

# THE ANNALS of MATHEMATICAL STATISTICS

FOUNDED AND EDITED BY H. C. CARVER, 1930-1938

EDITED BY S. S. WILKS, 1938-1949

THE OFFICIAL JOURNAL OF THE INSTITUTE  
OF MATHEMATICAL STATISTICS

## Contents

	PAGE
Properties of Probability Distributions With Monotone Hazard Rate RICHARD E. BARLOW, ALBERT W. MARSHALL AND FRANK PROSCHAN	375
A Renewal Theorem for Random Variables Which Are Dependent or Non-Identically Distributed..... Y. S. CHOW AND HERBERT ROBBINS	390
Average Renewal Loss Rates..... M. V. JOHNS, JR. AND R. G. MILLER, JR.	396
Combinatorial Results in Multi-Dimensional Fluctuation Theory CHARLES HOBBY AND RONALD PYKE	402
One Dimensional Random Walk With a Partially Reflecting Barrier..... G. LEHNER	405
On a Class of Simple Random Walks J. R. BLUM, D. L. HANSON AND S. V. PARTER	413
A Markov Process on Binary Numbers..... SIMEON M. BERMAN	416
Multivariate Wide-Sense Markov Processes and Prediction Theory FREDERICK J. BEUTLER	424
Central Limit Theorems for Families of Sequences of Random Variables F. EICKER	439
Asymptotic Normality and Consistency of the Least Squares Estimators for Families of Linear Regressions..... F. EICKER	447
The Limit of a Ratio of Convolutions..... P. E. NEY	457
Sequential Model Building for Prediction in Regression Analysis, I HAROLD J. LARSON AND T. A. BANCROFT	462
On the Estimation of the Probability Density, I G. S. WATSON AND M. R. LEADBETTER	480
Necessary and Sufficient Conditions for a Statistical Problem to Be Invariant Under a Lie Group..... DAVID R. BRILLINGER	492
Pairwise Comparison and Ranking in Tournaments HANS BÜHLMANN AND PETER J. HUBER	501
Pairwise Comparison and Ranking: Optimum Properties of the Row Sum Procedure PETER J. HUBER	511
Sampling Variances of the Estimates of Variance Components in the Unbalanced 3-Way Nested Classification..... D. M. MAHAMUNULU	521
On the Duals of Symmetric Partially-Balanced Incomplete Block Designs A. J. HOFFMAN	528
Correlations and Canonical Forms of Bivariate Distributions..... H. O. LANCASTER	532
On the Inadmissibility of Some Standard Estimates in the Presence of Prior In- formation..... M. SKIBINSKY AND L. COTE	539
A Sequential Decision Procedure for Choosing One of $k$ Hypotheses Concerning the Unknown Mean of a Normal Distribution..... EDWARD PAULSON	549
On Testing More Than One Hypothesis..... J. N. DARROCH AND S. D. SILVEY	555
The Posterior $t$ Distribution..... M. STONE	568
Shorter Confidence Intervals for the Mean of a Normal Distribution With Known Variance..... JOHN W. PRATT	574

(Continued on back cover)

Vol. 34, No. 2 — June, 1963