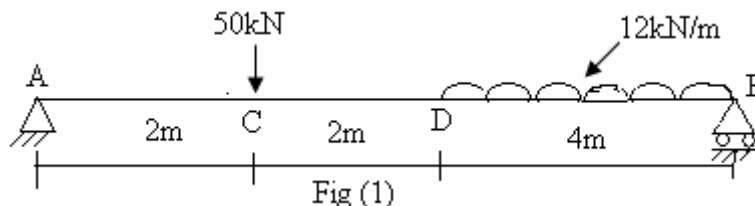


GUJARAT TECHNOLOGICAL UNIVERSITY**B. E. Sem - IV Examination - June- 2011****Subject code: 140201****Subject Name: Mechanics of Deformable Bodies****Date: 08/06/2011****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

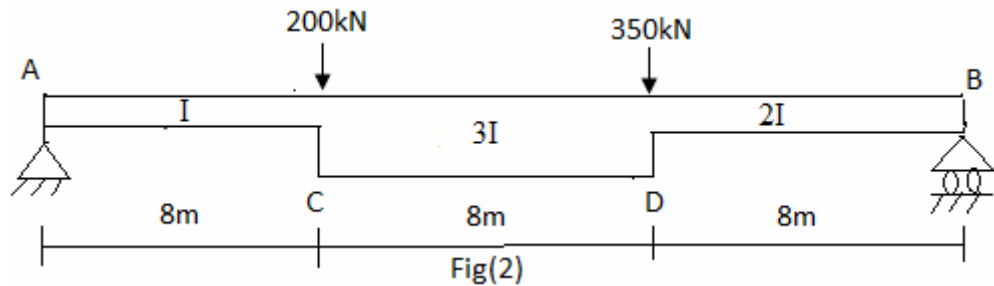
- Q.1 (a)** Identify whether the statement are True or False **06**
- (1) Slope at any section of the given beam is equal to the bending moment at the corresponding section of the conjugate beam.
 - (2) In cantilever beam slope is maximum at support.
 - (3) Tensile stress is not to be produce when axial load is applied within the core of section.
 - (4) At failure due to torsion, the angle of twist is less in brittle material compared to ductile material.
 - (5) Euler's formula can be applied only for short column.
 - (6) Theory of curved beam is applied in designing crane hooks.
- (b)** A hollow cylindrical cast iron column is 5m long both ends being fixed. **08**
Design the column to carry an axial safe load of 350kN. Use Rankine's formula and consider factor of safety 4, The internal diameter may be taken as 0.8 times of the external diameter. Take Rankine's constant $f_c = 550$ MPa and $\alpha = 1/1600$.
- Q.2 (a)** Find the maximum torque that can be safely applied to a shaft of 100mm **07**
diameter. The permissible angle of twist is 3 degree in a length of 5m and shear stress not to exceed 45 N/mm^2 . Take modulus of rigidity is $84 \times 10^3 \text{ N/mm}^2$.
- (b)** A curved beam of rectangular cross section of width 30mm and depth 50mm **07**
is subjected to pure bending moment with couple of 500 N.m. The mean radius of curvature is 60mm. find maximum and minimum stress. Find the position of neutral axis. Also sketch the bending stress diagram.
- OR**
- (b)** A curved beam has a 'T' section having flange 100mm x 20mm and web **07**
80mm x 20mm. The radius of curvature is 330mm so locate the position of neutral axis.
- Q.3 (a)** A beam of 8m span is simply supported at the ends as shown in fig(1). Use **10**
Macaulay's method Determine deflection at point C, slope at end A and maximum deflection. Take $E = 200 \times 10^6 \text{ kN/m}^2$ and $I = 0.00002 \text{ m}^4$.



- (b) Find out maximum slope and deflection of cantilever beam subjected to point load at free end by using moment area method 04

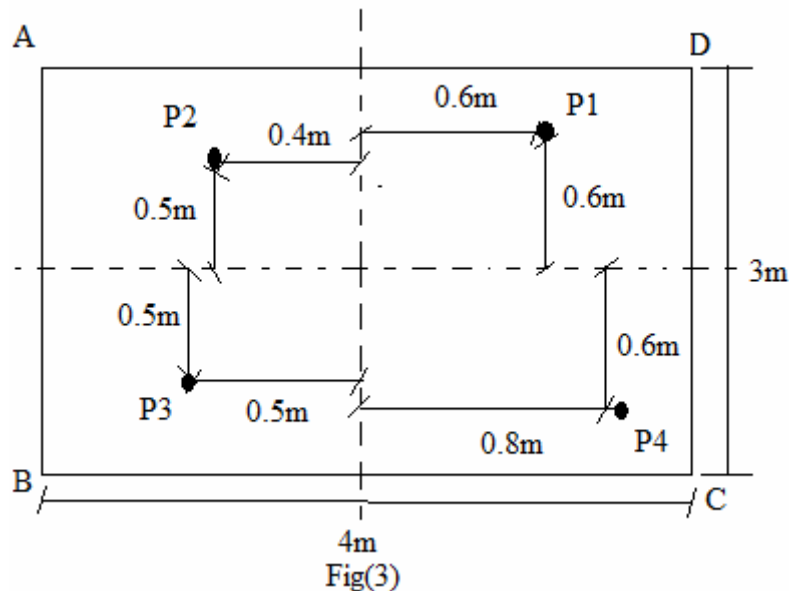
OR

- Q.3 (a) A simply supported beam as shown in fig (2). Use conjugate beam method determines slope and deflection at point C and D. Take $E = 200 \times 10^6 \text{ kN/m}^2$ and $I = 0.02 \text{ m}^4$. 10



- (b) Find out maximum slope and deflection of cantilever beam subjected to uniformly distributed load acting over the entire span. 04

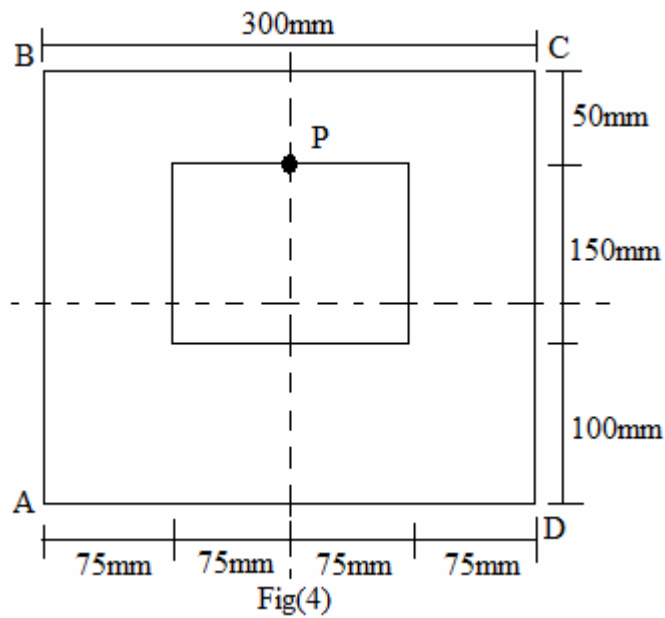
- Q.4 (a) An R.C.C. footing rectangular in plan 4m x 3m carries four axial loads of $P_1 = 300\text{kN}$, $P_2 = 400\text{kN}$, $P_3 = 500\text{kN}$, $P_4 = 600\text{kN}$ as shown in fig(3). Find the stress at each corners of the footing. 07



- (b) A masonry chimney having the shape of frustum of a cone is 25m high, the external diameter at top and internal diameter at bottom is 3m the chimney is 0.5m thick at base. If the weight of the chimney is 2000kN. Find the uniform horizontal wind pressure that may act per unit projected area of the chimney in order tension at the base may be avoided. 07

OR

- Q.4 (a) A masonry wall 10m high is 1.5m x 3m in section. A horizontal wind pressure of 1200N/m^2 act on the face 3m. Find maximum and minimum stress induce at the base section. Take unit weight of masonry wall 21kN/m^3 . 07
- (b) A short column has a square section 300mm x 300mm with a square hole 150mm x 150mm and carries an eccentric load $P = 1900\text{kN}$ as shown in fig(4). Determine maximum and minimum stress across the section. 07



- Q.5** (a) Explain the theory of bending of Curved beam with large initial curvature. **07**
 (b) Prove that the Euler's column theory when both ends of the column are hinged. **07**

OR

- Q.5** (a) Explain centroidal principal axes of a section. **07**
 (b) Write the assumption for design of riveted joint and explain strength of riveted joint. **07**
