

313308

25226

3 Hours / 70 Marks

Seat No.

--	--	--	--	--	--	--	--

-
- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Use of Non-programmable Electronic Pocket Calculator is permissible.
(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : 10
- a) Define Moment of Inertia. State its value for Semicircle about its Centroid.
 - b) Define Modulus of Elasticity and modulus of Rigidity.
 - c) Define lateral strain and linear strain.
 - d) Define the point of contra flexure and point of contra shear.
 - e) Draw a bending stress distribution diagram for 'T' section used as cantilever beam.
 - f) State shear stress equation and meaning of each term used in it.
 - g) Define the term Direct load and Eccentric load.

P.T.O.

2. Attempt any THREE of the following :

12

- a)
 - i) State the perpendicular axis theorem with their expression.
 - ii) Define the term Rigid body and Plastic body.
- b) Calculate polar M.I. of semi-circle having 60 mm diameter. Also calculate minimum radius of gyration. Diameter is parallel to y-y axis.
- c) Define the following terms.
 - i) Ultimate stress
 - ii) Yield stress
 - iii) Plastic strain
 - iv) Factor of safety.
- d) Find the M.I. of a symmetrical I – section having following details
 Flanges: 100 mm × 20 mm
 Overall depth: 280 mm
 Thickness of web: 10 mm

3. Attempt any THREE of the following :

12

- a) A mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The composite bar is subjected to an axial pull of 40 kN. If E for steel and copper is 200 GPa and 100 GPa respectively. Find the stresses developed in the rod and tube. Also find the extension of the rod.
- b) Determine the magnitude of 'P' for equilibrium and total elongation of the bar shown in Fig. No. 1 Take E = 210 GPa. Also calculate minimum stress induced.

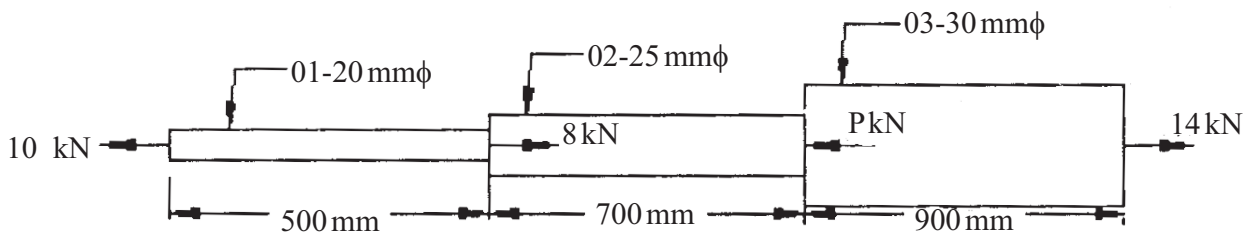


Fig. No. 1

- c) A circular hole of 20 mm diameter is to be punched in a mild steel plate of 3 mm thickness. If the shearing stress developed in the metal is 180 MPa, Find the required force to punch the hole.
- d) Draw stress- strain curve for mild steel and tor steel under tensile loading showing important points on it.

4. Attempt any THREE of the following : 12

- a) Draw the SFD and BMD for cantilever beam of 6 m length, fixed at point A and free at point B. It carries a point load of 10 kN at free end and UDL of 5 kN/m over entire span of the beam.
- b) A cantilever beam of rectangular section support udl of 5 kN/m. The span of the beam is 3 m. If the maximum bending stress is 100 N/mm^2 and depth of the beam is 1.5 times the width, Determine the size of beam.
- c) State the four assumptions in theory of pure bending.
- d) A hollow circular steel column having external diameter 300 mm and thickness 2 mm carries an eccentric load of 100 kN acting at an eccentricity of 100 mm. Calculate the maximum and minimum stresses.
- e) State the Euler's formula with the meaning of each the terms involved.

5. Attempt any TWO of the following : 12

- a) Draw SFD and BMD for a simply supported beam as shown in Fig. No. 2 Also find maximum shear force and bending moment Locate the point of zero shear.

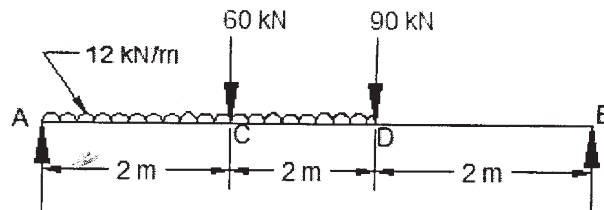


Fig. No. 2

- b) Draw SF and BM diagrams for the beam shown in Fig. No. 3. Also locate the point of contraflexure.

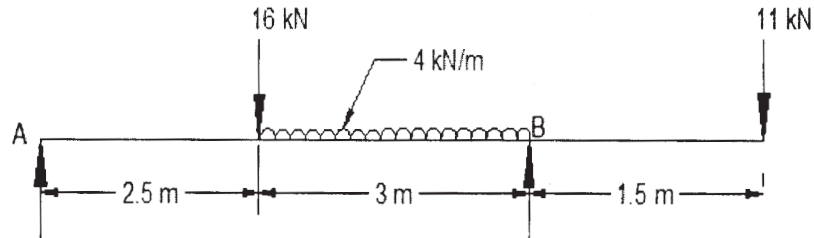


Fig. No. 3

- c) A cantilever beam is loaded as shown in Fig. No. 4. Draw the SFD and BMD.

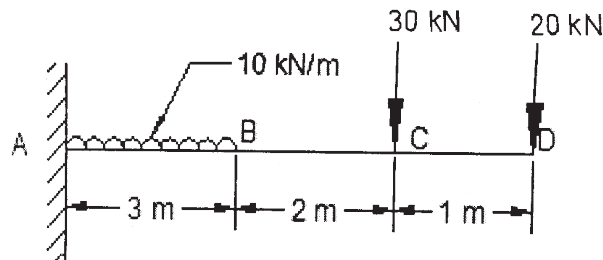


Fig. No. 4

6. Attempt any TWO of the following :

12

- a) Determine M.I. about X-X and Y-Y axis as shown in Fig. No. 5.

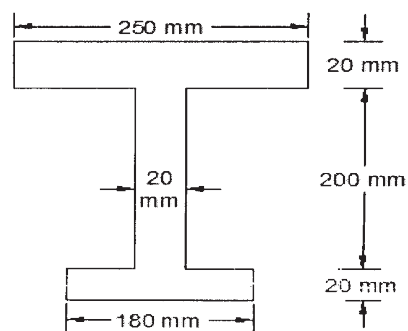


Fig. No. 5

- b) A hollow rectangular section, $200 \text{ mm} \times 400 \text{ mm}$ externally with uniform thickness of 40 mm carries a shearing force of 100 kN at section. Construct the shear stress distribution diagram giving all important values. Also calculate the ratio of max. to average shear stress.
- c) A rectangular pier $750 \text{ mm} \times 1000 \text{ mm}$ is subjected to a compressive load of 500 kN with an eccentricity of 250 mm along the axis bisecting 1000 mm side. Determine the resultant stresses at the base cross section of the pier. Also draw resultant stress distribution diagram showing all stresses.
-