

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

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

**Subject Code:3140603**

**Date:27-06-2022**

**Subject Name:Structural Analysis-I**

**Time:10:30 AM TO 01:00 PM**

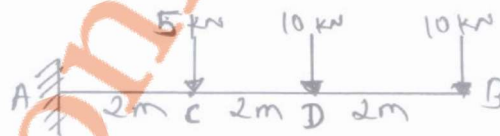
**Total Marks: 70**

**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.

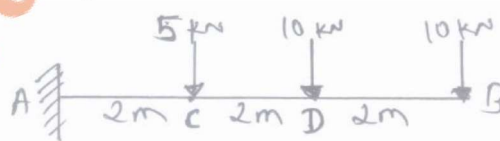
- Q.1**
- (a) Define resilience, proof resilience and modulus of resilience. **03**
- (b) Differentiate conjugate beam and real beam **04**
- (c) A short column rectangular section 250 mm x 200 mm is subjected to load of 400 kN at a point 50 mm from longer side and 100 mm from shorter side. Find maximum and minimum stress in the column. **07**

- Q.2**
- (a) Derive Euler's formula of critical load for column having both ends hinged **03**
- (b) Explain Maxwell's theorem of reciprocal deflections. **04**
- (c) Using conjugate beam method, find the slope and deflection at point B in terms of EI of the cantilever beam shown in figure. **07**

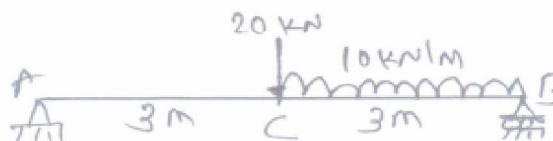


**OR**

- (c) Using moment area method, find slope & deflection at point C in terms of EI **07** for the beam shown in figure.



- Q.3**
- (a) State Moment area theorems I and II **03**
- (b) Determine degree of redundancy of simply supported beam, cantilever beam and propped cantilever beam. **04**
- (c) Find slope at point A and B & deflection at point C for the beam shown in figure. Take  $EI = 3000 \text{ kN.m}^2$ . **07**



**OR**

- Q.3** (a) Discuss stability checks for a dam. **03**

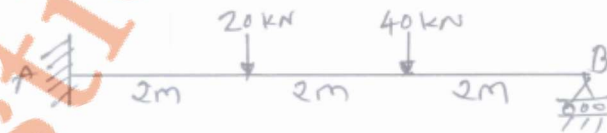
- (b) A cable loaded with 10 kN/m is stretched between two supports in the same horizontal line 200 m apart. If the central dip is 15 m, find the support reaction. **04**
- (c) A three hinged circular arch hinged at the support and at the crown has a span of 20 m and a central rise of 4 m. It carries a concentrated load of 120 kN at 6 m from left support. Determine the moment under point load and at 6 m from right support. **07**

- Q.4**
- (a) Define Core of the section. Derive and locate the same for a Circular cross section. **03**
  - (b) Define and explain: Kernel of rectangular section. **04**
  - (c) A cylindrical shell has 3.5 m length, 1.2 m diameter and 10 mm thickness, the shell is subjected to internal pressure of 2 N/mm<sup>2</sup>. Calculate the maximum shear and change in dimension of the shell. **07**

**OR**

- Q.4**
- (a) Explain Arch and Cable. **03**
  - (b) Write difference between strut and column. **04**
  - (c) A column has one end fixed and other end hinged with length of 6.0 m. It is made up of a tube having external diameter of 100 mm and wall thickness of 10 mm. If yield strength of the material is 410 N/mm<sup>2</sup> and Rankine constant is 1/4800, calculate Euler's critical load and Rankine's critical load. **07**

- Q.5**
- (a) State assumptions and limitations of Euler's formula **03**
  - (b) Derive formula for strain energy due to gradually applied loading. **04**
  - (c) Using method of consistent deformation, analyse the propped cantilever beam shown in Figure, and draw shear force and bending moment diagrams. Choose  $V_B$  as a redundant. **07**



**OR**

- Q.5**
- (a) State advantages of fixed beam over simply supported beam. **03**
  - (b) A fixed beam of 5 m span carries central uniformly distributed load of 10 kN/m on entire span. Find fixed end moment equation using area moment method. **04**
  - (c) A small concrete dam, triangular in cross section with one face vertical, is 8 m high and 3 m wide at base. It has to retain water on one face up to a depth 7 m. If unit weight of concrete is 25 kN/m<sup>3</sup> and that of water 10 kN/m<sup>3</sup>, calculate maximum and minimum stress intensity induced at the base. Sketch also stress distribution diagram under the base of dam. **07**

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