ABSTRACTS

DEPARTMENT OF AERONAUTICAL ENGINEERING

1. SIMPLIFICATION OF HARMONIZATION OF LAPLACE'S EQUATION BY PARTIAL CONFORMAL TRANSFORMATION. C. L. Amba Rao and K. Sreevatsa, *Proc. Soc. for Experimental Stress Analysis*, **11** (1).

In numerically solving Laplace's Equation, the field of the model is divided into a number of different regions. Conformal transformation is made on some of the regions so that regular star networks cover the entire field, thereby simplifying the harmonization. The procedure followed at the common junction is described by considering a particular example in photoelasticity.

2. THEORETICAL INVESTIGATION OF CREEP AND CRACK DENSITY STUDIES IN STRESSCOAT. P. Narasimhamurthy, *S.E.S.A. Proceedings*, **15** (1), 57–64.

In this paper the visco-elastic behaviour of Stresscoat is examined. Part I deals with the creep properties of Stresscoat. In Part II a simple analysis is made to arrive at a general semi-empirical formula to fit experimental (n, ϵ) curves and (n, h) curves.

3. ON THE DISTRIBUTION OF INTERMITTENCY IN THE TRANSITION REGION OF A BOUNDARY LAYER. Roddam Narasimha, *Journ. of Aero. Sci.*, Sept. 1957, **24** (9), Readers Forum.

Emmons' picture of spotwise transition from laminar to turbulent flow in a boundary layer has been shown to be correct in its fundamentals by Schubauer and Klebanoff. The intermittency factor γ measured by them is a measure of the probability $f(\mathrm{P})$ that the motion is turbulent at P, but Emmons' assumptions about the source-rate density function $g(x, y, t)$ do not explain the measured γ distributions. Nor is the significance of the Gaussian integral curve, fitted by Schubauer and Klebanoff to their data, clear. This note directs attention to some considerations which suggest an explanation.

4. NATURAL FREQUENCIES OF RECTANGULAR PLATES WITH EDGES ELASTICALLY RESTRAINED AGAINST ROTATION. C. V. Joga Rao and C. Lakshmi Kantham, *Journ. of Aero. Sci.*, Nov. 1957, **24**, Readers Forum.

Plates with attachments to heavier members along the edges can be described as having edges elastically restrained against rotation, in many cases uniformly along each edge. At the edges, setting slope $\alpha = \beta \mathrm{M}$, when M is the edge bending moment with β always positive, the elastic restraint can be analytically defined with $\beta \to 0$, $\beta \to \infty$ describing respectively, clamped and simply supported edges. In this note natural frequencies of such plates are calculated mainly following the nomenclature of Dana Young.

5. AN INVESTIGATION OF THE SOLUTION OF THE TORSION PROBLEM FOR A PIERCED TRIANGULAR SHAFT BY RELAXATION METHODS. B. V. Saroja (Mrs.), *Journ. of the Aero. Soc. of India*, **9** (3), 35–43.

The relaxation solution of the torsion problem for an equilateral triangular shaft pierced by three circular holes symmetrically situated has been examined critically in detail. Certain discrepancies associated with the vanishing of the total residual over a hole were noted in the earlier solutions. These have been accounted for and a detailed solution over three successive nets given.

6. MEASUREMENTS OF SHOCK DRAG DUE TO NOSE BLUNTNESS FOR A 40° CONE-CYLINDER AT $M = 1{\cdot}97$. M. A. Badrinarayanan, *Journ. of Aero. Soc. of India*, 1957, **9** (3), 44–49.

Using a direct reading drag balance the nose drag of 40° cone-cylinders with various degrees of bluntness at the nose has been measured at a Mach No. of 1·97 at zero angle of attack.

7. STUDY OF THE CURVING OF THE FREE JET. A. K. Roy, *Journ. of Aero. Soc. of India*, 1957, **9** (2), 28–33.

In this paper, the problem of curving of the free jet has been studied, by determining the form of the free streamline, breadth of the jet, curvature of the spiral into which the free streamline wind up, etc., by the help of momentum theorem, continuity and energy equations, conformal transformation, etc. The idea of curving of the free jet has been derived from the diffusor.

8. AN ANALYTICAL INVESTIGATION OF CREEP UNDER COMBINED LOADINGS. P. Narasimhamurthy, *Aircraft Engineering*, Nov. 1957.

Aerodynamic heating, which is one of the important characteristics of supersonic flight, introduces three additional problems for structural design: (*i*) Thermal Stresses, (*ii*) Creep deflections and (*iii*) Decrease in the stiffness of structure. The present paper is concerned with the second aspect, *i.e.*, creep deflections under combined loading. The paper is divided into three sections: Section I deals with the analytical formulation of the laws of creep under combined loadings with a survey of the earlier work on the subject. Section II deals with the experimental verification with a discussion on the nature and form of ϕ' the creep modulus. Section III deals with the extension of the analytical approach to an anisotropic case and a case where the uniaxial creep strain-rate-stress relationship is exponential. The theory has been verified on the experiments conducted by Johnson at the National Physical Laboratory, England.

9. ON THE DESIGN OF UNIFORM FLOW SUBSONIC NOZZLES. D. M. Rao, *Journ. of Aero. Soc. of India*, Nov. 1957.

An elementary analysis based on one-dimensional flow indicates the area divergence necessary to obtain gradient-free flow by compensating for the boundary layer growth in subsonic wind-tunnel nozzles. Experimental values of the boundary layer displacement thickness growth rate, obtained from a simple test on a constant area nozzle, are used to calculate the height divergence of a two-dimensional nozzle for uniform flow in the subsonic range. The proposed method takes into account secondary flows and boundary layer accumulation in corners, and provides a rapid method for routine design purposes.