ABSTRACTS

DEPARTMENT OF POWER ENGINEERING

Civil and Hydraulic Engineering Section

1. DESIGN OF SIPHONS—I. Prof. N. S. Govinda Rao, *Journal of the Central Board of Irrigation & Power*, October 1954, **11**, 487–96.

This is the first of a series of papers dealing with the design of siphons. The working of siphons and their methods of classifications are discussed. A history of the development of their designs together with a list of important siphon installations conclude the first series.

2. DETERMINATION OF FIXED-END MOMENTS. K. T. Sundara Raja Iyengar, *Journal of the American Concrete Institute*, October 1954, **26**, 201–03.

By using the MaClaurin Series to represent the elastic curve, a direct method for determining fixed-end moments in beams with irregular loading, is presented. The results are compared with those obtained by Column-Analogy and two other indirect methods.

3. DESIGN OF SIPHONS—II. Prof. N. S. Govinda Rao, *Journal of the Central Board of Irrigation & Power*, January 1955, **12**, 58–70.

Calculation of discharge through a volute siphon is discussed at length. Losses due to cavitation, discharge in a saddle siphon, limit of operating head are mentioned.

4. DURABILITY OF CONCRETE IN HYDRAULIC STRUCTURES. Prof. N. S. Govinda Rao and K. T. Sundara Raja Iyengar, *Journal of C.B.I. & P.*, January 1955, **12**, 90–101.

Conditions affecting durability and the various causes of deterioration of concrete in hydraulic structures are discussed in detail. Recommendations for getting durable concrete in massive hydraulic structures are mentioned.

5. VIBRATIONS IN SOILS. Prof. N. S. Govinda Rao and C. N. Nagaraj, *Indian & Eastern Engineer*, February 1955, 201–07.

This paper gives, in brief, the practical importance of the study of vibrations in soils. The effect of dynamic loads on soils, trends in the design of machine foundations and the methods of non-destructive testing of soils are explained in this paper.

6. GEGENBAUER TRANSFORMS. Dr. S. K. Lakshmana Rao, *Mathematics Student*, 1954, **22**, 161–65.

The Legendre transform of a function F (x) introduced by C. J. Tranter [*Quart. J. of Math.*, Oxford, 1950, (2), 1–8] is the sequence of numbers

$$f(n) = \int_{-1}^{+1} F(x) P_n(x)\, dx \qquad (n = 0, 1, 2, \ldots)$$

where $P_n(x)$ denotes the Legendre Polynomial of degree n. In two recent papers (R. V. Churchill and C. L. Dolph, *Proc. Am. Math. Soc.*, 1954, **5**, 93–100 and R. V. Churchill, *J. Math. & Phy.*, 1954, **33**, 105–78) the convolution and other operational properties for the Legendre transform have been developed. In the present paper the Gegenbauer transform of a function is introduced by the equation

$$f^{\nu}(n) = \int_{-1}^{+1} F(x) (1 - x^2)^{\nu-\frac{1}{2}} C_n^{\nu}(x)\, dx$$

$$(\nu > 0,\ n = 1, 2, \ldots)$$

where $C_n^{\nu}(x)$ denotes the Gegenbauer Polynomial. The convolution theorem and other operational properties of this transform are proved following completely the last two papers mentioned.

7. A PROOF OF LEGENDRE'S DUPLICATION FORMULA. Dr. S. K. Lakshmana Rao, *American Mathematical Monthly*, February 1955, **62** (2), 120–21.

The classical result

$$\Gamma(2s) = \frac{2^{2s-1}}{\sqrt{\pi}} \Gamma(s) \Gamma(s + \tfrac{1}{2})$$

is proved by the use of Mellin Transform.

8. AERODYNAMIC TESTING OF SCALE MODELS IN HYDRAULIC ENGINEERING. V. Sethuraman, *Journal of C.B.I. & P.*, April 1955, **12**, 324–39.

A brief history of air testing with particular reference to hydraulic structures and machines is traced. The advantages that result by employing air as a working medium in the place of water are given and the increasing predominance and importance of air testing, as also its limitations are set out. The analogy between the supercritical flow of water and the supersonic flow of gases is mentioned.

9. HIGH QUALITY CONCRETE FOR PRESTRESSING. T. S. Venkata Rao, *The Indian Builder*, May 1955, 1–4.

The qualities expected of the concrete for prestressing work and the factors affecting them are discussed. Methods of obtaining high quality concrete with particular reference to mix design and construction methods are given.

10. • ULTIMATE STRENGTH OF RECTANGULAR REINFORCED CONCRETE BEAMS. K. T. Sundara Raja Iyengar, *The National Institute of Engineering Magazine*, 1955, No. 4, 8–17.

The inconsistencies existing in the working stress theory of design of reinforced concrete member are shown. The principal ultimate strength theories for beams in flexure are discussed. Ultimate load equations are derived for rectangular beams failing in tension as well as compression.

11. DESIGN OF SIPHONS—III. Prof. N. S. Govinda Rao, *Journal of C.B.I. & P.*, April 1955, **12**, 234–45.

The qualities to be sought for in a good siphon are mentioned. Factors affecting the priming depth and discharge are discussed. A discussion of the application of scale model studies is given.

12. RESEARCH AND DEVELOPMENT IN PRESTRESSED CONCRETE. K. T. Sundara Raja Iyengar. *The Indian Builder*, June 1955, 3 (6), 7–11 and 42.

The development in prestressed concrete is discussed under two heads, *i.e.*, (1) Materials and (2) Applications. A list of important research projects in progress is made. Suggestions for future research in prestressed concrete are made.

13. LARGE DEFLECTIONS OF SIMPLY SUPPORTED BEAMS. K. T. Sundara Raja Iyengar and S. K. Lakshmana Rao, *Journal of the Franklin Institute*, June 1955, **259** (6), 523–29.

Large deflections of simply supported beams have been studied when the transverse loading consists of a uniformly distributed load *plus* a centrally concentrated load under the two cases, (1) the reactions are vertical, (2) the reactions are normal to the bent beam together with frictional forces. The solutions are obtained by the use of power series expansions.

DEPARTMENT OF AERONAUTICAL ENGINEERING

1. DESIGN AND OPERATION OF AN INTERMITTENT 1″×3″ SUPERSONIC WIND TUNNEL. Satish Dhawan, *Journ. of the Aero. Soc. of India*, February 1955, **7** (1), 1–17.

The design and development of a comparatively low cost Supersonic Wind Tunnel of the blow-down type is described. The working range of this wind tunnel covers Mach Nos. from 1·5 to 2·5 and Reynolds Nos. from $2{\cdot}5\times10^5$ per foot to $6{\cdot}0\times10^5$ per foot approximately. The operation of Blow-down Supersonic Wind Tunnels is discussed and a simple method for Reynolds Number control developed. This technique depends on control of the Settling Chamber pressure during a run to compensate for the effect of temperature drop, and allows the test section Reynolds Number to be held constant or varied in a predetermined manner.

2. THE INFLUENCE OF BODY FORCES ON THE STABILITY OF A REINFORCED RECTANGULAR PLATE. C. L. Amba Rao, *Journ. of the Royal Aero. Soc.*, June 1955, **59**, 437–41.

The critical load of a reinforced rectangular plate is obtained taking body forces into consideration. Further, nomograms are constructed for obtaining the buckling load of stiffened rectangular panels with or without body forces, stiffened or unstiffened, etc., for different length, width ratios.

3. SELECTION OF THE ELECTRIC DRIVE FOR THE 14′×9′ WIND TUNNEL. T. N. Krishnaswamy, *Journ. of the Aero. Soc. of India*, May 1955, **7** (2), 19–28.

The subject has been dealt with in 3 parts. First, from the consideration of energy ratio of the tunnel, etc., the power requirements of the motor including speed range, etc., have been arrived at. Secondly, various types of electric drives suited for wind tunnels have been discussed. Thirdly, the characteristics of the types of electric drive selected have been discussed in detail regarding efficiency, operating characteristics, etc.