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Code No: A5202

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech I Semester Examinations, October/November-2011
ADVANCED MECHANICS OF SOLIDS
(DESIGN FOR MANUFACTURING)

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

Answer any five questions
All questions carry equal marks

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1. A 2mm thick plate of steel is formed into the cross section shown in Fig.1. Locate the shear centre for the cross section. [12]

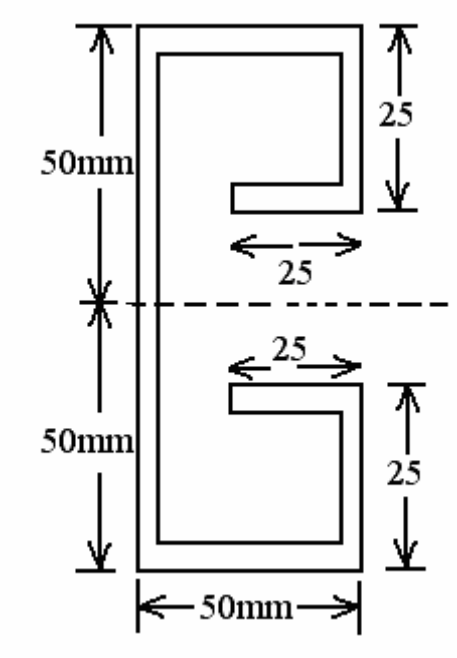

Fig.1

2. A simply supported bean of length 1.8m carries a central load of 3.4kN inclined at 30^0 to the vertical and passing through the centroid of the section as shown in Fig.2. Determine:
   a) Maximum tensile stress
   b) Maximum compressive stress
   c) Deflection due to the load. [12]

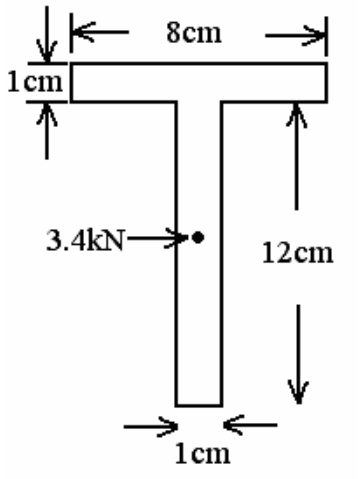

Fig.2

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3. A crane hook whose horizontal cross-section is trapezium, 50mm wide at the inner side, 25mm wide at the outer side and 50mm thick, carries a load of 10kN whose line if action is 60 mm from the inside edge of the section. The centre of curvature is at a distance of 50 mm from the inside edge. Calculate the maximum tensile and compressive stresses developed in the hook material. [12]

4. A T-section with flange 10cm×1cm and web 19cm×0.8cm is subjected to a torque of 200Nm. Find the maximum shear stress and angle of twist per metre length $G = 82kN/mm^2$. [12]

5. A shaft of hollow square section of outer side 38mm and inner side 30mm is subjected to twisting such that the maximum shear stress developed is 240 N/mm^2. What is the torque acting on the shaft and angular twist if the shaft is 1.2m long? Take $G = 8\times10^5 N/mm^2$. [12]

6. A circular plate is made of steel (E=200 GPa, γ =0.29 and Y=276MPa), has a radius a =250mm, and has thickness h=25mm. The plate is simply supported and subjected to a uniform pressure p=1.38 MPa. Determine the maximum bending stress in the plate and maximum deflection. [12]

7. A steel I-beam (E=200GPa) has a depth of 102 mm, width of 68mm, $I_x=2.53\times10^6 mm^4$, and length of 4m. It is attached to a rubber foundation for which $K_o=0.350N/mm^3$. A concentrated load P=30kN is applied at one end of the beam. Determine the maximum deflection, maximum flexural stress in the beam and the location of each. [12]

8. Explain the methods of computing contact stresses. [12]

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