Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3140603 Date:14-12-2022

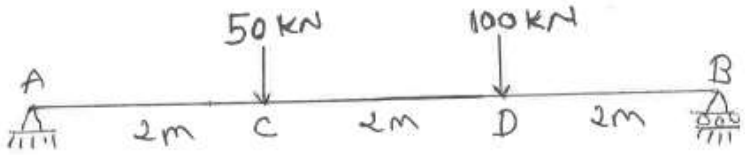
Subject Name:Structural Analysis-I

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.**

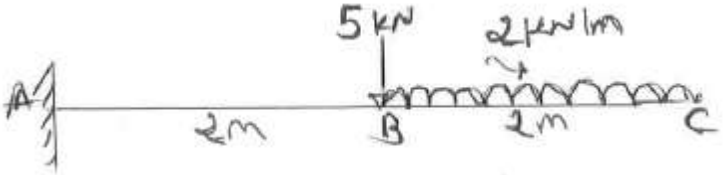
Q.1	**(a)**	State Moment Area theorems I and II.	**03**
	(b)	State and explain principle of superposition.	**04**
	(c)	Calculate slope at ends and deflection under point load for simply supported beam shown in figure by Macaulay's method. Take EI = 10,000 kN.m^2.	**07**



Q.2	**(a)**	Explain Maxwell's theorem of reciprocal deflections.	**03**
	(b)	Give advantages of fixed beam.	**04**
	(c)	A symmetrical three hinged circular arch has san 20 m and central rise 4 m. It is carrying point load 12 kN at 6 m from left side hinge. Calculate B.M. at 4 m from left support and also find maximum positive and negative bending moment.	**07**

OR

	(c)	Using conjugate beam method, find slope & deflection at point B and C for the beam shown in figure. Take EI = 2000 kN.m^2	**07**



Q.3	**(a)**	Differentiate between long and short column.	**03**
	(b)	A symmetrical three hinged parabolic arch of span 40 m and center rise of 8 m carries UDL of 30 kN/m over the left half of the san. Find out support reaction of the arch.	**04**
	(c)	A rectangular pier of size 300 mm x 300 mm is subjected to a compressive load of 900 kN at one of the corner. Find the stress intensities at all four corners of the pier and draw stress distribution diagram. If the load is acting at the center of the pier, also draw stress distribution diagram.	**07**

OR

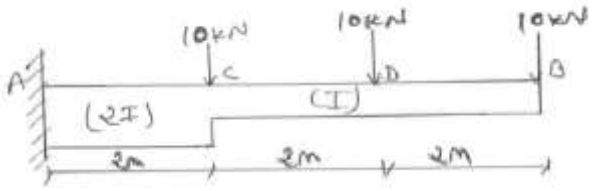
Q.3	**(a)**	Derive the formula for no tension condition at base for a dam.	**03**
	(b)	Obtain a relation for the maximum and minimum stresses at the base of a symmetrical column when it is subjected to an eccentric load about two axis.	**04**

(c) The external and internal diameter of a hollow cast iron column are 200 mm and 150 mm respectively. If column is hinged at both ends having a length of 4 m, determine the crippling load using Rankine formula. Take f_s = 550 N/mm^2 and $\alpha = 1/1600$. **07**

Q.4 **(a)** Explain advantages of three hinged arch over beam. **03**

(b) State assumptions and limitations of Euler's formula. **04**

(c) Determine maximum slope and deflection for a cantilever beam as shown in figure. Take E = 2 x 10^5 N/mm^2 and I = 2 x 10^8 mm^4. **07**



OR

Q.4 **(a)** Define Core of the Section. Derive and locate the same for a Circular cross section. **03**

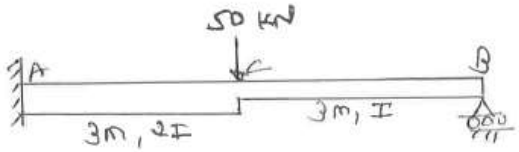
(b) A thin spherical shell of internal diameter 'd' and wall thickness 't', is subjected to internal pressure 'p'. Derive the expression for change in volume of the shell. **04**

(c) A thin cylindrical shell of 600 mm diameter is 1500 mm long and 10 mm thick. It is subjected to an internal pressure of 2 N/mm^2. Calculate the change in diameter, length and volume. Take E = 200 GPa and $\mu = 0.27$. **07**

Q.5 **(a)** Find out fixed end moment for a fixed beam carrying uniformly distributed load for the whole span. **03**

(b) A fixed beam of 10 m span carries U.D.L. of 10 kN/m on its entire span . Find fixed end moment equation using area moment method. **04**

(c) Using method of consistent deformation, analyse the propped cantilever beam shown in Figure. Draw shear force and bending moment diagrams also. **07**



OR

Q.5 **(a)** Define resilience, proof resilience and modulus of resilience. **03**

(b) Explain strain energy due to flexure in beam. **04**

(c) A cylindrical chimney, 25 m high, of uniform circular section is 5 m external diameter and 2 m internal diameter. It is subjected to a horizontal wind pressure of 1400 N/m^2. If the coefficient of wind pressure is 0.6 and unit weight of masonry is 22 kN/m^3, find the maximum and minimum stress at the base of section. **07**

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