## ABSTRACTS OF PAPERS

*(Abstracts of papers presented at the Eastern Regional Meeting of the Institute, April 21–22, 1961. Additional abstracts appeared in the March, 1961 issue.)*

6. **Tables of Minimum Functions for Generating Galois Fields** GF $(p^n)$. J. D. Alanen, Case Institute of Technology. (Introduced by I. M. Chakravarti.)

A polynomial $f(x)$ of degree $n$ irreducible in the field GF$(p)$ where $p$ is a prime number, is called a minimum function, if a root $\omega$ of the equation $f(x) = 0$, serves as a primitive element of GF$(p^n)$, that is, $\omega^0 = 1, \omega, \omega^2, \cdots, \omega^{p^n-2}$ are the $p^n - 1$ non-zero elements of GF$(p^n)$. It is known that for the GF$(p^n)$, there are $\varphi(p^n - 1)/n$ minimum functions, where $\varphi$ is the Euler function, $p$ a prime, and $n$ an integer. Minimum functions were very successfully used in the past in constructing sets of mutually orthogonal Latin squares, balanced incomplete block designs, confounded and fractional factorial designs. Recently these have found a new application in the construction of error-correcting codes. While searching for a minimum function of GF$(13^3)$, we noticed a lack of comprehensive tables of minimum functions in the published literature. A program has been written and all minimum functions generated for a fairly comprehensive set of values of $p$ and $n$.

7. **Testing to Establish a High Degree of Safety or Reliability.** F. J. Anscombe, Princeton University and Bell Telephone Laboratories. (Invited paper)

We are concerned with the possibility of establishing the safety of a weapon or the reliability of a component or device by testing a large number of specimens under some standard operating conditions and demonstrating that the proportion of failures, $p$, is very small. When possible, a fully economic treatment of such a problem is to be desired, in which the expected loss from wrong decisions is assessed and balanced against the cost of testing. But sometimes a noneconomic type of requirement must be considered, such as: (A) *The device will be accepted for service only if the test results permit an assertion with* 99% *confidence that* $p < 1/2000$. Most statisticians will interpret such a requirement, by analogy with the definition of a confidence coefficient, as follows: (B) *The acceptance rule must be such that, for all values of* $p > 1/2000$, *the least upper bound to the chance of acceptance* = 1%. But it is suggested that the following weaker interpretation is sufficiently stringent and more appropriate: (C) *The device will be accepted only if the test results justify fair betting odds of* 99:1 *that* $p < 1/2000$. These odds of 99:1 are to be the final betting odds of an observer who before the trial begins is open-minded and unprejudiced. A suitable prior probability distribution for $p$, relating to such an observer, is proposed, and an acceptance boundary for sequential testing is obtained. In order to complete the specification of a sequential rule of procedure, it is necessary to add a second boundary, for abandoning the trial when the cost of continuing seems excessive. Possible ways of doing this are discussed, and a boundary based on a detailed economic analysis is developed. Because the acceptance requirement (C) is probabilistic (Bayesian), the validity of the acceptance boundary is not affected by the introduction of a boundary for abandoning the trial.

8. **Extreme Values in Gaussian Sequences.** Simeon Berman, Columbia University.

The first theorem extends a result of Rényi (1958). Let $(\Omega, \mathcal{A}, P)$ be a probability space and $\{X_n\}$ a sequence of independent and identically distributed random variables defined on the space. For each $n$, let $Z_n = \max(X_1, \cdots, X_n)$; suppose that $Z_n$ has a limiting distribution. If $Q$ is another probability measure on $\mathcal{A}$ which is absolutely continuous with respect to $P$, then $Z_n$ has the same limiting distribution under $Q$ as under $P$. An applica-



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