Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

III SEMESTER B. TECH (MECHANICAL / I&P ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2018

SUBJECT: STRENGTH OF MATERIALS [MME 2103]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ***ALL*** the questions.
- Additional data, if any required, may be appropriately assumed.
- Assumptions made must be clearly mentioned.

1A. Differentiate between stress and strength. 02 M

1B. State the assumptions made in simple bending theory and obtain a relationship between bending moment, bending stress for a beam subjected to pure bending. 03 M

1C. For the beam configuration shown in figure 1.C, plot the shear force and bending moment distribution diagram. Also determine the location of point of contra flexure if any. 05 M

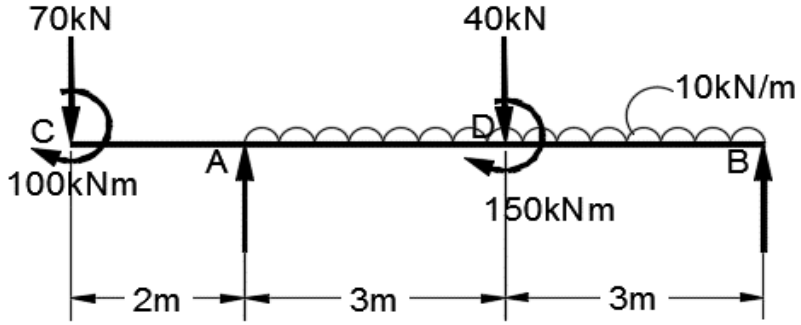

Figure 1.C

2A. A plane element is subjected to 40 N/mm^2 compressive stresses along horizontal X-direction, 80 N/mm^2 tensile stresses along vertical Y-direction and positive shear stresses of 48 N/mm^2 on each side of the plane. Determine the principal stresses, maximum shear stress and corresponding inclinations of the planes. Also, determine the resultant stress on the plane of maximum shear stress. Use any one approach (Analytical OR Graphical). 05 M

2B. For the beam configuration shown in figure 2.B determine the maximum deflection and slope at the supports through Macaulay's method. Take EI = 15 x 10^9 kN-mm^2 05 M

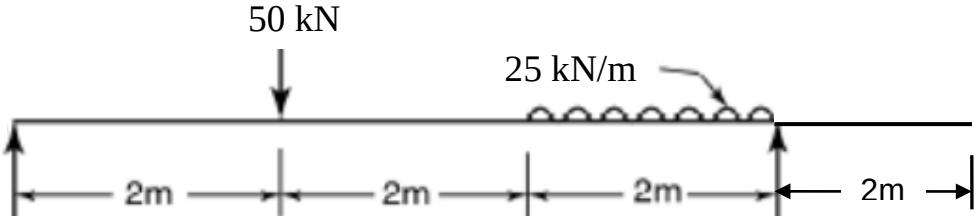

Figure 2.B

3A. A cast iron bracket of I Section has its top flange as 200 mm x 40 mm, bottom flange as 120 mm x 40 mm and thickness of the web as 40 mm. The overall depth of the section is 380 mm. If the beam is subjected to shear force of 150 kN, sketch the shear stress distribution over the depth of the section. 04 M

3B. State the assumptions made in theory of pure torsion and obtain the torsion equation. 04 M

3C. A square cross section timber column of 6 m can withstand a stress of 9 MPa. Determine the permissible width of column by using Euler's equation if both ends of the column are fixed. Assume modulus of elasticity as 12×10^6 kPa. 02 M

4A. For the beam configuration shown in figure 4.A determine the deflection and slope at the free end using direct integration method. 04 M

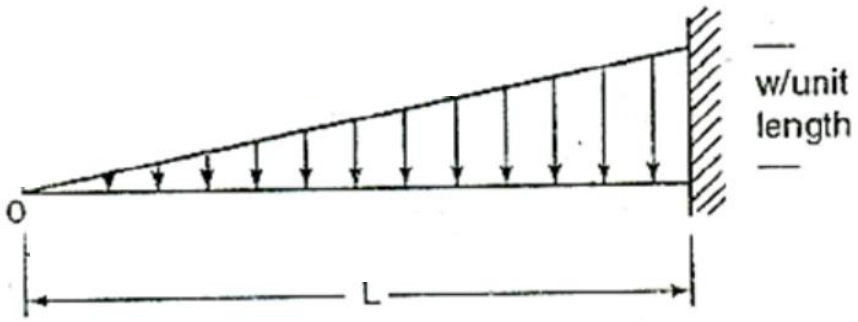

Figure 4.A

4B. A cylindrical shell 5 m long has 800 mm internal diameter and 50 mm thickness. The cylinder carries a fluid pressure of 2.5 MPa. Find percentage error in maximum circumferential stress if it is taken as thin shell, instead of thick shell. 04 M

4C. Define: i) Bulk Modulus ii) Endurance Limit 02 M

5A. A 0.75 m long solid shaft used in a machine drive is of 50 mm in diameter and need to transmit 130**.**9 Watt of power. 05 M

i) Calculate the shear stress and the angle of twist in the shaft.

ii) If the solid shaft is replaced with a hollow shaft of same length and material, having outer diameter 50 mm and thickness of 10 mm, and subjected to same torque then what would be the shear stress and angle of twist?

iii) Compare the results obtained in (i) & (ii) and comment.

Take rigidity modulus as 90 GPa.

5B. Differentiate between: 05 M

i) Long and Short columns
ii) Thin and Thick Cylinders
iii) Bending and Buckling
iv) Engineering stress and True stress
v) Resilience and Toughness