ABSTRACTS OF PAPERS

SUBMITTED FOR PRESENTATION TO THIS SOCIETY

The following papers have been submitted to the Secretary and the Associate Secretaries of the Society for presentation at meetings of the Society. They are numbered serially throughout this volume. Cross-references to them in the reports of the meetings will give the number of this volume, the number of this issue, and the serial number of the abstract.

114. Dr. W. Cauer: *Electric networks and bounded functions.*

The problem of designing communication networks with prescribed external characteristics corresponds essentially to the following: Given a complex variable λ, three positive quadratic forms of n variables with matrices L, R, D; to find the conditions that a given minor matrix of m-th order of functions is a chief minor of some A^{-1} where $A=\lambda L+R+\lambda^{-1}D$; then to find one or all sets of the original L, R, D which produce the given minor. A^{-1} is regular in the whole right half-plane, real for real λ, and the real part of A^{-1} belongs to a positive definite quadratic form whenever λ is a point of the right half-plane. The converse, that under these conditions one may construct positive definite L, R, D producing the given minor, seems to be true in general. This paper proves this theorem for: (1) $m=1$ (a) under restriction of degree of the driving point impedence corresponding to the R. M. Foster case (Bell System Technical Journal, 1924, p. 651), but $n=2$ or 3, (b) n infinite. (2) $m=2$, minor symmetric with respect to the secondary diagonal (symmetrical four-terminal network). Graphically given minors are considered. (Received December 20, 1930.)

115. Dr. W. Seidel (National Research Fellow): *On the approximation of continuous functions by linear combinations of continuous functions.*

The author presents a new proof of the following theorem of F. Riesz: *Let $\phi_1(x)$, $\phi_2(x)$, $\cdots$, $\phi_n(x)$, $\cdots$ be a sequence of arbitrary, linearly independent functions, defined and continuous in the interval $a\leqq x\leqq b$. A necessary and sufficient condition that linear combinations of these functions uniformly approximate every function $f(x)$, defined and continuous in $a\leqq x\leqq b$, is that there shall exist no function $\alpha(x)$, of bounded variation, satisfying the system of integral equations $\int_a^b\phi_i(x)d\alpha(x)=0$, $i=1, 2, \cdots$, except if $\alpha(x)$ is constant in the interval $a\leqq x\leqq b$ save perhaps for a denumerable set of values of x different from a and b.* Consider an $(n+1)$-dimensional euclidean space $(x_0, x_1, \cdots, x_n)$ and define the two curves $\Gamma_n^+: x_0=f(x)$, $x_1=\phi_1(x)$, $\cdots$, $x_n=\phi_n(x)$ and $\Gamma_n^-: x_0=-f(x)$, $x_1=-\phi_1(x)$, $\cdots$, $x_n=-\phi_n(x)$. Let $K_n(f, \phi_1, \cdots, \phi_n)$ be the smallest convex body containing Γ_n^+ and Γ_n^-. The origin O surely lies in $K_n(f, \phi_1, \cdots, \phi_n)$. Let the line joining O with the point $(1, 0, \cdots, 0)$ cut $K_n(f, \phi_1, \cdots, \phi_n)$ in a point A_n. The proof of the theorem is based on the following lemma: There