Code No: 113BJ

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, December-2014
STRENGTH OF MATERIALS – I
(Common to CE, CEE)

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.

Part- A **(25 Marks)**

1.a) Define the Poission's ratio, and what is its maximum value. (2 M)
b) A steel circular bar of radius 20 mm and 2 m long is subjected to a suddenly applied tensile force of 75 kN, determine the strain energy stored. (3 M)
c) Define the point of contraflexure and what is its significance? (2M)
d) Derive the relation between shear force and rate of loading. (3M)
e) Explain the limitation of flexure equation. (2M)
f) Define the section modulus and obtain the expression for a circular section.(3M)
g) Draw the Mohr's circle for a state of pure shear. (2M)
h) Explain the significance of various theories of failure. (3M)
i) Define a conjugate-beam. Explain the advantages of conjugate beam method. (2M)
j) Explain the Moment-Area Theorems. (3M)

Part- B **(50 Marks)**

2. A steel rod of 30 mm diameter is enclosed by a copper tube of 45 mm external diameter and internal diameter 35 mm. The composite bar of length 300 mm is subjected to an axial tensile force of 50 kN. Find the stresses in each bar and the load carried by each bar. Adopt E for Steel is 210 GPa and E for Copper is 110 GPa.

OR

3.a) Draw the stress-strain diagram for mild steel and explain various salient points.
b) A load *P* falls from a height of 25 mm on a collar at the lower end of a vertical steel bar 1.5 m long and 28 mm in diameter. If the maximum instantaneous elongation is 3 mm, determine the corresponding stress and the magnitude of the load P.

4. Draw shear force and bending moment diagrams for the beam shown in figure 1. Also find maximum bending moment.

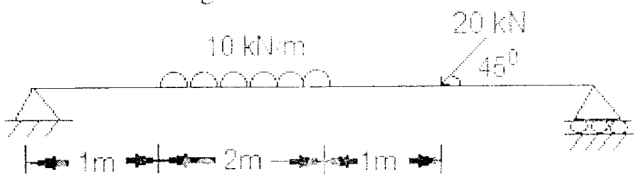

Figure 1

OR

5. Draw the shear force and bending moment diagrams for a beam of span 2.4 m supported and loaded as shown in Figure 2.

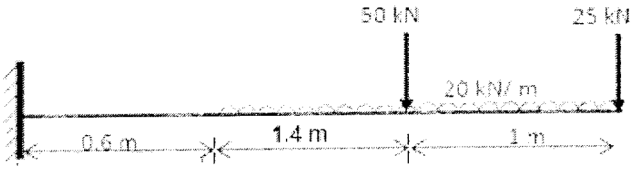

Figure 2

6. An unsymmetrical I-section beam of length 6m has equal over-hangs of 1.5 m at both ends. The cross-section has top flange 150 mm×12 mm, web 10mm×176mm and bottom flange 100 mm × 12 mm. Determine the maximum uniformly distributed load the beam can support, if the permissible stresses are limited to 90 N/mm^2 in compression and 150 N/mm^2 in tension.

OR

7. A simply supported beam of span 4 m carries a uniformly distributed load of 25 kN/m over the entire span. The cross-section of the beam is as shown in Figure 3. Draw the distribution of shear stress across the mid-span section and also find the ratio of maximum shear stress to the average shear stress in the beam.

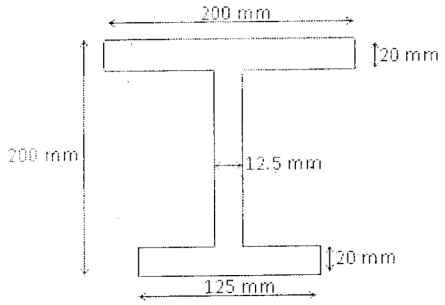

Figure 3

8. Using the Mohar's circle, for the state of stress shown in Figure 4, determine:
   a) the plane of action and the magnitude of principal stresses,
   b) maximum shear stress and
   c) the stresses acting on a plane making 30^0 in clockwise direction with respect to x-axis.

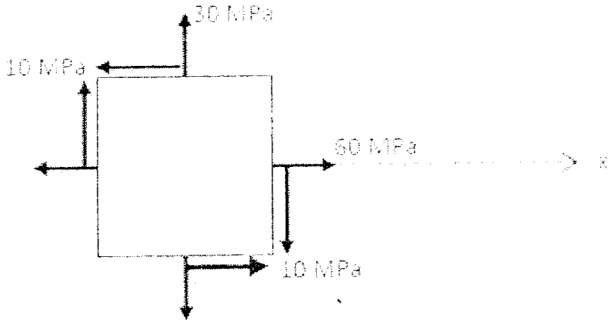

Figure 4

OR

9. Explain the following Failure theories and also derive the failure criterion:
   a) Maximum principal stress theory and
   b) Shear strain energy theory.

10. Find the mid-span deflection and the slopes at the supports of a beam loaded as shown in Figure 5. Adopt $E = 2\times10^5$ MPa and $I = 8000\times10^4$ mm^4.

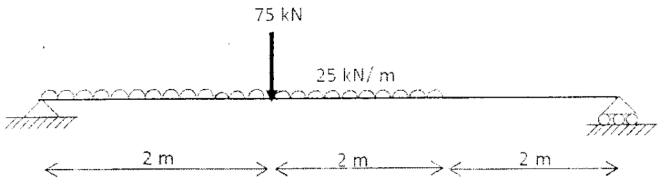

Figure 5

OR

11. A simply supported beam is loaded as shown in Figure 6. Find:
   a) the slope at the supports and
   b) the deflection at the point of action of loads and at the mid-span.
   Use conjugate-beam method.

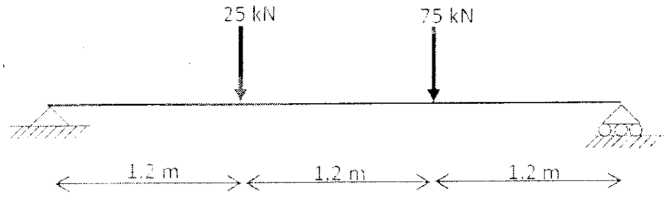

Figure 6

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