

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – SUMMER 2013****Subject Code: 140201****Date: 12-06-2013****Subject Name: Mechanics of Deformable Bodies****Time: 10:30am – 01:00pm****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) Explain the limitation of Euler's theory. **04**
(b) Explain core or kernel of the section. **03**
(c) A solid circular shaft transmits 75 kW power at 200 r.p.m. Calculate the shaft diameter, if the twist in the shaft is not to exceed 1° in 2 metres length of shaft, and shear stress is limited to 50MN/m^2 . Take $C = 100\text{GN/m}^2$. **07**
- Q.2** (a) A simply supported beam is loaded as shown in the fig.1. Determine the deflection under C and D using Macaulay's method. **07**
(b) Derive the basic equation of Torsion with usual notation. Give two practical application of structure subjected to torsion. **07**
- OR**
- (b) Analyze the circular beam in plan intercepting the central angle 2θ (or semi central angle: θ), fixed at ends and subjected to point load: W at mid span as shown in Fig.2. **07**
- Q.3** (a) A simply supported beam is loaded as shown in the fig.3. Determine the deflection under the point load by conjugate beam method. **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 crippling load and safe load taking factor of safety as 3. Taking $E = 2 \times 10^5\text{N/mm}^2$. **07**
- OR**
- Q.3** (a) Find the shear centre for the channel section having web $100 \times 10\text{ mm}$ and flange $50 \times 10\text{ mm}$. **07**
(b) A trapezoidal masonry dam is 15.0 m high and 3.5 m wide at top and 9.0 m at bottom. It retains water up to 13.0 m height on its vertical face. Find maximum and minimum resultant stress induced at the base of the section. Draw stress distribution diagram. **07**
- Q.4** (a) Derive Euler's formula for crippling load if both ends of columns are hinged. Also state limitation of Euler's formula. **07**
(b) A beam of a rectangular section 150 mm wide by 300 mm deep is subjected to bending moment of 48 kN-m. The trace of the plane of loading is inclined at 30° to y-y axis of the section. Locate the neutral axis of the section & Calculate the maximum bending stress induced in the section. **07**
- OR**
- Q.4** (a) Determine the maximum bending moment, maximum twisting moment and maximum shear force in a circular beam of 5.0m diameter supported symmetrically on 4 columns and loaded by UDL of 25.0kN/m . The beam has uniform section throughout. **07**

Q.4 (b) A single riveted double cover butt joint in plate 14mm thick is made with 21.5mm finished diameter rivets at a pitch of 90mm. If the allowable tensile stress 150 N/mm^2 , bearing stress 300 N/mm^2 , and shearing stress 100 N/mm^2 . Find the efficiency of the joint. **07**

Q.5 (a) Draw the neat sketch of varies types of riveted joint. **04**

(b) A masonry pier 2 m x 3 m supports a vertical load of 600 kN at an eccentricity if 1.2 m in both the directions. Find the stresses at the corners of the piers and draw the stress distribution diagram. What additional load should be applied at the centre of the pier so that there is no tension anywhere in the pier section. **10**

OR

Q.5 (a) Enlist the advantage of riveted connection and welded connection. **04**

(b) A beam of square section is subjected to uniform bending moment 1000 N.m **10**
If the cross section the beam is 65 mm x 65 mm. Find maximum & minimum stress for the following cases (a) The beam is straight and (b) The beam is curved to a radius of 250 mm along the centroidal axis and bending moment increases the curvature and also find position of Neutral axis.

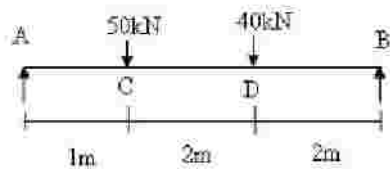


Fig. 1

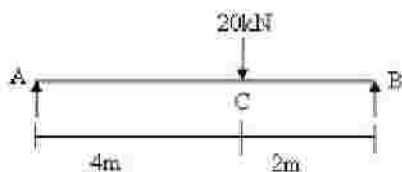


Fig. 3

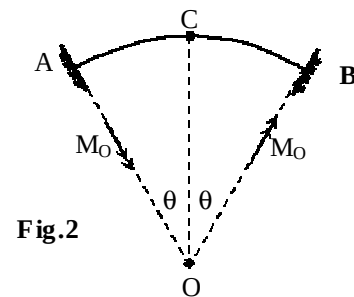


Fig.2
