R09

Code No: C0406, C5201, C1502

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I - Semester Examinations, March/April-2011

ADVANCED MECHANICS OF SOLIDS

(COMMON TO CAD/CAM, DESIGN FOR MANUFACTURING, MACHINE DESIGN)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. Show that the shear center for the section shown in fig. 1 is at $e = 4R/\pi$ measured from point *O.* (12M)

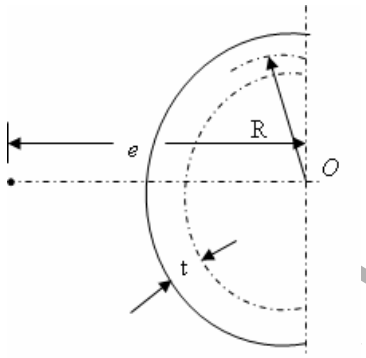

Fig. 1

2. A 90 mm × 60 mm × 10 mm unequal angle is placed with the larger leg vertical as shown in fig.2. It is subjected to a sagging bending moment of 700 N-m on the horizontal axis. Determine the stresses induced at points P_1 and P_2. (12M)

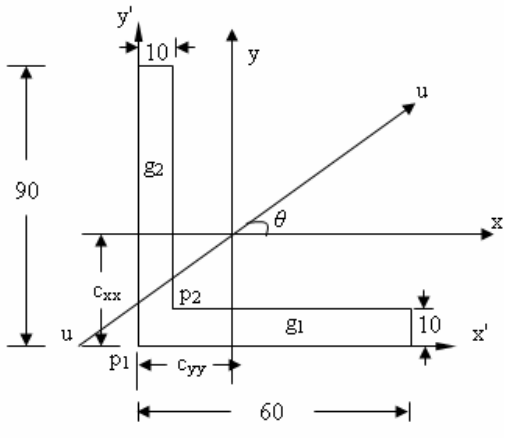

Fig. 2

3. A semicircular grider is fixed at both ends and is subjected to a uniformly distributed load over its entire spa. Determine the expression for moment at mid-span. Also determine the expression for bending moment, shear force and torsional moment at any point in the beam. (12M)

Contd……2

4. Derive an expression for the allowable twisting moment for a thin walled tube. Also derive an appropriate expression for strength-weight ratio of such a tube. Take τ_s as an allowable shear stress. (12M)

5. A flat steel turbine disk of 65 cm outside diameter and 10 cm inside diameter rotates at 3600 rpm, at which speed the blade and shrouding cause a tensile rim loading of 4300 kPa. The maximum stress at this speed is to be 104026 kPa. Find the maximum shrink allowance on the diameter when the disk and the shaft are rotating. (12M)

6. Analyze a circular plate freely supported around the edge and having a central hole carrying distributed load. Obtain maximum deflection and moment. (12M)

7. A semi-infinite steel bar (E= 200GPa) has a square cross section 80 mm on a side and rests on a Winkler foundation of modulus κ_o = 0.25 N/mm^2/mm. A downward force of 50 kN is applied to the end. Find the maximum and minimum deflections and their locations. Also find the flexural stress and its location. (12M)

8.a) What is contact stress? Discuss the method of computing contact stresses. (6M)

b) Derive the expression for contact pressure on a single row ball bearing. If the ball diameter is 4 cm, the radius of the groove is 2.5 cm. The diameter of the outer race is 20 cm and the greatest compressive force on one ball is 5 kN. Calculate the contact pressure. (6M)

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