Code No: 113AC **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November - 2015

MECHANICS OF SOLIDS

(Common to ME, MCT, MMT, AE, AME, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **[25 Marks]**

1.a) What is the importance of factor of safety? [2M]
b) Explain about resilience. [3M]
c) What are the advantages of I-beam? [2M]
d) Describe about overhanging beam and fixed beam. [3M]
e) What is a flitched beam? [2M]
f) What is section modulus and mention its effects? [3M]
g) What is maximum shear stress-theory? [2M]
h) How the principal stresses be evaluated? [3M]
i) What are the assumptions made in deriving torsion equation? [2M]
j) Why hollow shafts are more rigid compared to solid shafts for the same material? [3M]

PART –B **[50 Marks]**

2. A brass bar having cross sectional area of 1200 mm^2 is subjected to axial force as shown in figure 1. Find the total elongation of the bar. Modulus elasticity of brass is 110 GN/m^2. [10]

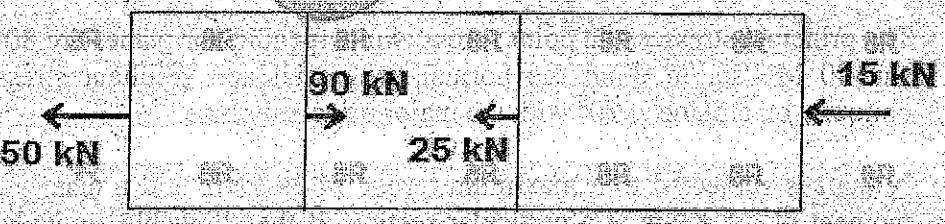

Figure: 1

OR

3. A reinforced concrete column is 400 mm × 400 mm in section. The column is provided with 4 bars each of 30 mm. diameter. The column carries a load of 400 KN. Find the stresses in concrete and steel bars. Take Es=210 GN/m^2, Ec=14 GN/m^2. [10]

4. Draw the BM and SF diagrams for the beams shown in figure 2. [10]

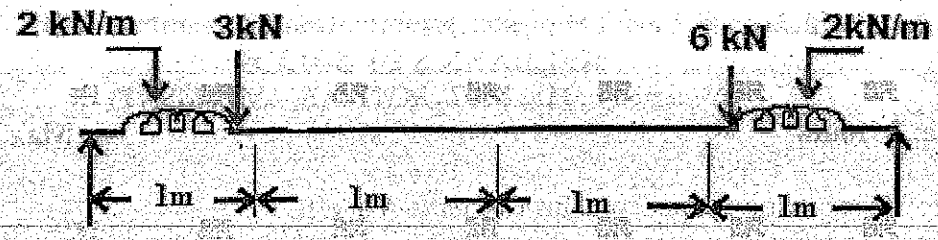

Figure: 2

OR

5. For the beam shown in figure 3. Draw SF and BM diagrams and find the point of contraflexure. [10]

Figure: 3

6. A simply supported beam carries a concentrated load at the centre of the span. If the maximum stress due to bending is 150 Mpa, Find the ratio of the depth of beam section to span in order that the central deflection may not exceed $\frac{1}{500}$ of the span. [10]

OR

7. A circular beam of 200 mm. diameter is subjected to a shear force of 8 KN. Find the value of maximum shear stress and sketch variation of shear stress along the depth of beam. [10]

8. The principal stresses at a point across two perpendicular planes are 80 MN/sq. m. and 40 MN/sq. m. Find the normal, tangential and resultant stresses and its obliquity on a plane at 20^0 with the major principal plane. [10]

OR

9. A shaft is subjected to a maximum torque of 10 kNm and a maximum bending moment of 7.5 KNm at a particular section. If the allowable equivalent stress in simple tension is 160 MN/sq. m. find the diameter of the shaft according to maximum shear stress theory. [10]

10. A solid steel shaft has to transmit 100 KW at 250 rpm. Taking allowable shear stress as 75 MN/sq. m, find the diameter of the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 50%. [10]

OR

11. A thin cylindrical shell of 3 m. long, closed at its ends has an internal diameter of 1.2 m and thickness of 16 mm. Calculate circumferential and longitudinal stresses induced and also change in length and diameter of the shell, if it is subjected to an internal pressure of 1.6 MN/sq. m. Take E=200 GN/sq. m and poisson's ratio = 0.25. [10]

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