(DME 212)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

MECHANICAL ENGINEERING

Paper - II : Mechanics of Materials

Time : 3 Hours **Maximum Marks : 75**

Answer question No.1 compulsory ***(15)***

Answer ONE question from each unit ***(4 × 15 = 60)***

1) a) Define Elasticity, Plasticity and Hooke's law.

b) Define Resilience, strain energy.

c) Give Torsion equation for a circular shaft.

d) Give the relation between load, shear force and Bending moment.

e) Write the formula for maximum shear stress in a rectangular beam of width 'b' and depth 'd'.

UNIT - I

2) a) Draw the stress – strain diagram for a mild steel specimen and explain the important points on it. ***(7)***

b) Find the stress, strain and Young's modulus of a brass rod of diameter 25 mm and of length 250 mm which is subjected to a tensile load of 50 kN when the extension of the rod is equal to 0.3 mm. ***(8)***

OR

3) a) A steel tube 40 mm internal diameter, 2.5 mm thick and 6 m long is covered throughout with copper tube 3 mm thick. The tubes are firmly united at their ends. This compound tube is subjected to tension and the stress produced in steel is 85 MPa. Determine : ***(9)***

i) Elongation of the tube

ii) Stress in the copper tube

iii) Load carried by the combined tube.

Take E_{steel} = 205 kN/mm^2 and E_{copper} = 110 kN/mm^2

b) Write expressions for the relationship between : ***(6)***

i) 'Modulus of Elasticity' and 'Shear modulus'

ii) 'Modulus of Elasticity' and 'Bulk modulus', and hence derive the relation among the three Elastic constants.

UNIT – II

4) a) Derive the torsion equation for a solid circular shaft of diameter 'd', subjected to torque 'T'. ***(10)***

b) Determine the torque that can be transmitted by a solid circular shaft if it transmits 300 kW of power at 225 r.p.m. ***(5)***

OR

5) A rectangular block of material is subjected to a tensile stress of 100 MPa on one plane and tensile stress of 48 MPa on a plane at right angles together with shear stress of 65 MPa on the same plane, Find

a) The magnitude of principal stress.

b) The magnitude of greatest shear stress.

c) The direction of principal plane.

d) The normal and tangential stresses on a plane inclined at 20° with the plane carrying greater stress.

UNIT - III

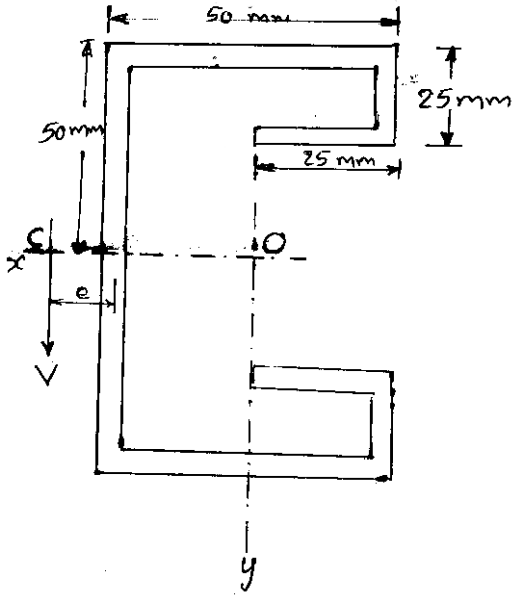
6) A 10 – m long simply supported beam carries the point loads of 10 kN and 6 kN at 2 m and 9 m respectively from the left end. It also carries a uniformly distributed load of 4 kN/m run for the length between 4 m and 7 m from the left end. Draw the shear force and bending moment diagram. ***(15)***

OR

7) A 6 – m long simply supported beam carries a point load of 4 N at 4 m from the left support. It is also carrying a uniform distributed load of 4 N/m for 2 m length starting from the left end. Draw the shear force and bending moment diagram.

UNIT - IV

8) A 3 mm thickness plate of steel is formed into the cross-section as shown in figure. Locate the shear centre for the cross-section. ***(15)***



OR

9) a) Derive an expression to find out the shearing stresses and position of shear centre for an I-section having equal flanges. ***(8)***

b) Prove that the maximum shear stress in a rectangular section is 1.5 times the average shear stress. ***(7)***

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