where

$$\left.\begin{aligned} S &= \sum_{n=1}^{\infty}\left(\frac{1-a^{2n}}{1+a^{2n}}\right)\frac{e^{-2n\mu}}{n}, \\ \alpha_p &= 2\sum_{n=1}^{\infty}(-1)^{n+1}\left(\frac{1-a^{2n}}{1+a^{2n}}\right)I_p(n)\frac{e^{-2n\mu}}{n}, \\ A_{mp} &= \sum_{n=1}^{\infty}\left(\frac{1-a^{2n}}{1+a^{2n}}\right)I_m(n)I_p(n)\frac{e^{-2n\mu}}{n}. \end{aligned}\right\} \tag{23}$$

Following the procedure of "I" we retain only a finite number p of the coefficients d_m. Writing

$$\gamma_m = \frac{K}{m}\tanh m\mu, \tag{24}$$

and eliminating $md_m \cosh m\mu$ between equations (21), (22) we find

$$\begin{vmatrix} A_{11}+\gamma_1 & A_{12} & \cdots & A_{1p} & \alpha_1 \\ A_{21} & A_{22}+\gamma_2 & \cdots & A_{2p} & \alpha_2 \\ \cdot & \cdot & \cdot & \cdot & \cdot \\ A_{p1} & A_{p2} & \cdots & A_{pp}+\gamma_p & \alpha_p \\ \alpha_1 & \alpha_2 & \cdots & \alpha_p & 2\left(\frac{1}{B} - \log a + K\mu\right) + 4S \end{vmatrix} = 0. \tag{25}$$

The capacity is then given by $-\frac{1}{4}K_1B$.

4. Alternative method of solution. The above treatment provides a satisfactory basis of computation when $K \geqq 1$. For completeness it is interesting to notice that, when $K<1$, more rapid convergence to the true solution is obtained by eliminating D and d_m from equations (13), (14) by treating (13) as a Fourier series in θ and (14) as one in η.

ON A. A. POPOFF'S METHOD OF INTEGRATION BY MEANS OF ORTHOGONALITY FOCI*

By HOWARD A. ROBINSON (*Research Laboratories, Armstrong Cork Company*)

In a recently published paper[1] a method is given which allows a marked reduction of the work necessary in computing the tristimulus values necessary in color specification work. The three tristimulus values are defined by the following relations:

$$X = \int E_L(\lambda)\bar{x}(\lambda)R(\lambda)d\lambda, \qquad Y = \int E_L(\lambda)\bar{y}(\lambda)R(\lambda)d\lambda, \qquad Z = \int E_L(\lambda)\bar{z}(\lambda)R(\lambda)d\lambda,$$

where $E_L(\lambda)$ are tabulated relative energy functions of a known light source L, $\bar{x}(\lambda)$, $\bar{y}(\lambda)$, $\bar{z}(\lambda)$ are tabulated luminosity functions and $R(\lambda)$ are the experimentally meas-

* Received August 9, 1945

[1] Quart. Appl. Math., 3, 166–174 (1945).

ured curves of reflecting power or percent transmission as a function of the wave length. The product functions $E_L\bar{x}$, $E_L\bar{y}$ and $E_L\bar{z}$ have also been tabulated and may be considered as the $\phi_k(x)$ in the original article. Work is now under way in setting up the necessary scales for the colormetric computations and will be published elsewhere.

It is pointed out in the introduction to Popoff's paper that the method requires the construction of certain diagrams, called scales, showing the abscissas of the centroids of certain areas associated with $\phi_k(x)$. Thus, operation (b) in Section 2 contains some unnecessary work, since it is unnecessary to find the centroids $\bar{a}_r$, $\bar{b}_r$, $\cdots$, only the abscissas of these centroids being required.

BOOK REVIEWS

Elementary electric-circuit theory. By Richard H. Frazier. McGraw-Hill Book Company, Inc., New York and London, 1945. ix+434 pp. $4.00.

"This book is designed as a complete elementary exposition of electric-circuit theory requisite in the technical foundation of all students of electrical engineering regardless of their expected branch of specialization—electric power, communications, or electronics" (from Author's Preface). As such it may be recommended to readers of the *Quarterly*, experts in other than electrical fields, who may at times have difficulty in following the exposition of mathematical methods as applied to electrical problems. They will find in this book by Professor Frazier, of Massachusetts Institute of Technology, a modern presentation of the field of remarkably broad coverage in a relatively small volume. The power and generality of modern methods, such for instance as the various types of network transformations, are very well presented and thoroughly exemplified. The author has taken great pains to point out possible pitfalls, and if his reader will give equally great attention to details he will find himself amply repaid. Historical references and a selected bibliography enhance the value of this book.

P. LeCorbeiller

Transmission lines, antennas and wave guides. By Ronold W. P. King, Harry Rowe Mimno and Alexander H. Wing. McGraw-Hill Book Company, Inc., New York and London, 1945. xv+347 pp. $3.50.

The book is divided into four chapters. The first chapter, on transmission lines, is written by Alexander H. Wing; the second and third, respectively on antennas and on wave guides, is by Ronold W. P. King; the short concluding chapter is on wave propagation by Harry Rowe Mimno.

The chapter on transmission lines concentrates on those topics which in recent years have interested research workers in microwave laboratories. Those parts of the theory which are needed in problems of long line communication, such as crostalk and interference problems, are not considered; but ample attention is given to high frequency measurements, impedance matching, suppression of harmonics, etc. The emphasis is definitely on high frequencies and on relatively short lines .The exposition is good.

The chapter on antennas constitutes one-half of the book. For this reason it is particularly unfortunate that it should contain so much misinformation and misinterpretation. For the most part it would be difficult for an inexpert reader to recognize what is right and what is wrong. Throughout, the reader is given to understand that the conclusions are based on rigorous electromagnetic theory. Engineering approximations in common use are called "very crude" if they are in error by as much as twenty-five per cent and one is led to believe that those approximations which are called "good" by the author are really good. Apparently, however, the author has not set a uniform objective standard of quality of approximations. He declares that his theoretical impedance curves are in "good agreement" with measured impedances. He does not give the measured values; but measured values from three published sources, and one unpublished but made known to the author, agree among themselves and disagree with King's curves, in some regions by as much as twenty-five to seventy per cent. These measured values also agree with the theoretical results published by this reviewer and by Marion C. Gray. These facts are not mentioned in