Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2020

Subject Code:3140603 **Date:11/02/2021**

Subject Name:Structural Analysis-I

Time:02:30 PM TO 04:30 PM **Total Marks:56**

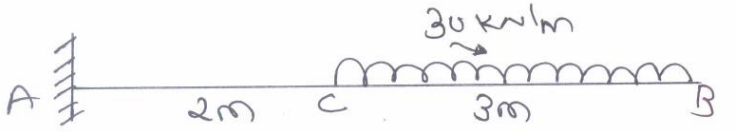
Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Differentiate Plane frame and Grid **03**

(b) State and explain principle of superposition. **04**

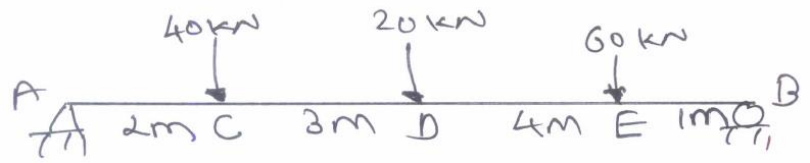
(c) Using Conjugate beam method, find the slope and deflection in terms of EI at free end of the cantilever beam shown in figure. **07**



Q.2 **(a)** Explain Maxwell's theorem of reciprocal deflections. **03**

(b) Differentiate Conjugate beam and real beam **04**

(c) Find slope at point A and B & deflection at point C in terms of EI for the beam shown in figure by Macaulay's method. **07**



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

(b) A masonry wall, 5 m high, is of solid rectangular section, 3 m wide and 1 m thick. A horizontal wind pressure of 1.2 kN/m^2 acts on the 3 m side. Find the maximum and minimum stress induced on the base, if unit weight of masonry is 22.4 kN/m^3. **04**

(c) A rectangular column section ABCD having AB = CD = 400 mm and BC = AD = 300 mm carries a compressive load 300 kN at corner B. Find the stress at each corner A, B, C and D and draw stress –distribution diagram for each side. **07**

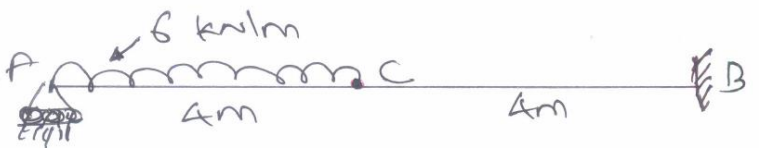
Q.4 **(a)** Discuss Stability checks for a dam. **03**

(b) A "T" section is having flange with 100 mm and total depth 80 mm. The thickness of flange and web is 10 mm. The length of column is 3 m and it is hinged at both ends. If E = 2.1 x 10^5 N/mm^2, find Euler' buckling load. **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 = 550N/mm^2 and α = 1/1600. **07**

Q.5 **(a)** Explain advantages of three hinged arch over beam. **03**

	(b)	Derive Euler's formula of critical load for column having both ends hinged	**04**
	(c)	A three hinged parabolic arch hinged at the support and at the crown has a span of 20 m and a central rise of 5m. It carries a concentrated load of 120 kN at 15 m from left support and a uniformly distributed load 20 kN/m over left half portion. Determine the moment, thrust and radial shear at a section 4 m from left support.	**07**
Q.6	**(a)**	Define Core of the Section. Derive and locate the same for a Circular cross section	**03**
	(b)	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**
	(c)	A thin cylindrical shell of 600 mm diameter is 1500 mm long and 10 mm thick. It is subjected to internal pressure of 2 MPa. Calculate the change diameter, length and volume. Take E = 200 GPa and poisson's ratio = 0.27.	**07**
Q.7	**(a)**	State basic difference between fixed and simply supported beams.	**03**
	(b)	A fixed beam of 10 m span carries central point load of 100 kN. Find fixed end moment equation using area moment method.	**04**
	(c)	Using method of consistent deformation, analyze the propped cantilever beam shown in Figure, and draw shear force and bending moment diagrams.	**07**



Q.8	**(a)**	Define resilience, proof resilience and modulus of resilience.	**03**
	(b)	Derive formula for strain energy due to sudden loading.	**04**
	(c)	A steel bar 1 m length is subjected to a pull such that the maximum stress is equal to 150 N/mm^2. Its cross section is 200 mm^2 over length of 950 mm and for the middle 50 mm length the sectional area is 100 mm^2. If E = 2 x 10^5 N/mm^2, Calculate strain energy stored in the bar.	**07**

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