

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: BE03006011

Date: 19/06/2026

Subject Name: THEORY OF STRUCTURE

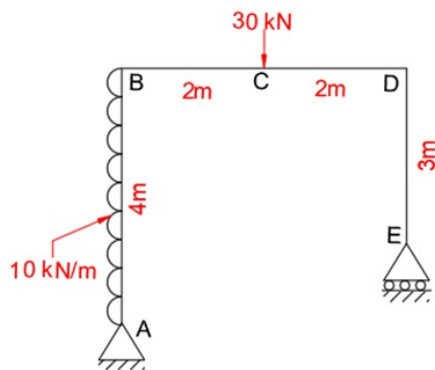
Time: 02:30 PM TO 05:00 PM

Total Marks: 70

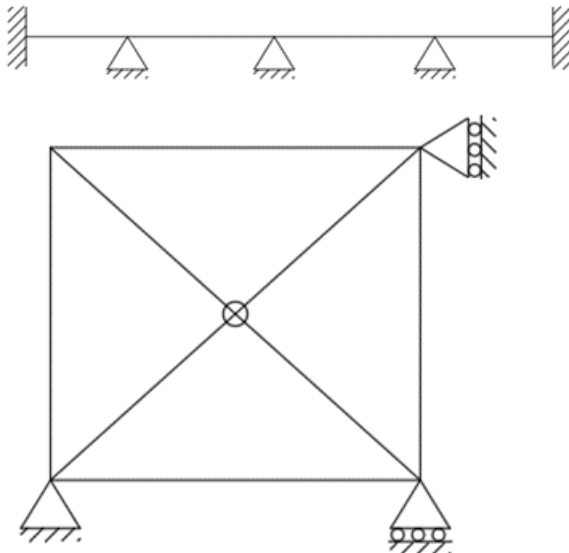
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain external stability and internal stability of structures. 03
- (b) Write the advantages of Three hinge arches over beam. 04
- (c) Analyze the portal frame shown in figure, and draw shear force and bending moment diagram. 07



- Q.2** (a) Distinguish between plane frame and plane truss. 03
- (b) Find out SI and KI of following Figures. 04



- (c) A three hinged parabolic arch of 6m rise and 30 m span is loaded by a point load of 100 kN at 10 m from left support and an udl of 20 kN/m over right half. Calculate the maximum bending moment on right half span. 07

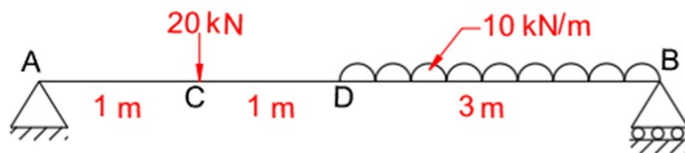
OR

- Q.2** (c) A thin cylindrical shell of internal diameter d , wall thickness is t and length is l , is subjected to internal pressure p . Derive the expression for change in volume of the cylinder. 07

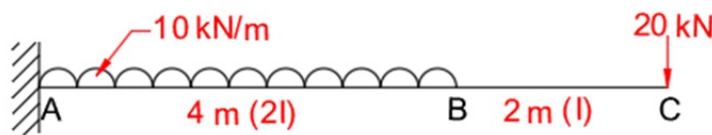
- Q.3** (a) A thin cylindrical shell 1000 mm dia, 5 m long and 8 mm thick is subjected to an internal pressure of 4 MPa, Find the circumferential stress produced if the efficiency of the longitudinal joint is 70 % . **03**
- (b) State and prove Maxwell's reciprocal theorem. **04**
- (c) A crane chain whose sectional area is 700 mm^2 carries a load of 10 kN. it is being lowered at a uniform rate of 40 mtr./ min., the chain gets jammed suddenly, at that time the length of the chain unwound is 12 meters. calculate the stress induced in the chain due to sudden stoppage. **07**

OR

- Q.3** (a) Define conjugate beam. Explain different kinds of a support condition in conjugate beam? **03**
- (b) Define slenderness ratio, radius of gyration and effective length for a long column. **04**
- (c) Using Macaulay's method determine the slope at end A and Deflection under C. For a simply supported beam of span 5 m and loaded as shown in figure. Take $EI = 2 \times 10^3 \text{ kN.m}^2$. **07**

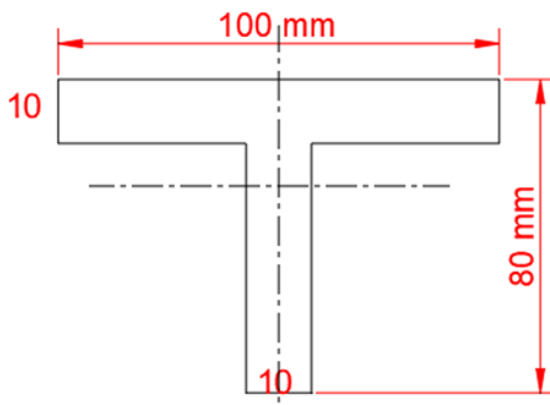


- Q.4** (a) Derive Euler's Crippling load formula for the long column fixed at both ends. **03**
- (b) Define and explain about Kernel of circular section. **04**
- (c) Find slope and Deflection at C for the beam as shown in figure. **07**



OR

- Q.4** (a) Define Influence line diagram and write the uses of it. **03**
- (b) Explain various Stability checks for a dam. **04**
- (c) A T-section as shown in figure. The thickness of flange and web is 10 mm. The length of column is 5 m and it is hinged at both ends. If $E = 2 \times 10^5 \text{ N/mm}^2$, Find Euler's load. **07**



- Q.5** (a) Define axial load, Eccentricity and Eccentric load. **03**
- (b) A rectangular body 600 mm long, 100 mm wide and 40 mm thick is subjected to a shear stress of 75 MPa. Find out the strain energy stored in it. Take $G = 84 \text{ GPa}$. **04**

- (c) A retaining wall of rectangular section 3 m wide and 7 m height . it retains earth up to full height. Check the stability for tension in base and for sliding. Take density of soil = 16 kN/m³ , density of wall material = 25 kN/m³ . angle of repose = 30 degree and poisson ratio = 0.5 . **07**

OR

- Q.5** (a) Explain about Principal of Superposition. **03**
- (b) Discuss strain energy due to flexure in beam. **04**
- (c) A rectangular block is subjected to a direct tensile stress of 800 N/mm² along with a shear stress . determine the shear stress if major principal stress not to exceed 1200 N/mm². (Tensile) . Also find the minor principal stress. **07**
