

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:2140603**Date:04-07-2022****Subject Name:Structural Analysis-I****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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1 (a)** i. State assumptions and limitations of Euler's formula. **03**
 ii. Draw neat sketch of different end conditions of column and its effective length. **04**

- (b)** Give equations of Static and Kinematics Indeterminacy for the following structures with meaning of each term used. (i) Beam, (ii) Plane truss, (iii) Plane Frame, (iv) Grid **07**

- Q.2 (a)** i. Differentiate Conjugate beam and real beam **03**
 ii. State and explain moment area theorem. **04**

- (b)** Using moment area method, calculate slope and deflection at free end of a cantilever beam, subjected to UDL of intensity 'w' over entire span 'l'. Take EI = constant. **07**

OR

- (b)** Find deflection at centre of a simply supported beam of length 'l' carrying a concentrated load 'W' at centre. Take EI = constant. **07**

- Q.3 (a)** i. Define Core of the Section. Derive and locate the same for a Circular cross section. **03**

- ii. Discuss Stability checks for a dam **04**

- (b)** A hollow rectangular column cross section has 200 x 150 mm external dimension with 20 mm thickness. A vertical load of 40 kN acts at an eccentricity of 30 mm on diagonal direction. Find maximum and minimum stress induced. **07**

OR

- Q.3 (a)** i. Differentiate between long and short column. **03**

- ii. Define the following terms. (i) Crippling load (ii) Effective length, (iii) radius of gyration, (iv) slenderness ratio. **04**

- (b) A fixed beam AB of span L carried a UDL of w per meter length over entire span. Support B settles during application of load. Calculate the settlement, so that there is no fixed end moment at B. Also find FEM at A. **07**

- Q.4 (a)** i. Explain Arch and Cable. **03**
 ii. Define and explain : Anchor cables **04**
- (b) i. Enlist the types of framed structures with neat sketch **03**
 ii. A cylindrical shell 4 m long and 660 mm in diameter with 8 mm thick plates is subjected to an internal pressure of 5 MPa. Calculate (i) circumferential stress (ii) longitudinal stress. Take $E = 200 \text{ GPa}$ and Poisson's ratio = 0.3 for the shell material. **04**

OR

- Q.4 (a)** i. Explain advantages of three hinged arch over beam. **03**
 ii. A thin cylindrical shell of internal diameter d, wall thickness t and length I, is subjected to internal pressure p. Derive the expression for change in volume of the cylinder **04**
- (b) A three hinged parabolic arch of span L and central rise "yc" carries a uniformly distributed load of "w: per unit length over the left half of the span. Show that the max positive moment is equal to $wl^2 / 64$ **07**

- Q.5 (a)** i. Define resilience, proof resilience and modulus of resilience. **03**
 ii. Derive the equation of the strain energy stored in a member due to torsion. **04**
- (b) A fixed beam AB of span 'l' carries a u.d.l. w kN/m over entire span. The Moment of Inertia of the beam from either end to a distance of l/4 is I and 2I for the remaining length. Determine the end moments. **07**

OR

- Q.5 (a)** i. Find out fixed end moment for a fixed beam subjected to a point load (W) at the center of the span (L). Also draw shear force and bending moment diagrams. **03**
 ii. Derive an expression for strain energy stored in a body when the load is applied suddenly. **04**
- (b) A cantilever beam of span L carries Uniformly Distributed Load 'W' per unit run. Find the strain energy stored in the beam. **07**
