Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2140603 Date:19/02/2021

Subject Name:Structural Analysis-I

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

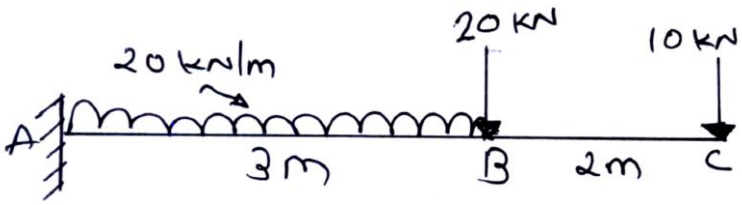
Instructions:

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) Explain Maxwell's theorem of reciprocal deflections. **04**

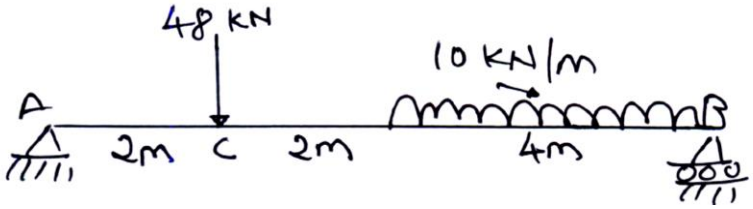
(c) Using Conjugate beam method, find the slope and deflection in terms of EI at free end of the cantilever beam shown in figure. **07**



Q.2 **(a)** Differentiate Conjugate beam and real beam **03**

(b) State Moment Area theorems I and II. **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)** Discuss Stability checks for a dam. **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)** Derive the formula for no tension condition at base 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 **07**

4 m, determine the crippling load using Rankine formula. Take f_s = 550N/mm^2 and α = 1/1600.

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 24 m and a central rise of 4m. It carries a concentrated load of 50 kN at 18 m from left support and a uniformly distributed load 30 kN/m over left half portion. Determine the moment, thrust and radial shear at a section 6 m from left support. **07**

Q.6 **(a)** Derive the equation of the strain energy stored in a member due to torsion. **03**

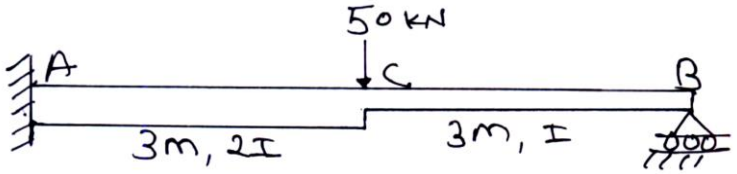
(b) A thin cylindrical shell of internal diameter d, wall thickness t and length I, is subjected to internal pressure p. Derive the expression for change in volume of the cylinder **04**

(c) A cylindrical vessel 2 m long and 500 mm in diameter with 10 mm thick plates is subjected to internal pressure of 3 MPa. Calculate the change in volume of the vessel. Take E = 200 GPa and poisson's ratio = 0.3 for the vessel material. **07**

Q.7 **(a)** Define and Explain core and Kernel of a section with suitable example. **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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