ABSTRACTS OF PAPERS

SUBMITTED FOR PRESENTATION TO THE 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.

219. Dr. W. H. Ingram: *A necessary condition for the operability of systems of synchronous alternators.*

In the case of three synchronous smooth-pole slip-ring machines connected together at a point, the *Lagrangean* multiplier is given by $e_0=\sum(z_0|z_k)e_k^* \cdot\psi_k-\rho_k)$, and the condition of operability is that real ψ's exist which satisfy the generalization of Hopkinson's equation $p_i=\sum e_i^*\cdot e_j^* z_{ij}^{-1}(k_{ij}-\delta_{ij}\lambda_i)$, where δ_{ij} is Kronecker's symbol, $k_{ij}=\sin(\psi_i+\alpha_i)\cos(\psi_j-\rho_j)$, $\lambda_i=(z_i|z_0)\sin\alpha_i$. A limit of synchronous operability is reached when any one of the derivatives $\partial p_i/\partial\psi_j$ vanishes. The ψ's are given explicitly by elliptic and, in the case of salient-pole machines, hyperelliptic functions; and more practically by a system of pendulums. The method of solution can be extended to unbalanced 3-phase systems without difficulty when the field currents are constant. (Received May 17, 1:34.)

220. Professor W. M. Whyburn: *Study of a series of the binomial type.*

The series $F[v, f(x)]=\sum_{i=0}^{\infty}\binom{v}{i}u_i$, where $u_i=\sum_{j=0}^{i}\binom{i}{i-j}f^{(j)}(x)(-1)^{i-j}$, v is a real number, and $\binom{v}{i}$ is a generalization of the binomial coefficient, is studied. Connection is made with previous investigations of derivatives of non-integral orders and with work on infinite systems of differential equations. (Received May 21, 1934.)

221. Professor D. N. Lehmer: *On the enumeration of magic cubes.*

The author devises a method of "normalizing" magic cubes so that the enumeration of them is made proof against repetition or omission. The enumeration has been carried out for cubes of order 3 with the result that there are exactly 4 normalized cubes each representing a group of 1,296 different cubes. The total number of magic cubes of order 3 is therefore 5,184 (Received May 19, 1934.)