Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(OLD)• EXAMINATION – WINTER 2016

Subject Code:140201 **Date:23/11/2016**

Subject Name:Mechanics Of Deformable Bodies

Time:02:30 PM to 05:00 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) Attempt following questions. **07**

1. If a member is subjected to a uniform bending moment M, the radius of curvature of the deflected form of the member is given by _____.
(a) M/R = E/I, (b) M/I = E/R, (c) M/E = RI.

2. The expression EI d^2y/dx^2 at a section of a member represents _____.
(a) Bending moment, (b) Shear Force, (c) slope.

3. The load on circular column of diameter d for keeping the stress wholly compressive may be applied anywhere within a concentric circle of diameter _____.
(a) d/8, (b) d/4, (c) d/2.

4. Polar moment of inertia of hollow circular shaft is equal to _____.
(a) $\pi/32(D^3-d^3)$, (b) $\pi/64(D^3-d^3)$, (c) $\pi/32(D^4-d^4)$,

5. Torsional rigidity of a shaft is defined as the torque to produce _____.
(a) Maximum twist in the shaft, (b) maximum shear stress in the shaft,
(c) a twist of one radian per unit length of the shaft.

6. A welded joint as compared to riveted joint has _____.
(a) more strength, (b) less strength, (c) same strength.

7. The ratio of crippling load for a column of length l with both ends fixed to the crippling load of same column with both ends hinge is equal to _____.
(a) 4, (b) 2, (c) 1

(b) Calculate the diameter of the shaft required to transmit 60kW at 150 rpm. The maximum torque is likely to exceed the mean torque by 20% for a maximum permissible shear stress of 60 N/mm^2. Also calculate the angle of twist for a length of 3m. Take modulus of rigidity is 80 x 10^3 N/mm^2. **07**

Q.2 (a) A hollow rectangle column having outside dimension 200mm x 150mm and 25mm thickness. Its length is 6m and it is fixed at one end and free at other end. Find the Euler's load if E = 2 x10^5 N/mm^2. **07**

(b) Explain the theory of Pure Torsion. **07**

OR

(b) A curved beam of rectangular cross section 30mm x 60mm is subjected to pure **07**

bending with couple of 600 N.m. The mean radius of curvature is 65mm. Find maximum and minimum stress, find the position of neutral axis and draw the bending stress diagram.

Q.3 **(a)** Explain the bending stress in beam subjected to Unsymmetrical bending. **07**

(b) Explain the types of riveted joints with sketch **07**

OR

Q.3 **(a)** Explain the failure of riveted joint with sketch **07**

(b) Two plates of 300mm x 10mm are single riveted and joined by double cover butt joint using 20mm diameter rivets. If permissible stress in shearing and bearing are 100N/mm^2 and 200N/mm^2 and in tearing 100 N/mm^2 find the strength of joint and its efficiency. Take pitch of rivet is 80mm. **07**

Q.4 **(a)** A rectangular column section ABCD having side AB = CD = 500mm and BC = AD = 400mm carries a compressive load of 600 kN at corner B. Find stress at each corner and draw stress distribution diagram. **07**

(b) A Cylindrical chimney, 25m high, of uniform circular cross section is 5 m external diameter and 2.5m internal diameter. It is subjected to a horizontal wind pressure of 1.5 kN/m^2. If the coefficient of wind pressure is 0.6 and unit weight of masonry is 22kN/m^3. Find the maximum and minimum stress at the base of the section. **07**

OR

Q.4 **(a)** Explain core or kernel of hollow rectangular and hollow circular section with sketch. **07**

(b) A small concrete dam, triangular in cross section with one face vertical, is 9m high and 3m wide at base. It has to retain water on its vertical face up to a depth of 8m. If unit weight of concrete is 25kN/m^3 and that of water 10kN/m^3, Calculate maximum and minimum stress intensities induced at the base. Also draw stress distribution diagram **07**

Q.5 **(a)** Using Macaulay's method find slope at A and deflection at C for the beam shown in **figure: 1**.Take EI = 3000 kN.m^2. **07**

(b) Using Conjugate beam method find the maximum slope and deflection for a cantilever beam shown in **figure: 2.** Take E = 2 x 10^5 N/mm^2, I = 2 x 10^8 mm^4. **07**

OR

Q.5 **(a)** Using Castigliano's first theorem calculate the maximum deflection for a cantilever beam shown in **figure:3**. Take E = 2 x 10^5 N/mm^2, I = 5 x 10^8 mm^4. **07**

(b) Explain the relation between slope, deflection and radius of curvature. **07**

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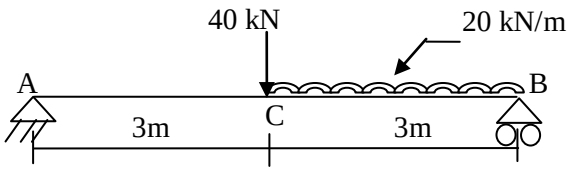

Figure :1, Q.5 (a) (EI constant)

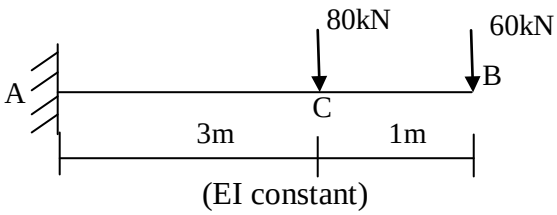

Figure (3), OR Q. – 5 (a)

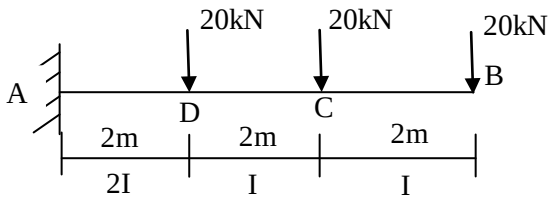

Figure (2), Q. – 5 (b)