ABSTRACTS

DEPARTMENT OF AERONAUTICAL ENGINEERING

1. THE ELASTIO-PLASTIC PROBLEM OF A THIN ROTATING DISK WITH A CENTRAL CIRCULAR HOLE AND HYPERBOLIC THICKNESS VARIATION. C. V. Joga RAO, *Proc. of the Third Congress of Theo. and Applied Mechanics,* Dec., 1957.

Using the maximum shearing stress condition of plasticity, the problem of a thin rotating disk with a central circular hole and a hyperbolic thickness variation along the radius has been solved in the elasto-plastic range. The results are of interest in the design of gas turbine disks. The formulae derived can be used for obtaining the stress distribution and angular velocities for beginning of yielding and for complete plasticity. Numerical calculations have been made for a typical disk made for a Nimonic alloy. The limitations of the derived results are also indicated.

2. DETERMINATION OF DISTRIBUTION OF TWIST ON A STRAIGHT WING TO CORRESPOND TO AN AERODONAMIC LOAD DISTRIBUTION ON A SWEPT BACK WING. S. N. Chaudhuri and K. S. Nagaraja, *Journ. of Aero. Sci. Readers Forum,* 1958, **25,** No. 9.

The problem of determining the twist distribution corresponding to a given load distribution on a swept wing (sheared straight wing) is comparatively simple and is known.

The present investigation based on the lifting surface method of Kuchemann enables the determination of twist distribution on the straight (sheared swept) wing depending entirely on the geometry of the wing plan-form, to correspond to a load distribution on the swept wing. The lift distribution can subsequently be calculated.

3. THE EFFECT OF TRANSVERSE SHEAR DEFORMATION AND ROTATORY INERTIA IN WAVE PROPOGATION AND VIBRATION OF THIN ELASTIC PLATES. P. Narasimamurthy, *Proc. of the Third Congress of Theo. and Applied Mechanics,* Dec. 1957.

In 1951, Mindlin proposed a set of equations of motion for plates, including the two important effects of rotatory inertia and transverse shear deformation. He introduced an unknown constant K^2 which was determined by comparison with Lamb's exact solution of infinite plate problem.

In this investigation, a different set of equations of motion are proposed to include the two effects without involving any unknown constant. The equations

are applied to the infinite plate and the results agree very well with Lamb's solution.

4. SUCTION AND POWER REQUIREMENTS OF A VENTILATED WALL 'HALF-NOZZLE' AT TRANSONIC SPEEDS. D. M. Rao and S. M. Ramachandra, *Journ. Aero. Soc. of India*, 1958, **10**, No. 4.

Experimenis conducted with a slotted wall (9.4 per cent open) and a perforated wall (18.2 per cent open), fitted in a two-dimensional half-nozzle configuration (*i.e.*, occupying one side only of a rectangular nozzle) and employing plenum suction, indicate suction flow requirements considerably in excess of the quantities needed by normal ventilated nozzles, in the Mach number range 0.8-1.05. Measurements of diffuser power show substantial benefits of employing suction with a half-nozzle. Effects of nozzle length/height ratio and divergence angle on suction and power are demonstrated, and it is shown that an optimum combination of divergence and suction can yield useful tunnel power reductions in the entire transonic speed range.

5. BENDING AND VIBRATION OF ELASTICALLY RESTRAINED CIRCULAR PLATES. C. Lakshmi Kantham, *Journ. of the Franklin Institute*, 1958, **265**, No. 6.

In the bending and vibration problem, it is found that the values of deflection and natural frequency vary considerably with change of end or edge conditions. In this paper a general boundary condition involving linear relation between moment and slope at an edge is considered, so that the simply supported and completely fixed edge conditions from the limiting cases. The constant of proportionality is the elastic restraint factor, which is a measure of the degree of fixture, varying from zero to positive infinity. Values of deflection in the one case and natural frequency in the other have been determined for intermediate values of the elastic restraint factor.

6. BENDING AND VIBRATION OF ELASTICALLY RESTRAINED BEAMS. C. Lakshmi Kantham, *Journ. of Aero. Soc. India*, 1958, **10**, No. 1.

Many of the beams and plates used in aircraft and other structures are neither simply supported nor fully clamped. This paper forms a part of a series of investigations on structures with non-ideal fixities. In the case of bending and vibration of beams the values of deflection and natural frequency respectively vary considerably with the elastic restraint factor. The equations developed for the elastically restrained vibrating beams and their eigen soluions have been used by the author in studying vibration of elastically restrained rectangular plates.

7. BENDING OF ELASTICALLY RESTRANED RECTANGULAR PLATES, C. Lakshmi Kantham, *Journ. of Royal Aero. Soc.*, November 1958.

Many of the beams and plates used in aircraft and other structures are neither simply supported nor fully clamped. This paper forms a part of a series of investigations on structures with non-ideal fixities. In the case of bending of rectangular plates with elastically restrained edges and under uniform pressure following the multiple Fourier approach of Timoshenko the variation of deflection at the centre of the plate has been obtained for various values of the elastic restraint. This variation has been studied for rectangular plates of ratio of sides equal to 1.0, 1.5 and 2.0.

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