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MASSACHUSETTS UNIV AMHERST DEPT OF MATHEMATICS AND S--ETC F/6 12/2  
APPLICATIONS OF FUNCTIONAL ANALYTIC AND MARTINGALE METHODS TO P--ETC(U)  
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AFOSR-81-0036

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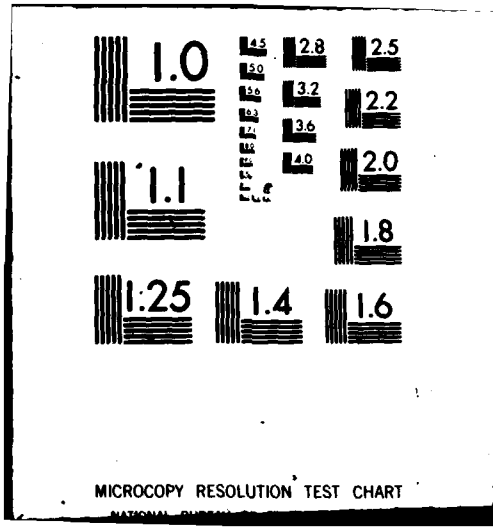
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This final report covers the applications of functional analytic and martingale methods to problems in queueing network theory. The principal investigator lists his publications, lectures, symposia and consulting activities.			

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# AFOSR-TR- 82 - 0256

Title: Applications of Functional Analytic and Martingale Methods to Problems in Queueing Network Theory -- Final Technical Report on Grant #AFOSR 81-0036.

Principal Investigator: Professor Walter A. Rosenkrantz

## I. Publications

- (1) Limit theorems for Markov processes via a variant of the Trotter-Kato theorem (with C.C.Y. Dorea), J. Appl. Prob. 17, 704-715 (1980).
- (2) Some martingales associated with queueing and storage processes, Zeit. Wahrsch. verw. Geb., 58, 205-222, 1981.
- (3) The Takács integro-differential equation in queueing theory: Existence and uniqueness of smooth solutions and related questions, AFOSR 81-0036 Technical Report No. 2 -- submitted to Annals of Probability and is currently being refereed.

## II. In Preparation

- (1) Diffusion approximation for a class of Markov processes satisfying a nonlinear Fokker-Planck equation. Note: This is a joint paper with Li Zhan Bing of Beijing Normal of the Peoples Republic of China.

## III. Coupling Activities i.e. Lectures, Symposia, etc.

- (1) I attended the IEEE international symposium on information theory in Santa Monica, CA in February 1981. Consulted with Dr. P. Bremaud of the École Nationale Supérieure de Techniques Avancées, Paris, France on martingale methods on statistical communication theory.
- (2) Lectured at UCLA, Department of Mathematics, on February 10, 1981. Title: Some martingales associated with queueing and storage processes.
- (3) Lectured at Stanford University, Department of Statistics, February 12, 1981. Title: Same as in (2).
- (4) I consulted with Professor R. Phillips of the Stanford University Mathematics department on some technical details concerning the dual semigroup and its applications to the Takács integro-differential equations. These discussions were very helpful and are so acknowledged in publication (3).

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#### IV. Consulting

- (1) At the request of Professors Jack Wolf and D. Towsley of the Electrical and Computer Engineering Department here at the University of Massachusetts, I've begun studying a paper entitled "Collision-Resolution Algorithms and Random Access Communications" by James L. Massey, UCLA-Eng-8016 under Contract (or grant) No. ONR N00014-78-C-0078. Professors Wolf and Towsley conjecture that Massey's results for the case of infinitely many identical sources generating Poisson traffic is the limit (in some suitable sense) of the case of finitely many sources. These and other problems arising from this paper are expected to occupy much of my time in the months ahead.
- (2) Professor W. Fleming has, in a private conversation, raised the question of characterizing the domain of the nonlinear semi-group arising in optimal control cf. M. Nisio, Publ. RIMS Kyoto University 13(1976), 513-537. Description of the domain would be very useful in obtaining regularity results.

These are two very interesting problems upon which we plan to work in the months ahead.

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