Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3140603 Date:27-06-2022

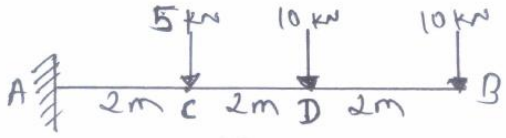
Subject Name:Structural Analysis-I

Time:10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

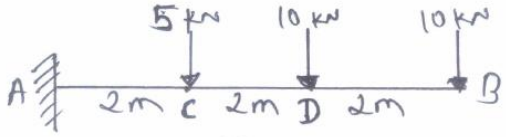
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

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**

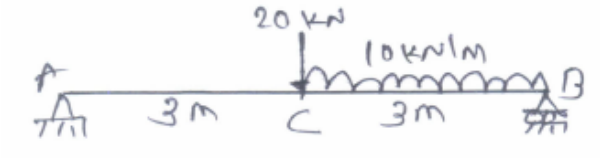


OR

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



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 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^2. Calculate the maximum shear and change in dimension of the shell. **07**

OR

Q.4 **(a)** Explain Arch and Cable. **03**

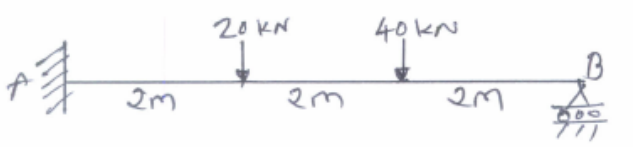
(b) Write difference between strut and column. **04**

(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^2 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^3 and that of water 10 kN/m^3, calculate maximum and minimum stress intensity induced at the base. Sketch also stress distribution diagram under the base of dam. **07**

****