

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- IV (Old) EXAMINATION – WINTER 2019

Subject Code: 140201

Date: 14/12/2019

Subject Name: Mechanics Of Deformable Bodies

Time: 10:30 AM TO 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) Derive relation between slope, deflection and radius of curvature. **07**
 (b) A dam 5 m high and 1m top width has vertical water face. Find the bottom width of the dam if no tension is to develop at the base. Density of masonry is 20 kN/m^3 . **07**
- Q.2** (a) Derive Euler's formula for crippling load if both ends of columns are fixed. Also state limitation of Euler's formula. **07**
 (b) A hollow mild steel tube 5 m long, 4 cm internal diameter and 5 mm thick is used as a strut with both ends hinged. Find the Euler's crippling load and safe load taking factor of safety as 3. Taking $E = 2 \times 10^5 \text{ N/mm}^2$. **07**
- OR**
- (b) Find slope and deflection at B for the cantilever beam loaded as shown in fig.1, using any method. Take $EI = \text{constant}$. **07**
- Q.3** (a) Find displacements of joint C of truss loaded as shown in fig.2. Assume that, all members have the same axial rigidity. **07**
 (b) A column is square in cross-section of $450\text{mm} \times 450\text{mm}$ in dimensions. The column carries an eccentric point load of 200kN on one diagonal at a distance of quarter diagonal length from a corner. Calculate the stress at all four corners. **07**
- OR**
- Q.3** (a) Draw neat sketches of kernel of the following cross sections: **07**
 (i) Square section $300\text{mm} \times 300\text{mm}$
 (ii) Hollow circular section with external diameter = 400mm and thickness = 100mm
 (b) A solid circular shaft of 100mm diameter of length 4m is transmitting 115kW power at 150 r.p.m. Determine maximum shear stress induced in the shaft and strain energy stored in the shaft. Take $G = 8 \times 10^4 \text{ N/mm}^2$. **07**
- Q.4** (a) A hollow cast iron column 5m long is fixed at both ends and has an external diameter of 300mm. The column supports an axial load of 1000kN. Find the internal diameter of the column, adopting a factor of safety of 5. Take $f_c = 550 \text{ N/mm}^2$ and $\alpha = 1/1600$. **07**
 (b) A semicircular beam of radius r is fixed at one end and free at the other. It is subjected to a peripheral load (UDL) of w per unit peripheral length. Draw shear force, bending moment and twisting moment diagrams of the beam. **07**
- OR**
- Q.4** (a) A quarter circular beam of radius 3m is fixed at one end and free at the other. It is subjected to a point load of 5kN at free end. Find the reactions at fixed end and draw shear force, bending moment and twisting moment diagrams. **07**
 (b) A closed ring of mean radius 200mm is subjected to a pull of 20kN, the line of action of which passes through its centre, the ring is circular in cross section with a radius equal to 50mm. Find the maximum tensile & compressive stress in the ring. **07**
- Q.5** (a) Draw the neat sketch of various types of bolted and welded joint. **07**

- (b) A curve bar of square section $75\text{ mm} \times 75\text{ mm}$ and of mean radius of curvature 112.5 mm is initially unstressed. If a bending moment of 9 kNm is applied to the bar and tends to straighten it, find the stresses at the inner and outer faces. 07

OR

- Q.5** (a) Find the shear center for the channel section having web $100 \times 10\text{ mm}$ and flanges $60 \times 10\text{ mm}$. 07
- (b) An angle ISA $100 \times 100 \times 10\text{ mm}$, is carrying an axial load of 100 kN . Design a bolted or welded connection of angle with 12 mm thick gusset plate. 07

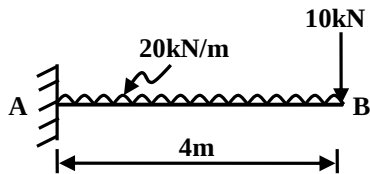


Fig.1

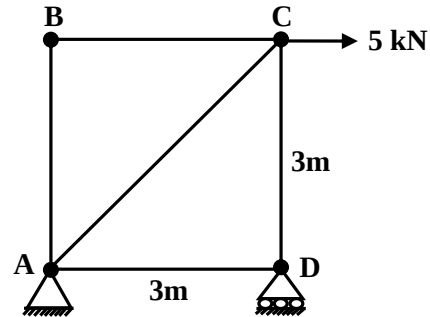


Fig.2

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