) = TEM	313
0353		ITEM = JLV8(I)	314
0354		JLV8(I) = JLV8(J)	315
0355		JLV8(J) = ITEM	316
0356	250	CONTINUE	317
0357	246	CONTINUE	
0358		NSTEP=11	
0359		IF (REC=IREC1-1	
0360		IF (NDC(IREC,45) .EQ. 0) GO TO 1001	
0361	1012	WRITE(IN1,IREC1,2003)	
0362		WRITE(IN2,IREC2,2003)	
0363		NSTEP=10	
0364		IREC=IREC1-1	
0365		IF (NDC(IREC,45) .EQ. 0) GO TO 1001	
0366	1011	WRITE(IN1,IREC1,2023)FAN(IFA)	
0367		WRITE(IN2,IREC2,2003)	
0368		NSTEP=12	
0369		IREC=IREC1-1	
0370		IF (NDC(IREC,45) .EQ. 0) GO TO 1001	
0371	1013	IF (NR.GT.6) GO TO 6019	
0372		IF (NR.GT.6) GO TO 6020	
0373	6019	WRITE(IN1,IREC1,2016)(JLVA(I),I=1,NR)	
0374		WRITE(IN2,IREC2,2003)	
0375		GO TO 6021	
0376	6020	WRITE(IN1,IREC1,2017)(JLVA(I),I=1,6)	
0377		WRITE(IN2,IREC2,2017)(JLVA(I),I=7,NR)	
0378	6021	CONTINUE	
0379		NSTEP=13	
0380		IREC=IREC1-1	
0381		IF (NDC(IREC,45) .EQ. 0) GO TO 1001	
0382	1014	IF (NR.GT.6) GO TO 6022	

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FORTRAN IV G LEVEL 19

AND

DATE = 71253

13/24/17

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0383       IF (NR.GT.6) GO TO 6023
0384       6022 WRITE(N1'REC1,2018)(R(I),I=1,NR)
0385       WRITE(N2'REC2,2003)
0386       GO TO 6024
0387       6023 WRITE(N1'REC1,2018)(R(I),I=3,6)
0388       WRITE(N2'REC2,2019)(R(I),I=7,NR)
0389       6024 CONTINUE
0390       KSTEP=33
0391       IREC=IREC1-1
0392       IF (MOD(IREC,45).EQ.0) GO TO 1001
0393       1060 WRITE(N1'REC1,2003)
0394       WRITE(N2'REC2,2003)
0395       KSTEP=14
0396       IREC=IREC1-1
0397       IF (MOD(IREC,45).EQ.0) GO TO 1001
0398       1015 WRITE(N1'REC1,2023)INAM(NF8)
0399       WRITE(N2'REC2,2003)
0400       KSTEP=15
0401       IREC=IREC1-1
0402       IF (MOD(IREC,45).EQ.0) GO TO 1001
0403       1016 IF (NR.LE.5) GO TO 6025
0404       IF (NR.GT.6) GO TO 6026
0405       6025 WRITE(N1'REC1,2016)(JLV6(I),I=1,NC)
0406       WRITE(N2'REC2,2003)
0407       GO TO 6027
0408       6026 WRITE(N1'REC1,2016)(JLV6(I),I=1,6)
0409       WRITE(N2'REC2,2017)(JLV6(I),I=7,NC)
0410       6027 CONTINUE
0411       KSTEP=16
0412       IREC=IREC1-1
0413       IF (MOD(IREC,45).EQ.0) GO TO 1001
0414       1017 IF (NR.LE.5) GO TO 6028
0415       IF (NR.GT.6) GO TO 6029
0416       6028 WRITE(N1'REC1,2018)(C(I),I=1,NC)
0417       WRITE(N2'REC2,2003)
0418       GO TO 6030
0419       6029 WRITE(N1'REC1,2018)(C(I),I=1,6)
0420       WRITE(N2'REC2,2019)(C(I),I=7,NC)
0421       6030 CONTINUE
0422       260 CONTINUE
0423       KSTEP=17
0424       IREC=IREC1-1
0425       IF (MOD(IREC,45).EQ.0) GO TO 1001
0426       1018 WRITE(N1'REC1,2003)
0427       WRITE(N2'REC2,2003)
0428       KSTEP=18
0429       IREC=IREC1-1
0430       IF (MOD(IREC,45).EQ.0) GO TO 1001
0431       1019 IF (MULT.EQ.1) WRITE(N1'REC1,2024)INAM(IV)
0432       IF (MULT.EQ.0) WRITE(N1'REC1,2024)INAM(IV)
0433       WRITE(N2'REC2,2003)
0434       KSTEP=19
0435       IREC=IREC1-1
0436       IF (MOD(IREC,45).EQ.0) GO TO 1001
0437       1020 WRITE(N1'REC1,2002)
0438       WRITE(N2'REC2,2003)

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350

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FORTRAN IV G LEVEL 14

ANOT

DATE = 71253

12/24/17

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0435      NSTEP=20
0440      IREC=IREC1-1
0441      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0442      1021 WRITE(N1,IREC1,2025)
0443      WRITE(N2,IREC2,2026)
0444      NSTEP=21
0445      IREC=IREC1-1
0446      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0447      1022 WRITE(N1,IREC1,2003)
0448      WRITE(N2,IREC2,2003)
0449      NSTEP=22
0450      IREC=IREC1-1
0451      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0452      1023 WRITE(N1,IREC1,2027)FNAM(NFA),NDFRO,SSRAD
0453      WRITE(N2,IREC2,2028)VSR0,FRO,FRO1
0454      NSTEP=23
0455      IREC=IREC1-1
0456      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0457      1024 WRITE(N1,IREC1,2029)FNAM(NFB),NDFCOL,SSCAD
0458      WRITE(N2,IREC2,2028)VSCOL,FCOL,FCOL1
0459      NSTEP=24
0460      IREC=IREC1-1
0461      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0462      1025 WRITE(N1,IREC1,2030)FNAM(NFA),FNAM(NFB),NOFINT,SSINT
0463      WRITE(N2,IREC2,2031)VSINT,FINI
0464      NSTEP=25
0465      IREC=IREC1-1
0466      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0467      1026 WRITE(N1,IREC1,2003)
0468      WRITE(N2,IREC2,2003)
0469      NSTEP=26
0470      IREC=IREC1-1
0471      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0472      1027 WRITE(N1,IREC1,2032)NDFSS3,SSSB
0473      WRITE(N2,IREC2,2033)VSSB,FSUB
0474      NSTEP=27
0475      IREC=IREC1-1
0476      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0477      1028 WRITE(N1,IREC1,2033)ADFE,SSSE
0478      WRITE(N2,IREC2,2034)VSE
0479      NSTEP=28
0480      IREC=IREC1-1
0481      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0482      1029 WRITE(N1,IREC1,2035)NDFTO,SSIO
0483      WRITE(N2,IREC2,2036)VSTO
0484      IF (NDFE) 270,270,271
0485      271      NUSE = SQRT(VSE)
0486      NSTEP=29
0487      IREC=IREC1-1
0488      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0489      1030 WRITE(N1,IREC1,2003)
0490      WRITE(N2,IREC2,2003)
0491      NSTEP=30
0492      IREC=IREC1-1
0493      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0494      1031 WRITE(N1,IREC1,2003)

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350
351

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FORTRAN IV G LEVEL 19

ANDT

DATE = 71253

13/24/17

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0495      WRITE(N2,IREC2,2036)RMSE
0496      270 IF(INDEFINT)2730,2730,274
0497      274 RMSE = SQRT(VSIN1)
0498      NSTEP=31
0499      IREC=IREC1-1
0500      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0501      1032 WRITE(N1,IREC1,2093)
0502      WRITE(N2,IREC2,2037)RMSE
0503      2730 NSTEP=32
0504      1049 IREC=IREC1-1
0505      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0506      1050 WRITE(N1,IREC1,2093)
0507      WRITE(N2,IREC2,2037)
0508      GO TO 1049
0509      273 IF((FLAG) 293,293,294
0510      294 DO 295 I=1,ILINK
0511          R(I) = RE(I)
0512          C(I) = Q(I)
0513          RE(I) = CE(I)
0514          Q(I) = QB(I)
0515          CE(I) = R(I)
0516          295 QB(I) = C(I)
0517      293 CALL INTER(IV)
0518      RETURN
0519      2001 FORMAT(55X,'PAGE',14,'L',16X/)
0520      2002 FORMAT(55X,'PAGE',14,'R',16X/)
0521      2003 FORMAT(30X)
0522      2004 FORMAT(53X,8A4,15X/)
0523      2005 FORMAT(7A4,52X/)
0524      2006 FORMAT(35X,'VARIABLE (',A4,' ) TABLE OF MEANS',15X/)
0525      2007 FORMAT('AND EFFECTS (',A4,' ) VERSUS (',A4,' )',44X/)
0526      2008 FORMAT(' ROWS =',34X,'C C L U M N S =',A6,17X)
0527      2009 FORMAT('A6,RX,4IN EACH BLOCK, ROW 1 DENOTES CELL MEANS, ROW 2 DENOT
          1ES',12X)
0528      2010 FORMAT(' CELL SIZE, AND ROW 3 DENOTES STANDARD DEVIATION.',31X)
0529      2011 FORMAT(' CODED',34X,'C O D E D L E V E L S',18X)
0530      2012 FORMAT(' LEV.',13,5110,22X)
0531      2013 FORMAT(4113,20X)
0532      2014 FORMAT(12,1P6E10.3,16X)
0533      2015 FORMAT(1P6E10.3,20X)
0534      2016 FORMAT(5X,13,5110,22X)
0535      2017 FORMAT(7110,10X)
0536      2018 FORMAT(12X,1P6E10.3,17X)
0537      2019 FORMAT(1P6E10.3,20X)
0538      2020 FORMAT(' COL.',7X)
0539      2023 FORMAT(5X,'ESTIMATES OF ',A4,' ADJUSTED MEANS, ORDERED',23X)
0540      2024 FORMAT(20X,'ANALYSIS OF VARIANCE FOR VARIABLE ',A4,22X)
0541      2025 FORMAT(5X,'SOURCE OF VARIATION',14X,'D.F.',7X,'SUM OF SQUARES',17X
          1)
0542      2026 FORMAT(5X,'MEAN SQUARE',8X,'F VS. ERROR',3X,'F VS. INTERACTION',
          125X)
0543      2027 FORMAT(2X,A6,4X,'(ROWS)',119,1P20.6,18X)
0544      2028 FORMAT(1P20.6,2:17.3,26X)
0545      2029 FORMAT(8X,A6,4X,'(CCLS)',119,1P20.6,18X)
0546      2030 FORMAT(5X,A6,'A6',A6,'(INTERACTION)',111,1P20.6,18X)
0547      2031 FORMAT(1P20.6,2:17.3,43X)

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FORTRAN IV G LEVEL 19

ANDY

DATE = 71253

13/24/17

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0548 2032 FORMAT(10X,'SUBTOTALS',5X,118,1PE20.6,10X)
0549 2033 FORMAT(12X,'ERROR',7X,118,1PE20.6,10X)
0550 2034 FORMAT(1PE20.6,60X)
0551 2035 FORMAT(12X,'TOTAL',7X,118,1PE20.6,10X)
0552 2036 FORMAT('ROOT MEAN SQUARE ERROR = ',1PE20.6,35X)
0553 2037 FORMAT(7X,'ROOT MEAN SQUARE INTERACTION = ',1PE16.6,26X)
0554 1001 WRITE(11,'REC1,2001')KOUNT
0555      WRITE(12,'REC2,2002')KOUNT
0556      KOUNT=KOUNT+1
0557      GO TO (1002,1003,1004,1005,1006,1007,1008,1009,1010,1011,1012,
1013,1014,1015,1016,1017,1018,1019,1020,1021,1022,1023,1024,1025,
21026,1027,1028,1029,1030,1031,1032,273,1660),NSTEP
0558      ENC

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359

FORTRAN IV G LEVEL 19

ECSYM

DATE = 71253

13/24/17

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0001      SUBROUTINE ECSYM(A,Q,B,NAI)
          C
          C      SOLVE A POSITIVE SEMIDEFINITE OR POSITIVE DEFINITE
          C      SYMMETRIC EQUATION
          C
0002      COMMON N,IOVLV,ITYPE,TTL(15),VNAH(10),PNAH(2),NLVL(2),NEND(2,12),
          1LEVEL(2,12),HRA,NCA,NRB,NCB,JAB(8),N1,N2,NVAL,NFACT,NG12,MULT,
          2NSUBJ,NLOV,AH1,NW2,NT,ISEG,M12,GJZ,KOUNT,NDIAG,IKEC1,IKEC2,IKEC3
          3,NYTRAN(10),THAM(10),LOV(10),MNLOV(10)
0003      DIMENSION A(12,12),Q(12),B(12),AA(78),T(78),O(13)
0004      IJ = 0
0005      DO 1 J=1,NR
0006      DO 1 I=1,J
0007      IJ = IJ+1
0008      1  AA(IJ) = A(I,J)
0009      NRA = NR
0010      NR8 = NR
0011      NCA = NR
0012      NCB = NR
0013      CALL INSLD(AA,T,D)
0014      IX = 1
0015      DO 2 I=1,NR
0016      IX = IX+1
0017      JX = 1
0018      B(I) = 0.
0019      DO 6 J=1,NR
0020      IF(J-I) 3,3,4
0021      3  JX = J
0022      GO TO 5
0023      4  JX = JX+J-1
0024      5  IJ = IX + JX - 1
0025      6  B(I) = B(I) + T(IJ)*Q(IJ)
0026      2  CONTINUE
0027      DO 10 I=1,NR
0028      SUM = 0.
0029      DO 12 J=1,NR
0030      12 SUM = SUM + A(I,J)*B(J)
0031      IF(O(I)) 13,14,13
0032      14 DEN = 1.
0033      GO TO 15
0034      13 DEN = ABS(Q(I))
0035      15 IF(ABS(SUM-C(I))/DEN - 1.E-5) 10,10,16
0036      10 CONTINUE
0037      GO TO 20
0038      16 CONTINUE
0039      20 RETURN
0040      END

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FORTRAN IV G LEVEL 19

INTER

DATE = 71253

13/24/77

```

0001      SUBROUTINE INTER(IV)
0002      EXTERNAL PRINT
0003      COMMON H,IV,LY,I,TYPE,ITL(15),VRAM(10),FNAME(2),NLVL(2),NEND(2,12),
1LEVEL(2,12),NRA,ACA,NRP,NCB,JAC(5),N1,N2,NVPL,NFACT,NG12,MULT,
2NSUBJ,NLUV,NL1,AGE,OF,ISLC,N12,NJ2,KOUNT,NDIAG,IPEC1,IPEC2,IPEC3
3,NTRAC(10),TRAP(10),LUV(10),NLNLUV(10)

0004      DIMENSION TEXT(15)
0005      DATA CSIZE/' '
0006      CALL GRINI(CSIZE)
0007      MASK=1610612739
0008      CALL GCPFK(MASK,PFINT)
0009      CALL GERAS(100)
0010      CALL GROPLY(' ',1,6400)
0011      CALL GROPLY('THE ANALYSES ON THE FOLLOWING VARIABLES ARE NOW COMPL
1ETE.',57,6400)
0012      IF(MULT.EQ.1)WRITE(4,25)(VNAME(IJ),IJ=1,IV)
0013      IF(MULT.EQ.0)WRITE(4,25)(TNAM(IJ),IJ=1,IV)
0014      25 FORMAT(10(2X,A4))
0015      CALL PSICH(TEXT,NCF,6400)
0016      CALL GROPLY(TEXT,NCF,6400)
0017      CALL GROPLY(' ',1,6400)
0018      CALL GROPLY('PRESS KEY 1 TO CONTINUE WITH CALCULATIONS OR KEY 2 TO
1 STOP',50,6400)
0019      CALL GROPLY('CALCULATIONS AT THIS STAGE.',27,6400)
0020      10 CALL GWAIT
0021      IF(N.EQ.30.OR.N.EQ.1)GO TO 205
0022      IF(N.EQ.31)GO TO 210
0023      IF(N.EQ.2)GO TO 75
0024      GO TO 10
0025      75 NVPL=IV
0026      203 CALL GERAS(100)
0027      CALL GRRLSE
0028      RETURN
0029      210 CALL GERAS(100)
0030      CALL GRRLSE
0031      STOP
0032      400 GO TO 210
0033      END

```

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FORTRAN IV G LEVEL 19

OUTPUT

DATE = 71253

13/24/17

```

0001      SUBROUTINE OUTPUT
0002      EXTERNAL PFINT
0003      COMMON N,ICVLY,ITYPE,TTL(5),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
1LEVEL(2,12),MRA,MCA,NRA,NCB,JAB(8),N1,N2,NVBL,NFACT,HGIC,MUL1,
2NSUBJ,NLUV,MN1,MN2,NY,ISGC,NIZ,NJZ,KOUNT,NDIAG,IREF1,IREF2,IREF3
3,NTRAN(10),TNAM(10),LUV(10),MNLUV(10)
0004      DIMENSION TEXT(18),TEXT2(20)
0005      EQUIVALENCE (TEXT(1),TEXT2(1))
0006      DATA CSIZE/'8'/
0007      CALL GRINIT(CSIZE)
0008      N=-1
0009      MASK1=2013265923
0010      MASK=2113929219
0011      NC=72
0012      IF (MULT.EQ.0) CALL GCPFK(MASK1,PFINT)
0013      IF (MULT.EQ.1) CALL GCPFK(MASK,PFINT)
0014      IREF1=1
0015      IREF2=1
0016      3 FORMAT(20A4)
0017      CALL GROPLY(' ',1,6400)
0018      CALL GROPLY(' ',1,6400)
0019      CALL GROPLY(' ',1,6400)
0020      CALL GROPLY(' ',1,6400)
0021      CALL GROPLY(' ',1,6400)
0022      CALL GROPLY(' ',1,6400)
0023      CALL GROPLY(' ',1,6400)
0024      CALL GROPLY(' ',1,6400)
0025      CALL GROPLY(' ',1,6400)
0026      IF (MULT.EQ.1) CALL GROPLY('PRESS KEY 1 TO PROCEED TO THE FIRST PA
1GE OF YOUR UNIVARIATE RESULTS.',68,6400)
0027      IF (MULT.EQ.0) CALL GROPLY('PRESS KEY 1 TO PROCEED TO THE FIRST PA
1GE OF YOUR MULTIVARIATE RESULTS.',70,6400)
0028      5 CALL GWAIT
0029      IF (N.EQ.1) GO TO 15
0030      IF (N.EQ.30) GO TO 75
0031      IF (N.EQ.31) GO TO 50
0032      GO TO 5
0033      15 CALL GERAS(100)
0034      DO 16 I=1,45
0035      READ(N1,IREF1)TEXT2
0036      CALL GROPLY(TEXT,NC,6400)
0037      17 CALL GWAIT
0038      IF (N.EQ.1) GO TO 30
0039      IF (N.EQ.2) GO TO 15
0040      IF (N.EQ.3) GO TO 32
0041      IF (N.EQ.4.OR.N.EQ.5.OR.N.EQ.6.OR.N.EQ.30) GO TO 75
0042      IF (N.EQ.31) GO TO 50
0043      GO TO 17
0044      25 CALL GERAS(100)
0045      DO 26 I=1,45
0046      READ(N2,IREF2)TEXT2
0047      CALL GROPLY(TEXT,NC,6400)
0048      27 CALL GWAIT
0049      IF (N.EQ.1) GO TO 34
0050      IF (N.EQ.2) GO TO 25

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FORTRAN IV G LEVEL 19

OUTPUT

DATE = 7/25/53

13/24/17

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0051      IF (N.EQ.3) GO TO 36
0052      IF (N.EQ.4.GH.N.EQ.5.OR.N.EQ.6.OR.N.EQ.30) GO TO 75
0053      IF (N.EQ.31) GO TO 50
0054      GO TO 27
0055      30 IREC2=IREC1-45
0056      GO TO 25
0057      32 IF (IREC1.EQ.46) GO TO 17
0058      IREC1=IREC1-50
0059      GO TO 15
0060      75 CALL GERAS(100)
0061      CALL GRRLSE
0062      RETURN
0063      34 IREC1=IREC2-45
0064      GO TO 15
0065      36 IF (IREC2.EQ.46) GO TO 27
0066      IREC2=IREC2-50
0067      GO TO 25
0068      50 CALL GERAS(100)
0069      CALL GRRLSE
0070      STOP
0071      400 CALL GERAS(100)
0072      WRITE(6,402)
0073      402 FORMAT(1H1,'ERROR')
0074      GO TO 50
0075      END

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FORTRAN IV G LEVEL 19

PLOT

DATE = 71253

13/24/17

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0001      SUBROUTINE PLOT
0002      EXTERNAL PFINT,EUBINT
0003      INTEGER XNVBL,YNVBL
0004      COMMON N,IOVLY,IType,TTL(15),VNAME(10),FNAME(2),NLVL(2),HEND(2,12),
1LEVEL(2,12),NRA,NCA,NRB,NGB,JAB(6),N1,N2,NVBL,NFACT,NG12,MULT,
2NSUBJ,NLUV ,AW1,NW2,NT,ISEQ,NIZ,NJZ,KOUNT,NDIAG,IREC1,IREC2,IREC3
3,NTRAN(10),TNAP(10),LUV(10),MNLUV(10)
0005      DIMENSION X(100),Y(100),NCCUNT(100),NTEN(100),NHUND(100),
1MXCH(3),MAXCH(3),MIYCH(3),MAYCH(3),TEXT(15),ISET(13),SETUP(15)
0006      EQUIVALENCE (ISET(1),SETUP(1))
0007      DOUBLE PRECISION DNP
0008      DATA CSIZE/'B'/
0009      10 REWIND N#1
0010      IMPY=-16777216
0011      NR=NLVL(1)
0012      NCC=NLVL(2)
0013      MASK1=1140850695
0014      NSTEP=1
0015      NC=60.
0016      XSUM=0.0
0017      YSUM=0.0
0018      XSUM2=0.0
0019      YSUM2=0.0
0020      KOUNT=0
0021      CALL GRXIT(CSIZE)
0022      CALL GCRCB(ECBINT)
0023      CALL GCPEK(MASK1,PFINT)
0024      CALL GERAS(100)
0025      CALL GRDPLY(' ',1,6400)
0026      CALL GRDPLY('AT THIS STAGE YOU MAY LOOK AT PLOTS OF YOUR DATA POINTS.',57,6400)
0027      CALL GRDPLY('YOU HAVE THE CHOICE OF SEEING A CELL, A ROW, A COLUMN',1,57,6400)
0028      CALL GRDPLY('ALL YOUR DATA. TO INDICATE YOUR CHOICE OF POINTS, TYPE IN',58,6400)
0029      CALL GRDPLY('THE LEVELS OF BOTH FACTORS. IF YOU WISH TO SEE ALL 1 LEVELS',58,6400)
0030      CALL GRDPLY('OF A FACTOR TYPE "D" FOR THE LEVEL',35,6400)
0031      CALL GRDPLY('EXAMPLE: SUPPOSE FACTOR 1 IS DESIGNATED AS THE ROWS 1 IN THE',59,6400)
0032      CALL GRDPLY('ANOVAR TABLE',22,6400)
0033      CALL GRDPLY('2,2 INDICATES BOTH LEVELS AT 2.',43,6400)
0034      CALL GRDPLY('0,4 INDICATES THE 4TH COLUMN.',46,6400)
0035      CALL GRDPLY('3,0 INDICATES THE 3RD ROW.',43,6400)
0036      CALL GRDPLY('0,0 INDICATES ALL POINTS.',42,6400)
0037      CALL GRDPLY(' ',1,6400)
0038      185 DO 25 I=1,2
0039      WRITE(14,20)FNAME(I)
0040      26 FORMAT('WHICH LEVEL DO YOU WISH TO SEE OF ',A4,'?')
0041      CALL PETCH(TEXT,NC,6400)
0042      CALL GRDPLY(TEXT,NC,6400)
0043      CALL GWAII
0044      IF(IType.NE.3)GO TO 402
0045      CALL GRDPLY(TEXT,NC)

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FORTRAN IV G LEVEL 19

PLOT

DATE = 71253

13/24/17

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0046      CALL XBLANK(TEXT,NC)
0047      INDEX=0
0048      CALL INX(TEXT,INDEX,NC,DNP,&401)
0049      IF(I.EQ.1)NFAC1=DNP
0050      IF(I.EQ.2)NFAC2=DNP
0051      25 CONTINUE
0052      175 IF(NFAC1.GT.NN.OR.NFAC2.GT.NCC)GO TO 180
0053      CALL GROPLY(' ',1,&400)
0054      191 CALL GROPLY('WHICH VARIABLE DO YOU WISH TO ASSIGN TO THE X-AXIS?',
      .151,&400)
0055      NSTEP=2
0056      190 CALL WAIT
0057      IF(ITYPE.NE.3)GO TO 402
0058      CALL GRPLY(TEXT,NC)
0059      CALL XBLANK(TEXT,NC)
0060      VNAME1=TEXT(1)
0061      CALL GROPLY('WHICH VARIABLE DO YOU WISH TO ASSIGN TO THE Y-AXIS?',
      .151,&400)
0062      NSTEP=3
0063      195 CALL WAIT
0064      IF(ITYPE.NE.3)GO TO 402
0065      CALL GRPLY(TEXT,NC)
0066      CALL XBLANK(TEXT,NC)
0067      VNAME2=TEXT(1)
0068      XNVBL=-1
0069      YNVBL=-1
0070      DO 50 I=1,NVBL
0071      50 IF(VNAME1.EQ.VNAME(I)) XNVBL=I
0072      IF(VNAME2.EQ.VNAME(I)) YNVBL=I
0073      IF(XNVBL.EQ.-1.OR.YNVBL.EQ.-1)GO TO 450
0074      CALL GROPLY(' ',1,&400)
0075      CALL GROPLY(' ',1,&400)
0076      CALL GROPLY('IF, AT ANY TIME, YOU WISH TO RETURN TO YOUR PREVIOUS',
      .152,&400)
0077      CALL GROPLY('UNIVARIATE ANALYSIS OUTPUT, PRESS KEY 29.',41,&400)
0078      CALL GROPLY(' ',1,&400)
0079      CALL GROPLY('TO RETURN TO THE BEGINNING OF THIS SEGMENT TO SEE',49
      .1,&400)
0080      CALL GROPLY('ADDITIONAL PLOTS, PRESS KEY 1.',30,&400)
0081      CALL GROPLY(' ',1,&400)
0082      CALL GROPLY('TO SEE YOUR DATA AGAIN, PRESS KEY 5.',36,&400)
0083      I=0
0084      DO 75 N=1,NSLDJ
0085      READ(INW1) SETUP
0086      IF(NFAC1.EQ.0.AND.NFAC2.EQ.0)GO TO 76
0087      IF(NFAC1.EQ.0.AND.ISET(2).EQ.NFAC2)GO TO 76
0088      IF(NFAC1.EQ.ISET(1).AND.NFAC2.EQ.0)GO TO 76
0089      IF(ISET(1).EQ.NFAC1.AND.ISET(2).EQ.NFAC2)GO TO 76
0090      GO TO 75
0091      76 IF(ISETUP(2+XNVBL).EQ.-999..OR.SETUP(2+YNVBL).EQ.-999.)GO TO 75
0092      I=I+1
0093      ACOUNT(I)=0
0094      NTEN(I)=ODRCOUNT(I,10)
0095      NHUN=(RCOUNT(I)-NTEN(I))/10
0096      NHUN(I)=30*(NHUN,10)
0097      X(I)=SETUP(2+XNVBL)

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FORTRAN IV G LEVEL 19

PLOT

DATE = 71253

13/24/17

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0098      Y(I)=SETUP(2+YNVBL)
0099      XSUM=XSUM+X(I)
0100      YSUM=YSUM+Y(I)
0101      XSUM2=XSUM2+X(I)*X(I)
0102      YSUM2=YSUM2+Y(I)*Y(I)
0103      KOUNT=KOUNT+1
0104      75 CONTINUE
0105      IF(KOUNT.LE.1)GO TO 425
0106      XMEAN=XSUM/FLCAT(KOUNT)
0107      YMEAN=YSUM/FLCAT(KOUNT)
0108      XSC=((XSUM2-XSUM*XSUM/FLCAT(KOUNT))/FLCAT(KOUNT-1))**.5
0109      YSD=((YSUM2-YSUM*YSUM/FLCAT(KOUNT))/FLCAT(KOUNT-1))**.5
0110      XMID=.5*XSD
0111      YMID=.5*YSO
0112      XMIN=XMEAN-XMID
0113      XMAX=XMEAN+XMID
0114      YMIN=YMEAN-YMID
0115      YMAX=YMEAN+YMID
0116      XDIS=2.*XMID/56.
0117      WRITE(NT,101)XMIN,XMAX
0118      101 FORMAT(2(1PE10.3,2X))
0119      BACKSPACE NT
0120      READ(NT,102)MIXCH,MAXCH
0121      102 FORMAT(A4)
0122      CALL GEXAS(100)
0123      CALL GRKLE
0124      NSTEP=4
0125      CALL INITP
0126      CALL PFKP(MASK1,PFINT)
0127      CALL FCBP(EOBIAT)
0128      CALL GRAXES(C.,4092.,0.,4092.,0,4092,0,4092)
0129      CALL GRCHAR('BP',MIXCH,10,376.,400.,KODEB)
0130      CALL GRCHAR('BP',VNAH(XNVBL),4,2250.,400.,KODEH)
0131      CALL GRCHAR('BP',MAXCH,10,3580.,400.,KODEB)
0132      WRITE(NT,101)YMIN,YMAX
0133      BACKSPACE NT
0134      READ(NT,102)MIYCH,MAXCH
0135      CALL GRCHAR('BP',MIYCH,10,0.,600.,KODEC)
0136      CALL GRCHAR('BP',VNAH(YNVBL),4,100.,2320.,KODEH)
0137      CALL GRCHAR('BP',MIYCH,10,0.,4092.,KODED)
0138      CALL GRAXES(XMIN,XMAX,YMIN,YMAX,600,4012,600,4012)
0139      CALL GRGRID(XMIC,YMID,'A',KODEE)
0140      DO 90 II=1,KCUNT
0141      CALL UV00(2)
0142      DO 91 KK=1,2
0143      91 CALL PUTUV(X(II),Y(II),KCODEF)
0144      ICT=IMPY*(16-NTEN(II))
0145      CALL GRPLOT('BP','B','B',1,2,ICT,'Q',KODEG)
0146      CALL UV99
0147      90 CONTINUE
0148      DO 95 II=1,KCUNT
0149      IF(INHUND(II).EQ.0.AND.NCUNT(II).LT.10)GO TO 95
0150      X(II)=X(II)-XDIS
0151      CALL UV00(2)
0152      DO 96 KK=1,2
0153      96 CALL PUTUV(X(II),Y(II),KODEF)

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FORTRAN IV G LEVEL 19

PLOT

DATE = 71253

13/24/17

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0154      ICT=(N2**((16-MHUNG(1)))
0155      CALL GRPLT('BP','B','B',1,2,ICT,'D',KUNFG)
0156      CALL UV99
0157      95 CONTINUE
0158      505 FORMAT(1H ,110)
0159      CALL WAIT
0160      99 CALL REFILL
0161      CALL RLSEP
0162      IF(N.EQ.1)GO TO 10
0163      IF(N.EQ.31)GO TO 299
0164      RETURN
0165      400 CALL GSRAS(100)
0166      GO TO 10
0167      401 CALL GRDPLY('FORMAT ERROR. PLEASE REENTER DATA.',35,6400)
0168      GO TO (185,259,299),NSTEP
0169      402 IF(ITYPE.EQ.1.AND.N.EQ.29)GO TO 99
0170      IF(ITYPE.EQ.1.AND.N.EQ.30)GO TO 99
0171      IF(ITYPE.EQ.1.AND.N.EQ.31)GO TO 299
0172      CALL GRDPLY('YOU SHOULD BE IN A POSITION REQUIRING EOB.',42,6400)
0173      GO TO (185,190,195),NSTEP
0174      180 CALL GRDPLY(' ',1,6400)
0175      CALL GRDPLY('ONE OF YOUR LEVEL NUMBERS EXCEEDS THE NUMBER OF LEVEL
      IS FOR THE FACTOR.',70,6400)
      CALL GRDPLY('PLEASE REENTER YOUR SET OF POINTS.',34,6400)
      GO TO 185
0176      425 CALL GRDPLY(' ',1,6400)
0177      CALL GRDPLY(' ',1,6400)
0178      CALL GRDPLY('DOES IT MAKE SENSE TO PLOT ONLY ONE POINT?',42,6400)
0179      CALL GRDPLY('PRESS KEY 1 TO REENTER A NEW SET OF POINTS.',43,6400)
0180      426 CALL WAIT
0181      IF(N.EQ.1)GO TO 10
0182      IF(N.EQ.31)GO TO 299
0183      GO TO 426
0184      450 CALL GRDPLY(' ',1,6400)
0185      CALL GRDPLY('PLEASE REENTER YOUR NAMES.',26,6400)
0186      GO TO 191
0187      299 IF(NSTEP.EQ.41)GO TO 300
0188      CALL GSRAS(100)
0189      CALL GRRLSE
0190      STOP
0191      300 CALL REFILL
0192      CALL RLSEP
0193      CALL UV99
0194      STOP
0195      ENC
0196
0197

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FORTRAN IV G LEVEL 19

DELETE

DATE = 71253

13/24/17

```

0001      SUBROUTINE DELETE
0002      EXTERNAL PFINT,EOBINT
0003      COMMON N,ICNLY,ITYPE,TTL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
1LEVEL(2,12),HRA,MZA,MRO,NCB,JAB(0),N1,N2,NVBL,MFACT,NG12,MULT,
2NSUBJ,MLOV,MN1,MN2,NT,1SEQ,N12,NJ2,KOUNT,NOIAG,IREC1,IREC2,IREC3
3,NTRAM(10),TRAM(10),LOV(10),MNLUV(10)
0004      DATA CSIZE/'0'/
0005      DATA BLANK/' '/
0006      MULT=0
0007      CALL GRINT1(SIZE)
0008      CALL CGEGR1(ABINT)
0009      MASK=610612739
0010      CALL GCIFK(MASK,PFINT)
0011      20 CALL GERAS(100)
0012      CALL GROPLY(' ',1,6400)
0013      CALL GROPLY(' ',1,6400)
0014      CALL GROPLY('YOUR RESPONSE VARIABLE NAMES WILL APPEAR BELOW ONE AT
1 A TIME.',61,6400)
0015      CALL GROPLY('PRESS KEY 1 IF YOU WISH TO INCLUDE THE VARIABLE OR KE
LY 2 IF',59,6400)
0016      CALL GROPLY('YOU WISH TO DELETE THE VARIABLE.',32,6400)
0017      CALL GROPLY(' ',1,6400)
0018      IK=0
0019      25 IK=IK+1
0020      TEST=VNAME(IK)
0021      CALL GROPLY(TEST,4,6400)
0022      26 CALL GWAIT
0023      IF(N.EQ.30)GO TO 203
0024      IF(N.EQ.31)GO TO 210
0025      IF(N.EQ.1)GO TO 29
0026      IF(N.EQ.2)GO TO 35
0027      GO TO 26
0028      29 LUV(IK)=IK
0029      MNLUV(IK)=IK
0030      TRAM(IK)=VNAME(IK)
0031      IF(IK.LT.NVBL)GO TO 25
0032      IF(IK.EQ.NVBL)GO TO 30
0033      35 CALL GOKSP(1)
0034      LUV(IK)=0
0035      MNLUV(IK)=0
0036      TRAM(IK)=BLANK
0037      IF(IK.EQ.NVBL)GO TO 30
0038      IF(IK.LT.NVBL)GO TO 25
0039      30 CALL GROPLY(' ',1,6400)
0040      CALL GROPLY(' ',1,6400)
0041      CALL GROPLY('THE ABOVE VARIABLES ARE THE ONES YOU DECIDED TO INCLU
1CE.',56,6400)
0042      CALL GROPLY('IF YOU AGREE, PRESS KEY 1; IF YOU WOULD LIKE TO TRY
1AGAIN.',59,6400)
0043      CALL GROPLY('PRESS KEY 2.',12,6400)
0044      32 CALL GWAIT
0045      IF(N.EQ.1)GO TO 50
0046      IF(N.EQ.2)GO TO 20
0047      IF(N.EQ.3)GO TO 203
0048      IF(N.EQ.31)GO TO 210
0049      GO TO 32

```

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FORTRAN IV G LEVEL 19

DELETE

DATE = 71253

13/24/17

```
0050      50 IF (LUV(NVBL).EQ.0)TNAM(NVBL)=VNAM(NVBL)
0051      NVBL=NVDL-1
0052      DO 150 IC=1,NVBL
0053      IF (TNAM(IC).NE.BLANK)GO TO 150
0054      153 DO 152 JA=IQ,NVBL
0055      152 TNAM(JA)=TNAM(JA+1)
0056      IF (TNAM(IQ).EQ.BLANK)GO TO 153
0057      150 CONTINUE
0058      203 CALL GERAS(100)
0059      CALL GRRLSE
0060      RETURN
0061      400 GO TO 203
0062      210 CALL GERAS(100)
0063      CALL GRRLSE
0064      STOP
0065      ENC
```

FORTRAN IV G LEVEL 15

MAINB

DATE = 71253

13/24/17

```

0001      SUBROUTINE MAINB
0002      COMMON N,ICVLY,ITYPE,TTL(15),VNAME(10),PHAM(2),NLVL(2),HEND(2,12),
      1LEVEL(2,12),NRA,NCA,NRH,NCF,JAL(8),N),KZ,NVPL,NFAC,NC12,MULT,
      2ASUBJ,NLUV,NW1,NW2,NT,ISIC,NFZ,NJZ,KOUNT,KU1AG,IRCC1,IRCC2,IRCC3
      3,NTXAN(10),TAP(10),LUV(10),NLUV(10)
0003      DOUBLE PRECISION DSQV,DSQU,DSSCP,J
0004      DIMENSION SUB(12,12),RE(12),CE(10),Q(12),UP(12),NN(12,12),RE1(12),
      1,RE2(12),CE1(12),CE2(12),QAI(12),QAZ(12),QAI(12),QAZ(12),SUB1(12,1
      22),SUB2(12,12),F(55),E(55),CRAP(11),E1(55),H4(55),H5(55),HAB(55),
      3HSB(55),K(55),DSSCP(10,10),CUMC(10)
      NI=NI2
      NJ=NJ2
0005      4000 BACKSPACE NW2
0006      READ(NW2)NN1
0007      REWIND NW2
0008      READ(NW2) DSSCP
0009      DO 101 IX=1,3
0010      101 READ(NW2) SLF,SUB,SUB,SUB,SUB,SUB,SUB,SUB,SUB,SUB
0011      READ(NW2) CUMC,CUMC
0012      KG = NVBL
0013      DO 3011 NV1=1,KC
0014      DO 299 IX=1,NV1
0015      299 READ (NW2) NI,NJ,K,SUB,RE,CE,Q,CB
      BACKSPACE NW2
0016      DO 302 JG = 1,12
0017      RE1(JG)=RE(JG)
0018      CE1(JG) = CE(JG)
0019      CA1(JG) = C(JG)
0020      CB1(JG) = CB(JG)
0021      DO 302 JH=1,12
0022      302 SUB1(JG,JH) = SUB(JG,JH)
0023      DO 301 NV2 = NV1,KC
0024      READ (NW2) NI,NJ,K,SUB,RE,CE,Q,CB
0025      DO 303 JG = 1,12
0026      RE2(JG) = RE(JG)
0027      CE2(JG) = CE(JG)
0028      CA2(JG) = C(JG)
0029      CB2(JG) = CB(JG)
0030      DO 303 JH = 1,12
0031      303 SUB2(JG,JH) = SUB(JG,JH)
0032      B = DSSCP(NV1,NV2)
0033      CALL GENHE(D,NN1,SUB1,SUB2,RE1,RE2,CE1,CE2,QAI,QAZ,QBI,QB2,NV1,
0034      1NV2,NI,NJ,E,FA,H4,HAB,H5,SE,NHFSR,NJFE)
0035      301 CONTINUE
0036      REWIND NW2
0037      READ(NW2)DUPC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,
0038      1DUPC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC,DUMC
0039      DO 104 IZ=1,3
0040      104 READ(NW2) SLF,SUB,SUB,SUB,SUB,SUB,SUB,SUB,SUB,SUB
0041      READ(NW2) CUMC,DUMC
0042      3011 CONTINUE
0043      NRA = NVPL
0044      NCA = NVPL
0045      NRH = NVPL
0046      NCF=NVPL
0047      CALL INSLCIE,F1,CRAP)
0048

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FORTRAN IV G LEVEL 19

MAINB

DATE = 7/253

13/24/17

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0049      ALDE = CRAP(NRA)
0050      NSTEP=1
0051      IREC=IREC1-1
0052      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0053      501  WRITE(N1'IREC1,2005)(TTL(IJ),IJ=1,15)
0054      WRITE(N2'IREC2,2006)
0055      NSTEP=2
0056      IREC=IREC1-1
0057      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0058      502  WRITE(N1'IREC1,2003)
0059      WRITE(N2'IREC2,2003)
0060      NSTEP=3
0061      IREC=IREC1-1
0062      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0063      503  WRITE(N1'IREC1,2007)
0064      WRITE(N2'IREC2,2008)FNAM(N1),FNAM(NJ)
0065      CALL WRIR(E,NRA,1)
0066      NSTEP=4
0067      IREC=IREC1-1
0068      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0069      504  WRITE(N1'IREC1,2003)
0070      WRITE(N2'IREC2,2003)
0071      NSTEP=5
0072      IREC=IREC1-1
0073      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0074      505  WRITE(N1'IREC1,2009)
0075      WRITE(N2'IREC2,2003)
0076      CALL WRIR(CRAP,NRA,0)
0077      DO 312 I=1,NRA
0078      II = LTERM(I,1)
0079      IF(E(III) 321,321,325
0080      325  CRAP(II) = SQRT(E(III))
0081      312  CONTINUE
0082      DO 313 I = 1,NRA
0083      DO 313 J=I,NRA
0084      IJ = LTERM(I,J)
0085      313  RR(IJ) = E(IJ)/(CRAP(II)*CRAP(J))
0086      NSTEP=6
0087      IREC=IREC1-1
0088      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0089      506  WRITE(N1'IREC1,2003)
0090      WRITE(N2'IREC2,2003)
0091      NSTEP=7
0092      IREC=IREC1-1
0093      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0094      507  WRITE(N1'IREC1,2010)
0095      WRITE(N2'IREC2,2003)
0096      CALL WRIR(RR,NRA,1)
0097      321  CONTINUE
0098      NSTEP=8
0099      IREC=IREC1-1
0100      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0101      508  WRITE(N1'IREC1,2003)
0102      WRITE(N2'IREC2,2003)
0103      NSTEP=9
0104      IREC=IREC1-1

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FORTRAN IV G LEVEL 19

MAINB

DATE = 71253

13/24/17

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0105      IF(MCD(IREC,45) .EQ. 0) GO TO 1001
0106      509  WRITE(N1'IREC1,2011)FAAH(N1)
0107      WRITE(N2'IREC2,2012)FNAH(NJ)
0108      REWIND NW2
0109      WRITE(NW2) HAB,HA,HB,E,CRAH,EE,HSB,NDFE,NDFI,ALDE,NI,NJ,NDFS8
0110      REWIND NW2
0111      RETURN
0112      1001 WRITE(N1'IREC1,2001)KOUNT
0113      WRITE(N2'IREC2,2002)KOUNT
0114      KOUNT=KOUNT+1
0115      GO TO(501,502,503,504,505,506,507,508,509),NSTEP
0116      2001 FORMAT(55X,'PAGE',I4,'L',16X/)
0117      2002 FORMAT(55X,'PAGE',I4,'R',16X/)
0118      2003 FORMAT(80X)
0119      2005 FORMAT(15A4,' MULTIVARIA',8X)
0120      2006 FORMAT('TE ANALYSIS',69X)
0121      2007 FORMAT(40X,'MATRIX E AFTER ELIMINATION OF FA',8X)
0122      2008 FORMAT('CTORS(',A4,') AND ('',A4,')',58X)
0123      2009 FORMAT(40X,'STEPWISE LOG DETERMINANTS',15X)
0124      2010 FORMAT(40X,'CORRELATIONS BASED ON E',17X)
0125      2011 FORMAT(40X,'SUBTOTALS (ALL EFFECTS) ',A4,' AND',8X)
0126      2012 FORMAT(A4,76X)
0127      END

```

FORTRAN IV G LEVEL 15

GENHE

DATE = 71253

13/24/17

```

0001      SUBROUTINE GENHE(D,NN1,SUB1,SUB2,RE1,RE2,CE1,CE2,QA1,QA2,QB1,QB2,
      1RV1,NV2,N1,NJ,E,HA,HB,HAB,HSD,NDFSB,NDFE)
      C
      C      GENERATES THE ELEMENTS OF SUM OF SQUARES AND PRODUCTS
      C      MATRICES FOR ERROR (E) AND EFFECTS OR HYPOTHESES (H)
      C
0002      DOUBLE PRECISION SSUB,SPR,S,T,DN,ET,D
0003      COMMON N,ICVLY,ITYPE,TTL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
      1LEVEL(2,12),NRA,NCA,NRD,NCE,JAB(H),N1,N2,NVHL,AFACT,NG12,MULT,
      2HSUBJ,HLUV,NM1,MW2,NT,ISEQ,N12,NJ2,KOUNT,NDIAG,IREC1,IREC2,IRLC3
      3,N(PAN(10),TAN(10),LUV(10),WNLUV(10)
      DIMENSION SUB1(12,12),SUB2(12,12),RE1(1),RE2(1),CE1(1),CE2(1),
      1  QA1(1),QA2(1),QB1(1),QB2(1),E(1),HA(1),HB(1),HAB(1),HSD(1),
      2  R(12),RB(12),NN1(12,12),NIDCT(12)
0005      NG = 0
0006      SSUB = 0.00
0007      SUMA=0.
0008      SUMB=0.
0009      NR = NLVL(N1)
0010      NC = NLVL(NJ)
0011      NDFSB = -1
0012      SPR = 0.00
0013      DO 1 I = 1,NR
0014      DO 1 J = 1,NC
0015      S = 0.00
0016      T = 0.00
0017      S = SUB1(I,J)
0018      T = SUB2(I,J)
0019      CN = 0.00
0020      DN=NR1(I,J)
0021      IF (NR1(I,J)) 1,1,2
0022      2 SUMA = SUMA + SUB1(I,J)
0023      SUMB = SUMB + SUB2(I,J)
0024      AG=NG+AN1(I,J)
0025      SPR=SPR+S*T/CN
0026      NDFSB = NDFSB + 1
0027      1 CONTINUE
0028      ET = 0.00
0029      ET=D-SPR
0030      S = C.DC
0031      CN = 0.00
0032      S = SUMA
0033      T = 0.00
0034      T = SUMB
0035      CN = NG
0036      SSUB=SPR-S*T/DN
0037      DO 6 I = 1,NR
0038      NIDCT(I) = 0
0039      R(I) = 0.
0040      RB(I) = 0.
0041      DO 6 J = 1,NC
0042      NIDCT(I)=NIDCT(I)+NR1(I,J)
0043      R(I) = R(I) + SUB1(I,J)
0044      6 RB(I) = RB(I) + SUB2(I,J)
0045      SRU = C.
0046      DO 7 I = 1,NR

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FORTRAN IV G LEVEL 19

GENHE

DATE = 7/253

13/24/17

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0047      AN = N(DCT(I))
0048      7      SRU = SRU + R(I)*RB(I)/AN
0049      SRA = 0.
0050      DO 8 I = 1, NR
0051      8      SRA = SRA + REI(I)*RA2(I)
0052      SCA = 0.
0053      DO 9 J = 1, NC
0054      9      SCA = SCA + CEI(J)*CB2(J)
0055      SINT = SPR - SPU - SCA
0056      IJ = LTERM(NV1, NV2)
0057      E(IJ) = ET
0058      MA(IJ) = SRA
0059      FB(IJ) = SCA
0060      MAR(IJ) = SINT
0061      KSB(IJ) = SSUB
0062      NDPE = NG - NDFSD - 1
0063      RETURN
0064      END

```

FORTRAN IV G LEVEL 19

HAINE

DATE = 71253

13/24/17

```

0001      SUBROUTINE HAINE
0002      COMMON N,(LVLY,ITYPE,TTL(15),VNAM(10),FNAME(2),NLVL(2),NEND(2,12),
1LEVEL(2,12),NR#,ACA,NRB,NCD,JAB(8),N1,N2,NVBL,AFAC,NG12,MULT,
2NSUBJ,NLUV ,N1,N2,NJ,ISEQ,N12,NJZ,KOUNT,NDIAG,IREF1,IREF2,IREF3
3,MYRAN(10),THAM(10),LUV(10),NNLUV(10)
0003      DIMENSION HAE(55),HA(55),HB(55),CRAP(11),EI(55),E(55),HSB(55)
0004      READ(NW2) HAB,HA,HB,E,CRAP,EI,HSB,NDFE,NDFI,ALDE,N1,NJ,NDFS8
0005      REWIND NW2
0006      CALL TGHAT(HSB,E,CRAP,EI,ACFE,NDFS8,ALDE,N1,NJ)
0007      NDFI = NDFS8 - NLVL(N1) - NLVL(NJ) + 2
0008      IF(NDFI) 501,501,502
0009      502 NSTEP=1
0010      IREF=IREF1-1
0011      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0012      50 WRITE(N1,IREF1,2003)
0013      WRITE(N2,IREF2,2003)
0014      NSTEP=2
0015      IREF=IREF1-1
0016      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0017      51 WRITE(N1,IREF1,25)FNAME(N1),FNAME(NJ)
0018      WRITE(N2,IREF2,2003)
0019      CALL TGHAT(HAB,E,CRAP,EI,NDFE,NDFI,ALDE,N1,NJ)
0020      501 NDFI = NLVL(N1) - 1
0021      IF(NDFI) 503,503,504
0022      504 NSTEP=3
0023      IREF=IREF1-1
0024      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0025      52 WRITE(N1,IREF1,2003)
0026      WRITE(N2,IREF2,2003)
0027      NSTEP=4
0028      IREF=IREF1-1
0029      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0030      53 WRITE(N1,IREF1,27)FNAME(N1)
0031      WRITE(N2,IREF2,2003)
0032      CALL TGHAT(HAB,E,CRAP,EI,NDFE,NDFI,ALDE,N1,NJ)
0033      503 NDFI = NLVL(NJ) - 1
0034      IF(NDFI) 505,505,506
0035      506 NSTEP=5
0036      IREF=IREF1-1
0037      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0038      54 WRITE(N1,IREF1,2003)
0039      WRITE(N2,IREF2,2003)
0040      NSTEP=6
0041      IREF=IREF1-1
0042      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0043      55 WRITE(N1,IREF1,27)FNAME(NJ)
0044      WRITE(N2,IREF2,2003)
0045      CALL TGHAT(HAB,E,CRAP,EI,NDFE,NDFI,ALDE,N1,NJ)
0046      505 ISEQ = 17
0047      WRITE(NW2) NSUBJ
0048      REWIND NW2
0049      NSTEP=7
0050      605 IREF=IREF1-1
0051      IF(MOD(IREF,45) .EQ. 0) GO TO 1001
0052      WRITE(N1,IREF1,2003)
0053      WRITE(N2,IREF2,2003)

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FORTRAN IV G LEVEL 19

MAINE

DATE = 71253

13/24/17

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0054      GO TO 405
0055      56 KKOUN=KOUNT-2
0056      WRITE(N1'REC1,2004)KKOUN'
0057      WRITE(N1'REC1,2003)
0058      WRITE(N1'REC1,2005)
0059      WRITE(N1'REC1,2006)
0060      WRITE(N1'REC1,2007)
0061      DO 601 IJ=1,38
0062      601 WRITE(N1'REC1,2003)
0063      DO 602 IJ=1,43
0064      602 WRITE(N2'REC2,2003)
0065      ITEMP=NVSL
0066      NVSL=NLUV
0067      NLUV=ITEMP
0068      RETURN
0069      1001 WRITE(N1'REC1,2001)KOUNT
0070      WRITE(N2'REC2,2002)KOUNT
0071      KOUNT=KOUNT+1
0072      GO TO (50,51,52,53,54,55,56),NSTEP
0073      2001 FORMAT(55X,'PAGE',I4,'L',16X/)
0074      2002 FORMAT(55X,'PAGE',I4,'R',16X/)
0075      2003 FORMAT(60X)
0076      25  FORMAT(40X,'INTERACTION ',A4,' * ',A4,17X)
0077      27  FORMAT(49X,A4,' EFFECTS',19X)
0078      2004 FORMAT('PAGE',I3,' WAS THE LAST PAGE OF YOUR MULTIVARIATE RESULTS.
1',25X)
0079      2005 FORMAT('YOU NOW HAVE THE FOLLOWING OPTIONS:',45X)
0080      2006 FORMAT('PRESS KEY 4 TO PERFORM ANOTHER MULTIVARIATE ANALYSIS',
125X)
0081      2007 FORMAT('
KEY 31 TO TERMINATE',53X)
0082      END

```

FORTRAN IV G LEVEL 19

TENAT

DATE = 71253

13/24/17

```

0001      SUBROUTINE TENAT(H,E,CRAP,EI,NDFE,NDFH,ALDE,N1,NJ)
      C
      C      CONTROLS THE MULTIVARIATE ANALYSIS (LILEL IMODC-RATIO,
      C      UNION-INTERSECTION, AND DISCRIMINANT ANALYSIS)
      C
0002      COMMON N,ICVLY,ITYPE,YTE(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
      1LEVEL(2,12),ARA,NCA,NRD,NCB,JAB(8),N1,N2,NVBL,AFACT,NG12,MULT,
      2NSUBJ,NLUV ,AH1,IM2,NT,ISEQ,N12,NJ2,KOHT,NDIAG,IREC1,IREC2,IREC3
      3,NTRAN(10),TNAP(10),LUV(10),NMLUV(10)
0003      DIMENSION H(1),E(1),CRAP(1),EI(1),T(100),U(10,10),SYM(55),PE(30),
      1HX(55),DIS(50),RO(5(30)
0004      NRA = NVBL
0005      NCA = NDFH
0006      NR3 = NRA
0007      NCB = NRA
0008      NRD = NLVL(N1)
0009      NCGL = NLVL(NJ)
0010      IFG=1
0011      B = FNAME(NJ)
0012      IMX = (NRA*(NRA+1))/2
0013      DO 44 I = 1,IMX
0014      I = I
0015      IF (H(I))43,44,43
0016      44 CONTINUE
0017      GO TO 45
0018      43 CALL TRI(H,T,CRAP)
0019      IF(NCB-1)40,40,41
0020      41 NCT = NCB
0021      NCB = NRA
0022      DO 1 I=1,IMX
0023      1 H(I) = H(I)+E(I)
0024      CALL INSLD(H,HX,CRAP)
0025      ALDH = CRAP(NCA)
0026      AM = NDFE
0027      AM = AM + 0.5*FLOAT (NDFH-NVBL-1)
0028      DF = NDFH*NRA
0029      XST = -(ALDE-ALDH)*AM
0030      IFG=1
0031      NSTEP=1
0032      IREC=IREC-1
0033      IF(400(IREC,45) .EQ. 0) GO TO 1001
0034      3001 WRITE(N1,IREC1,2003)
0035      WRITE(N2,IREC2,2003)
0036      NSTEP=2
0037      IREC=IREC1-1
0038      IF(400(IREC,45) .EQ. 0) GO TO 1001
0039      3002 WRITE(N1,IREC1,2010)XST
0040      WRITE(N2,IREC2,2011)DF
0041      PR = CHIX(XST,DF)
0042      FCX = (FLOAT (NDFH))*2 + FLOAT (NRA**2) - 5.
0043      DEL = DF*FCX
0044      DEL = DEL/(48.*AM**2)
0045      DG = DF + 4.
0046      PS = CHIX(XST,DG)
0047      PZ = PR + (PS-PR)*DEL
0048      IF(PZ - 1.0) 310,310,311

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FORTRAN IV G LEVEL 19

TEMAT

DATE = 71253

13/24/17

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0049      310 PR = PZ
0050      311 IF (PR - 1.0) 312,313,315
0051      313 PR = 1.0
0052      312 PR = 1.-PR
0053          NSTEP=3
0054          IREC=IREC1-1
0055          IF (MOD (IREC,45) .EQ. 0) GO TO 1001
0056      3003 WRITE (N1,IREC1,2012) PR
0057          WRITE (N2,IREC2,2003)
0058          NSTEP=4
0059          IREC=IREC1-1
0060          IF (MOD (IREC,45) .EQ. 0) GO TO 1001
0061      3004 WRITE (N1,IREC1,2003)
0062          WRITE (N2,IREC2,2003)
0063          NSTEP=5
0064          IREC=IREC1-1
0065          IF (MOD (IREC,45) .EQ. 0) GO TO 1001
0066      3005 WRITE (N1,IREC1,2013)
0067          WRITE (N2,IREC2,2003)
0068          CALL WRIR (N,NRA,1)
0069      212 DO 161 I=1,NVBL
0070          II = LTERH (I,1)
0071          IF (H(II)) 171,171,315
0072      315 DIS(I) = SCRT (H(II))
0073      161 CONTINUE
0074          DO 162 I=1,NVBL
0075          DO 162 J=1,NVBL
0076          IJ = LTERH (I,J)
0077      162 SYM(IJ) = W(IJ)/(DIS(I)*DIS(J))
0078          NSTEP=6
0079          IREC=IREC1-1
0080          IF (MOD (IREC,45) .EQ. 0) GO TO 1001
0081      3006 WRITE (N1,IREC1,2003)
0082          WRITE (N2,IREC2,2003)
0083          NSTEP=7
0084          IREC=IREC1-1
0085          IF (MOD (IREC,45) .EQ. 0) GO TO 1001
0086      3007 WRITE (N1,IREC1,2014)
0087          WRITE (N2,IREC2,2003)
0088          CALL WRIR (SYM,NVBL,1)
0089      171 CONTINUE
0090          GO TO (213,95),IFG
0091      213 DO 3 J = 1,NCT
0092          DO 3 I = 1,NRA
0093          U(I,J) = 0.
0094          DO 3 K = 1,NRA
0095          IK = LTERH (I,K)
0096          KJ = (J-1)*NRA + K
0097      3 U(I,J) = U(I,J) + HX(IK)*T(KJ)
0098          DO 4 J = 1,NCT
0099          DO 4 I = 1,J
0100          IJ = LTERH (I,J)
0101          SYM(IJ) = 0.
0102          DO 4 K=1,NRA
0103          KI = (I-1)*NRA + K
0104      4 SYM(IJ) = SYM(IJ) + T(KI)*U(K,J)

```

FORTRAN IV G LEVEL 19

TENAT

DATE = 71253

13/24/17

```

0105      DO 80 J=1,NCT
0106      DO 80 I=1,J
0107      IJ = LTERM(I,J)
0108      HX(IJ) = 0.
0109      DO 80 K=1,NCT
0110      IK = LTERM(I,K)
0111      KJ = LTERM(K,J)
0112      80  HX(IJ) = HX(IJ)+SYM(IK)*SYM(KJ)
0113      CALL FACE(HX,PE,NCT)
0114      RCAN = 0.
0115      DO 10 I = 1,NCT
0116      10  RCAN = RCAN + PE(I)**2
0117      DO 11 I = 1,NCT
0118      11  PE(I) = PE(I)/SQRT(RCAN)
0119      RCAN = SCRT(RCAN)
0120      IF(NRA-NDF+112,13,13)
0121      12  NS = NRA
0122      GO TO 14
0123      13  NS = NDFH
0124      14  AH = NDFH - NRA
0125      AN = (ABS(AH)-1.)/2.
0126      AN = NDFE-NRA-1
0127      AN = AN/2.
0128      NSTEP=8
0129      IREC=IREC1-1
0130      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0131      3008 WRITE(N1,IREC1,2003)
0132      WRITE(N2,IREC2,2003)
0133      NSTEP=6
0134      IREC=IREC1-1
0135      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0136      3009 WRITE(N1,IREC1,2015)
0137      WRITE(N2,IREC2,2016)RCAN
0138      NSTEP=10
0139      IREC=IREC1-1
0140      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0141      3010 WRITE(N1,IREC1,2017)NS,AN,AN
0142      WRITE(N2,IREC2,2003)
0143      DO 16 I = 1,NRA
0144      DIS(I) = 0.
0145      DO 16 J = 1,NCT
0146      16  DIS(I) = DIS(I) + U(I,J)*PE(J)
0147      52  NSTEP=11
0148      IREC=IREC1-1
0149      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0150      3011 WRITE(N1,IREC1,2003)
0151      WRITE(N2,IREC2,2003)
0152      NSTEP=12
0153      IREC=IREC1-1
0154      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0155      3012 WRITE(N1,IREC1,2018)
0156      WRITE(N2,IREC2,2003)
0157      CALL WRIR(DIS,NRA,0)
0158      DO 18 I = 1,NRA
0159      PDIS(I) = 0.
0160      DO 18 J = 1,NRA

```

FORTRAN IV G LEVEL 19

TEMAT

DATE = 71253

13/24/17

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0161      IJ = LTERM(I,J)
0162      18  RDIS(I) = E(IJ)*DIS(J)+RDIS(I)
0163      CON = 0.
0164      DO 19 J = 1,NRA
0165      19  CON = CON + RDIS(J)*DIS(J)
0166      DO 20 I = 1,NRA
0167      20  II = LTERM(I,I)
0168      RDIS(I) = RDIS(I)/SQRT (CON+E(II))
0169      NSTEP=13
0170      IREC=IREC1-1
0171      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0172      3013 WRITE(N1,IREC1,2003)
0173      WRITE(N2,IREC2,2003)
0174      NSTEP=14
0175      IREC=IREC1-1
0176      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0177      3014 WRITE(N1,IREC1,2019)
0178      WRITE(N2,IREC2,2003)
0179      CALL WRIR(RDIS,NRA,0)
0180      GO TO 99
0181      45  NSTEP=15
0182      IREC=IREC1-1
0183      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0184      3015 WRITE(N1,IREC1,2003)
0185      WRITE(N2,IREC2,2003)
0186      NSTEP=16
0187      IREC=IREC1-1
0188      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0189      3016 WRITE(N1,IREC1,2020)
0190      WRITE(N2,IREC2,2003)
0191      GO TO (99,210),IFG
0192      GO TO 99
0193      40  DO 50 I = 1,NRA
0194      DIS(I) = 0.
0195      DO 50 J = 1,NRA
0196      50  IJ = LTERM(I,J)
0197      DIS(I) = E(IJ)*T(J)+DIS(I)
0198      F = 0.
0199      DO 51 I = 1,NRA
0200      51  F = F+DIS(I)*T(I)
0201      DFM = NRA
0202      DFA = NDPE-NRA+1
0203      F = F*DFN/CFM
0204      IFG=2
0205      NSTEP=17
0206      IREC=IREC1-1
0207      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0208      3017 WRITE(N1,IREC1,2003)
0209      WRITE(N2,IREC2,2003)
0210      NSTEP=18
0211      IREC=IREC1-1
0212      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0213      3018 WRITE(N1,IREC1,2021) F,DFM,DFN
0214      WRITE(N2,IREC2,2003)
0215      GO TO 52
0216      210 DO 211 I=1,IMX

```

FORTRAN IV G LEVEL 19

TENTAT

DATE = 71253

13/24/17

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0217      211 H(I)=H(I)+E(I)
0218      GO TO, 212
0219      99  RETURN
0220      1001 WRITE(N1, IREC1, 2001) KOUNT
0221      WRITE(N2, IREC2, 2002) KOUNT
0222      KOUNT=KOUNT+1
0223      GO TO(3001, 3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012,
      13013, 3014, 3015, 3016, 3017, 3018), NSTEP
0224      2001 FORMAT(55X, 'PAGE', I4, 'L', 16X/)
0225      2002 FORMAT(55X, 'PAGE', I4, 'R', 16X/)
0226      2003 FORMAT(80X)
0227      2010 FORMAT('LIKELIHOOD RATIO TEST STATISTIC, CHI-SQUARE = ', E14.4, ' WI
      1TH', 15X)
0228      2011 FORMAT(F10.0, ' D.F.', 65X)
0229      2012 FORMAT(30X, 'SIGNIFICANT AT LEVEL ', E13.3, 16X)
0230      2013 FORMAT(40X, 'MATRIX H+E', 30X)
0231      2014 FORMAT(40X, 'CORRELATIONS BASED ON H+E', 15X)
0232      2015 FORMAT('STANDARDIZED ROY STATISTIC OR SQUARE OF A CANONICAL CORREL
      1ATION = ', 13X)
0233      2016 FORMAT(E16.6, 64X)
0234      2017 FORMAT(10X, 'READ HECK CHARTS WITH S = ', I3, ' M = ', F8.1, ' N = ', F6
      1.1, 15X)
0235      2018 FORMAT(20X, 'HEIGHT OF DISCRIMINANT FUNCTION', 28X)
0236      2019 FORMAT(7X, 'CORRELATIONS BETWEEN DISCRIMINANT FUNTION AND ORIGINAL
      1 VARIABLES', 8X)
0237      2020 FORMAT(20X, 'DEGENERATE CASE ALL H-ELEMENTS ZERO', 24X)
0238      2021 FORMAT('TEST STATISTIC F = ', F10.4, ' WITH ', F4.0, ' AND ', F6.0, ' D.
      1 F.', 25X)
0239      ENC

```

FORTRAN IV G LEVEL 19

TRI

DATE = 71253

13/24/17

```

0001      SUBROUTINE TRI(A,T,D)
      C
      C TRI ROUTINE : THE UPPER HALF OF A SYMMETRIC GRAMIAN MATRIX
      C IS STORED AS A ONE DIMENSIONAL VECTOR IN PACKED FORM A(1,1),
      C A(1,2),A(2,2),A(1,3),A(2,3),A(3,3), ETC. NRA AND NCA (FIRST
      C TWO COMMONS) MUST BE SET EQUAL TO THE ORDER OF THE MATRIX.
      C D IS A WORKING FIELD, AND SHOULD BE DIMENSIONED ONE LARGER
      C THAN NRA AT THE END, NRD=NRA, BUT NCB IS REPLACED BY THE
      C RANK OF THE MATRIX A. THE MATRIX T, PACKED IN ORDER T(1,1),
      C T(2,1),T(3,1),...,T(NRA,1),T(1,2),...,T(NRA,2),...,T(NRA,NRB),
      C IS A TRIANGULAR MATRIX T SUCH THAT T*T' = A. IF THE CALLING
      C PROGRAM WISHES TO USE T AS A DOUBLE SUBSCRIPTED FIELD, THE
      C DIMENSION OF THE FIRST ARGUMENT MUST E Q U A L NRA. IF THIS
      C IS INCONVENIENT, SINGLE-DIMENSION T IN THE SAME WAY AS A, THEN
      C UNPACK T INTO A DOUBLE SUBSCRIPTED TU BY CALCULATING IJ =
      C (J-1)*NRA + I. THEN TU(I,J) = T(IJ)
      C
0002      COMMON N,IOVLY,ITYPE,TTL(15),VNAH(10),FNAM(2),NLVL(2),NEND(2,12),
      C 1LEVEL(2,12),NRA,NCA,NRB,NCB,JAB(8),N1,A2,NVBL,NFACT,NG12,MULT,
      C 2NS,BJ,NLUV,NM1,NM2,NT,ISEC,NIZ,NJZ,KOUNT,NDIAG,IREF1,IREF2,IREF3
      C 3,N,RAN(10),TNAP(10),LUV(10),MNLUV(10)
      C DIMENSION A(1),T(1),D(1)
      C NRB = NRA
      C NCB = NRA
      C DO 577 I=1,NRA
      C I = I
      C CALL SLITO(I)
      C DO 577 J=I,NRA
      C J=J
      C IJA = (J*(J-1))/2 + I
      C SUM = A(IJA)
      C IM = I-1
      C 400 IF (IM) 560,566,575
      C 575 DO 574 K=1,IM
      C K=K
      C KIA = (K-1)*NRB + I
      C KJA = KIA + J - 1
      C 574 SUM = SUM - T(KIA)*T(KJA)
      C 566 IF (J-1) 565,585,573
      C 585 IF (A(IJA)) 572,572,576
      C 576 D(I) = SUM
      C QD = A(IJA)
      C 401 IF (SUM/QD + 5.E-4) 572,570,570
      C 570 IF (SUM/QD - 5.E-5) 590,590,661
      C 661 IF (I-NCA) 573,573,590
      C 572 WRITE(N1,IREF1,650)
      C WRITE(N2,IREF2,2003)
      C 650 FORMAT(40X,'MATRIX IS NOT GRAMIAN',19X)
      C 2003 FORMAT(80X)
      C GO TO 607
      C 590 CALL SLITO(1)
      C D(1) = 0.
      C 573 IJ = (I-1)*NRB + J
      C CALL SLITOT(1,JLL)
      C IF (JLL) 569,569,591
      C 569 T(IJ) = SUM/SQRT (D(I))
      C
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PCRTAN IV G AEVEL 19

TRI

DATE = 71253

13/24/17

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0038      GO TO 577
0039      591 CALL SLITO(1)
0040      402 IF(ABS (SUM/CO) - 5.E-5) 592,592,662
0041      662 IF(1-NCB) 572,572,592
0042      592 T(IJ) = 0.
0043      577 CONTINUE
0044      IF(NRB-1) 601,601,630
0045      630 DO 600 I=2,NRB
0046      I=I
0047      DO 600 J=2,I
0048      J=J
0049      IJC = (I-1)*NRB + J - 1
0050      600 T(IJC)=0.
0051      601 CONTINUE
0052      DO 602 I=1,NCB
0053      I=I
0054      DO 603 J=1,NRB
0055      J=J
0056      IJC = (I-1)*NRB + J
0057      IF(T(IJC)) 602,604,602
0058      604 IF(J-NRB) 603,605,605
0059      603 CONTINUE
0060      605 NCB = NCB-1
0061      403 IF(1-NCB-1) 606,610,610
0062      606 DO 608 K=1,NCB
0063      DO 608 L=1,NRB
0064      IJC = K*NRB + L
0065      IJF = IJE - ARB
0066      608 T(IJF) = T(IJE)
0067      GO TO 601
0068      602 CONTINUE
0069      610 GO TO 607
0070      607 RETURN
0071      ENC

```

FORTRAN IV G LEVEL 19

CHIX

DATE = 71253

13/24/17

0001

FUNCTION CHIX(X,DF)

C
C
C

CHI-SQUARE 'P' FROM 'X'

0002

CHIX=GAMX(X/2.,DF/2.)

0003

RETURN

0004

END

FORTRAN IV G LEVEL 19

GAMX

DATE = 71253

13/24/17

```

0001      FUNCTION GAMX(X,DE)
      G
      C      INCOMPLETE GAMMA DISTRIBUTION, FORWARD, P FROM X
      C
0002      Y=X
0003      DF=DE
0004      SUM=0.
0005      IF(DF-200.)20,21,21
0006      20 IF(X)1,1,2
0007      1  GAMX=0.
0008      GO TO 99
0009      2  IF(DF)3,3,4
0010      3  GAMX = 1.
0011      GO TO 99
0012      4  AI = DF
0013      F = AI * ALOG(Y) - Y - ELGGM(AI+1.)
0014      16 IF(F+80.)10,10,11
0015      11 FG=EXP (F)
0016      FH = FG
0017      12 SUM = SUM + FG
0018      FG=FG*Y/(AI+1.)
0019      AI = AI + 1.
0020      IF(AI-200.)2E,28,25
0021      28 IF(FG-FH)13,14,14
0022      14 IF(AI-200.)12,12,25
0023      13 FH = FG
0024      IF(FG/SUM - 1.E-8)15,15,12
0025      10 AI = AI+1.
0026      IF(AI-200.)27,27,25
0027      27 F=F+ALOG(Y/AI)
0028      GO TO 16
0029      21 CH=9.*DF
0030      26 YN = ((Y/DF)**0.33333333-1.+1./DH)*SQRT (DH)
0031      UNMIX=YGRHX(YN)
0032      GAMX=UNMIX+SUM
0033      GO TO 99
0034      15 GAMX = SUM
0035      GO TO 99
0036      25 CH = 9.*AI
0037      CF = AI
0038      GO TO 26
0039      99 RETURN
0040      END

```

FORTRAN IV G LEVEL 19

YORMX

DATE = 71253

13/24/17

```

C001      FUNCTION YORMX(X)
          C
          C      NORMAL DISTRIBUTION, ARGUMENT X, RESULT P
          C
          Y=X
          IF(X+13.)1,1,2
          YORMX=0
          GO TO 99
          IF(X-7.)3,3,4
          YORMX = 1.
          GO TO 99
          3   G=1.12837917*EXP (-Y*Y/2.)
          Z=G/2.82842712
          XA = ABS (Y)
          IF(XA-2.5)5,6,6
          6   U = 1./((XA+1./((XA+2./((XA+3./((XA+4./((XA+5./((XA+6./((XA+7./((XA+8./((XA
          1+9./((XA+10./((XA+11./((XA+12./XA)))))))))))
          10  IF(Y)7,8,8
          7   YORMX = U*Z
          GO TO 99
          8   YORMX=1.-U*Z
          GO TO 99
          5   ET = 1.41421356/(1.41421356+0.3275911*XA )
          U = G*(((G.94064607*ET-1.28782245)*ET+1.25969513)*ET-0.25212
          1866)*ET+0.225836846)*ET * 0.5
          Z=1.
          GO TO 10
          99  RETURN
          END
C021
C022
C023
C024

```

FORTRAN IV G LEVEL 19

ELGGH

DATE = 71253

13/24/17

```

0001      FUNCTION ELGGH(X)
          C
          C      LOG OF GAMMA FUNCTION FOR ARGUMENTS GREATER THAN ZERO
          C
0002      Y=X
0003      TERM=1.0
0004      IF(X)1,1,2
0005      1    ELGGH = 0.
0006          GO TO 99
0007      2    IF(Y-10.)3,3,4
0008      3    TERM=TERM*Y
0009          Y=Y+1.
0010          GO TO 2
0011      4    ELGGH=(Y-0.5)*ALOG(Y)-Y+1./((12.*Y)-1./((360.*Y**3)+1./((1260.
1    *Y**5)-1./((1680.*Y**7)+0.91893853-ALOG(TERM)
0012      99    RETURN
0013          END

```

FORTRAN IV G LEVEL 19

FACE

DATE = 71253

13/24/77

0001

SUBROUTINE FACE(R,FE,NRR)

C
C
C
CCONTAINS THE LARGEST ROOT AND ASSOCIATED EIGENVECTOR OF
A SYMMETRIC MATRIX

0002

DIMENSION R(1275),F(50),FL(50),NTAG(50),FE(50),RTR(50)
DOUBLE PRECISION OND,SUMA,SUMB,FJ,FEJ,R1JD,FEI
NREF=0

0003

ITEC = 600/NRR

0004

80 DO 99 I=1,NRR

0005

99 NTAG(I)=0

0006

NCCU=0

0007

DO 100 J=1,NRR

0008

F(J)=0.0

0009

DO 101 I=1,NRR

0010

IJA=LTERM(I,J)

0011

IF(I-J)105,101,105

0012

105 F(I)=F(I) + R(IJA)

0013

101 CONTINUE

0014

100 F(IJA) = -F(I)/2.0

0015

109 DO 110 I=1,NRR

0016

IF(NTAG(I)) 111,112,111

0017

111 FL(I)=-F(I)

0018

GO TO 110

0019

112 FL(I)=F(I)

0020

110 CONTINUE

0021

DO 120 I=1,NRR

0022

IF(FL(I))120,120,121

0023

120 CONTINUE

0024

GO TO 199

0025

121 IF(NCCU-2*NRR)122,122,199

0026

122 JA=1

0027

DO 123 J=2,NRR

0028

IF(FL(I)-FL(J))124,123,123

0029

124 FL(I)=FL(J)

0030

JA=J

0031

123 CONTINUE

0032

IF(NTAG(JA))125,126,125

0033

126 NTAG(JA)=1

0034

GO TO 130

0035

125 NTAG(JA)=0

0036

130 ACCU=NCCU+1

0037

DO 131 I=1,NRR

0038

IF(I-JA)132,131,132

0039

132 IJB=LTERM(I,JA)

0040

F(I)=F(I)+R(IJB)

0041

131 CONTINUE

0042

GO TO 109

0043

199 DO 200 I=1,NRR

0044

200 F(I)=-2.*F(I)

0045

DO 211 I=1,NRR

0046

II = LTERM(I,I)

0047

211 FE(I) = F(I) + SIGN (R(II),F(I))

0048

SUM=0.0

0049

DO 222 J=1,NRR

0050

222 SUM=SUM+ABS (FE(J))

0051

0052

FORTRAN IV G LEVEL 19

FACE

DATE = 71253

13/24/17

```

0053      DO 223 K=1,NRR
0054      223 FE(K)=FE(K)/SQRT(SUM)
0055      NITE=0.
0056      DNC = 1.00
0057      303 DO 304 I=1,NRR
0058      SUMA=0.000
0059      SUMB=0.000
0060      DO 305 J=1,NRR
0061      306 FJ=0.000
0062      FJ = FE(J)
0063      FEJ=0.000
0064      FEJ=FE(J)
0065      IJD=LTERM(I,J)
0066      RIJD=0.000
0067      RIJD=R(IJD)
0068      SUMA=SUMA+RIJD*FJ
0069      SUMB=SUMB+FEJ*FJ
0070      305 CONTINUE
0071      FL(I)=FE(I)
0072      FEI=0.000
0073      FEI=SUMA/SUMB
0074      304 FE(I)=FEI
0075      NITE=NITE+1
0076      IF(NITE - ITEC) 320,320,399
0077      320 DO 321 I=1,NRR
0078      IF (ABS (FE(I)-FL(I))-1.E-6)321,321,303
0079      321 CONTINUE
0080      399 RETURN
0081      ENC

```

FORTRAN IV G LEVEL 19

WRIR

DATE = 71253

13/24/17

```

0001      SUBROUTINE WRIR(R,NV,NN)
      C
      C SUBROUTINE FOR WRITING CORRELATIONS, MEANS, AND FACTOR LOADINGS
      C NN IS ZERO FOR FACTOR LOADINGS AND MEANS, ONE OTHERWISE
      C
0002      COMMON N,IOVLY,ITYPE,TTL(15),VNAM(10),FNAME(2),NLVL(2),NEND(2,12),
      1LEVEL(2,12),ARA,NCA,NRB,NCR,JAB(8),N1,N2,NVBL,AFAC,NG12,MULT,
      2NSUBJ,NLUV,AW1,NW2,NT,ISEQ,NIZ,NJZ,KOLNT,NDIAG,IREC1,IREC2,IREC3
      3,NTRAN(10),TNAM(10),LUV(10),MNLUV(10)
0003      DIMENSION R(1275),JWR(7),RWR(7),UWR(7)
0004      DO 1101 I=1,NV
0005      NRE=(NV-1)/7+1
0006      DO 1102 J=1,NRE
0007      IF(7*J-NV) 1103,1103,1104
0008      1103 K=7
0009      GO TO 1105
0010      1104 K=7-7*J+NV
0011      1105 DO 1107 L=1,K
0012      JWR(L)=7*(J-1)+L
0013      JWRL = JWR(L)
0014      1107 UWR(L)=TNAM(JWRL)
0015      NSTCP=1
0016      IREC=IREC1-1
0017      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0018      401 WRITE(N1,IREC1,2003)
0019      WRITE(N2,IREC2,2003)
0020      NSTCP=2
0021      IREC=IREC1-1
0022      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0023      402 IF(K.LE.5)GO TO 301
0024      IF(K.GT.5)GO TO 302
0025      301 WRITE(N1,IREC1,501)(UWR(M),M=1,K)
0026      WRITE(N2,IREC2,2003)
0027      GO TO 303
0028      302 WRITE(N1,IREC1,501)(UWR(M),M=1,5)
0029      WRITE(N2,IREC2,502)(UWR(M),M=6,K)
0030      303 CONTINUE
0031      IF(MN)1129,1130,1129
0032      1130 DO 1131 M=1,K
0033      MF = JWR(M)
0034      1131 RWR(M) = R(MF)
0035      NSTCP=3
0036      IREC=IREC1-1
0037      IF(MOD(IREC,45) .EQ. 0) GO TO 1001
0038      403 IF(K.LE.5)GO TO 304
0039      IF(K.GT.5)GO TO 305
0040      304 WRITE(N1,IREC1,503)(RWR(N),N=1,K)
0041      WRITE(N2,IREC2,2003)
0042      GO TO 306
0043      305 WRITE(N1,IREC1,503)(RWR(N),N=1,5)
0044      WRITE(N2,IREC2,504)(RWR(N),N=6,K)
0045      306 CONTINUE
0046      GO TO 1102
0047      1129 DO 1120 M=1,K
0048      MR= LTERM(1,JWR(M))
0049      1120 RWR(M)=R(MR)

```

FORTRAN IV G LEVEL 19

WRTR

DATE = 71253

13/24/17

```

0050      VX=TNAM(I)
0051      NSTEP=4
0052      IREC=IREC1-1
0053      IF (MOD(IREC,45) .EQ. 0) GO TO 1001
0054      404 IF (K.LE.5) GO TO 307
0055      IF (K.GT.5) GO TO 308
0056      307 WRITE(N1,IREC1,505)VX,(RWR(N),N=1,K)
0057      WRITE(N2,IREC2,2003)
0058      GO TO 309
0059      308 WRITE(N1,IREC1,505)VX,(RWR(N),N=1,5)
0060      WRITE(N2,IREC2,504)(RWR(N),N=6,K)
0061      309 CONTINUE
0062      1102 CONTINUE
0063      IF (NN11127,1128,1127)
0064      1127 CONTINUE
0065      1101 CONTINUE
0066      1129 RETURN
0067      1001 WRITE(N1,IREC1,2001)KCUNT
0068      WRITE(N2,IREC2,2002)KCUNT
0069      KCUNT=KCUNT+1
0070      GO TO(401,402,403,404),NSTEP
0071      2001 FORMAT(55X,'PAGE',I4,'L',16X/)
0072      2002 FORMAT(55X,'PAGE',I4,'R',16X/)
0073      2003 FORMAT(8CX)
0074      501 FORMAT(12X,A4,4(8X,A4),16X)
0075      502 FORMAT(2(8X,A4),53X)
0076      503 FORMAT(7X,1P5E12.4,13X)
0077      504 FORMAT(1P2E12.4,56X)
0078      505 FORMAT(3X,A4,1P5E12.4,13X)
0079      END

```

FORTRAN IV G LEVEL 15

INSLD

DATE = 71253

13/24/17

```

0001      SUBROUTINE INSLD (A,T,D)
      C
      C      OBTAINS INVERSE OR CONDITIONAL INVERSE OF GRAMIAN
      C      MATRICES; ALSO OBTAINS STEP-WISE LOG-DETERMINANTS
      C
0002      COMMON N,IOVLY,(TYPE,ITL(15),VNAME(10),FNAME(2),NLVL(2),NEND(2,12),
11,EVCL(2,12),ARA,ACA,NRB,KCB,JAB(8),N1,N2,NVBL,NFACT,NG12,MULT,
2H,SUBJ,NLUV,AX1,NW2,NF,ISEC,NIZ,NJZ,KCLNT,NDIAG,IREF1,IREF2,IREF3
3,NTRAN(10),YNAME(10),LUV(10),MNLUV(10)
      DIMENSION A(1),T(1),D(1)
      CO = 0.
0003      DO 577 I=1,NRA
0004      CALL SLITOT(I)
0005      DO 577 J=1,NRA
0006      IJA = ((J-1)*J)/2 + I
0007      SUP = A(IJA)
0008      IM = I-1
0009      400 IF (IM) 566,566,575
0010      575 DO 574 K=1,IM
0011      KIA = ((I-1))/2 + K
0012      KJA = ((J-1))/2 + K
0013      IF (D(K)) 1584,574,1584
0014      1584 SUM = SUP - T(KIA)*T(KJA)/D(K)
0015      574 CONTINUE
0016      566 IF (J-1) 585,585,573
0017      585 IF (A(IJA)) 576,1100,576
0018      D(I) = SUM
0019      1100 DO 1101 M=1,NRA
0020      MX = (M*(M+1))/2
0021      IF (A(MX)) 1102,1101,1102
0022      1102 CO = ABS (A(MX))
0023      GO TO 1103
0024      1101 CONTINUE
0025      1103 IF (CO) 572,1104,401
0026      1104 LLP = (ARA*(NRA+1))/2
0027      DO 1105 M=1,LLP
0028      IF (A(M)) 1106,1105,1106
0029      1106 GO = ABS (A(M))
0030      GO TO 1107
0031      1105 CONTINUE
0032      1107 IF (GO) 572,572,401
0033      576 D(I) = SUM
0034      CO = A(IJA)
0035      401 IF (ABS (SUM/CO) - 5.E-5) 590,590,573
0036      572 WRITE (N1,IREF1,1572)
0037      WRITE (N2,IREF2,2003)
0038      1572 FORMAT (17X,'MATRIX NOT POS DEFINITE OR POS SEMIDEFINITE',20X)
0039      2003 FORMAT (80X)
0040      1573 RETURN
0041      590 CALL SLITG(1)
0042      D(I) = 0.0
0043      573 IJ = (J*(J-1))/2 + I
0044      CALL SLITOT(1,JLL)
0045      IF (JLL) 569,569,591
0046      569 T(IJ) = SUM
0047      GO TO 577

```

FORTRAN IV G. LEVEL 19

INSLO

DATE = 71253

13/24/71

```

0050      591 CALL SLITG(11)
0051      402 IF (ABS (SUM/GO)-5.E-5) 592,592,569
0052      592 T(1J)=0.0
0053      577 CONTINUE
0054      DO 303 I=1,NRB
0055      IA=(1+I)*I/2
0056      IF (T(1A)) 301,300,301
0057      301 T(1A)=1.0/T(1A)
0058      300 CONTINUE
0059      IF (NRB-1) 701,701,702
0060      702 AM = NRB-1
0061      DO 303 I=1,NM
0062      IPX=1+I
0063      DO 303 J=IPX,NRA
0064      IIN=(J+(J+1))/2
0065      IAC=(J+J-1)/2+1
0066      SUMI=0.0
0067      JMI=J-1
0068      DO 304 K=1,JMI
0069      IAB=(J+(J-1))/2+K
0070      IBC=(K+(K-1))/2+1
0071      IF (T(IIN)) 304,305,304
0072      304 SUMI=SUMI-T(IAB)*T(IBC)
0073      T(IAC)=SUMI*T(IIN)
0074      GO TO 303
0075      305 T(IAC)=0.0
0076      303 CONTINUE
0077      DO 101 I=1,NRA
0078      DO 101 J=I,NRA
0079      SUMX=0.0
0080      DO 901 K=J,NRA
0081      KIX=(K+(K-1))/2+1
0082      KJX=KIX+J-1
0083      901 SUMX=SUMX+T(KIX)*T(KJX)*C(K)
0084      JIX=(J+(J-1))/2+1
0085      101 T(JIX)=SUMX
0086      701 CONTINUE
0087      IF (D(1)) 114,114,115
0088      115 D(1)=ALOG(C(1))
0089      GO TO 118
0090      114 C(1)=0.-.99999999E33
0091      118 IF (NRA-1) 1573,1573,1575
0092      1575 DO 122 I=2,NRA
0093      IH=I-1
0094      IF (D(I)) 119,119,120
0095      120 IF (D(IH)+.99999999E+38) 119,119,123
0096      123 D(I)=D(IH)+ALOG(C(I))
0097      GO TO 122
0098      119 C(I)=0.-.99999999E38
0099      122 CONTINUE
0100      RETURN
0101      ENC

```

FORTRAN IV G LEVEL 19

LTERM

DATE = 71253

13/24/17

```
0001      FUNCTION LTERM(I1,JJ)
          C
          C      LOCATES TERMS OF SYMMETRIC MATRICES STORED IN PACKED
          C      (UPPER TRIANGULAR) FORM
          C
0002      IF(I1-JJ) 1,2,2
0003      1      LTERM = (JJ * (JJ-1))/2 + I1
0004      GO TO 3
0005      2      LTERM = (I1 * (I1-1))/2 + JJ
0006      3      RETURN
0007      END
```

FORTRAN IV G LEVEL 19

SLITO

DATE = 71253

13/24/17

```

0001      SUBROUTINE SLITO (IOS)
0002      COMMON N,IOVLY,ITYPE,TTL(15),VH,M(10),FMAK(2),RLVL(2),HEND(2,12),
        1LEVEL(2,12),KRA,KCA,HRD,NCB,JAB(8),N1,N2,NVGL,NFACT,NG12,MULT,
        2NSUBJ,NDATA,NW1,NW2,NT,ISEC,NIZ,NJ2,KCOUNT,NJ1AG,IREF1,IREF2,IREF3
        3,NTRAN(10)
0003      IF (IOS) 1,1,2
0004      2   JAB(IOS) = 1
0005      RETURN
0006      1   DO 3 K=1,8
0007      3   JAB(K) = 0
0008      RETURN
0009      END

```

FORTHAN IV G LEVEL 19

SLITOT

DATE = 71253

13/24/17

```

0001      SUBROUTINE SLITCT(IEO,JDC)
0002      COMMON N,IOVLY,I TYPE,TTL(15),VNAH(10),FNAH(2),HLVL(2),NEND(2,12),
      !LEVEL(2,12),ARA,ACA,ARB,ACB,JAB(8),N1,N2,NVEL,NFACT,AG12,MULT,
      ZASUBJ,NDATA,AM1,AM2,NT,ISFC,N12,NJ2,KOUNT,NDIAG,IREF1,IREF2,ISCB,
      3,NTRAN(10)
0003      IF (JAB(100)) 1,1,2
0004      1   JDC = 0
0005      GO TO 3
0006      2   JDC = 1
0007      3   JAB(100) = 0
0008      RETURN
0009      END

```