Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019

Subject Code: 2144002 **Date: 13/12/2019**

Subject Name: Fundamentals of Structural Analysis

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.**

			MARKS
Q.1	**(a)**	Comparison between S.I. and K.I.	**03**
	(b)	Differentiate between frame and truss.	**04**
	(c)	Determine each of the structures shown in Fig. (1) are internally determinate, Indeterminate or Unstable. If it is Indeterminate what is the degree of determinacy?	**07**
Q.2	**(a)**	Define Moment- Area Theorems.	**03**
	(b)	Define Differential equation for Elastic Curve with diagram and write the assumption for Elastic Curve.	**04**
	(c)	Using Macaulay's method, for the simply supported beam of span 10 m as shown in Fig. (2). Find the deflection at point C. Take E = 200 GPa, I = 6.95 X 10^8 mm^4.	**07**
		OR	
	(c)	Calculate vertical and horizontal deflections of the joint C of the pin- jointed plane frame shown in Fig. (3), by unit load method. The cross- sectional area of AB is 100 mm^2 and of AC and BC 150 mm^2, each E = 2 X 10^5 N/mm^2.	**07**
Q.3	**(a)**	A water main of 800 mm internal dia. Is carrying at a pressure head of 100 m. If allowable hoop stress is 20 N/mm^2, find suitable thickness of the pipe. Take density of water as 10 kN/m^3.	**03**
	(b)	Find slope and deflection at point C for the beam shown in Fig. (4). Take EI= 3000 kNm^2.	**04**
	(c)	Find slope and deflection at the point B and C for the beam shown in Fig. (5). Take EI= 3000 kNm^2.	**07**
Q.3	**(a)**	Define Unit Load Method.	**03**
	(b)	Draw the kernel section for the rectangular, Hollow rectangular, Circular and Hollow circular sections.	**04**
	(c)	A cantilever of length 'l' carries a uniformly distributed load of 'W' kN/m for a distance of l/2 from the free end. Find the slope and deflection at the free end.	**07**
Q.4	**(a)**	Differentiate between Axial Load and Eccentric Load.	**03**
	(b)	A thin cylinder 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, 1/m = 0.27.	**04**
	(c)	Analyse the fixed beam shown in Fig. (6) . Support 'A' sink by 20 mm down. Draw BMD. Take EI = 20,000 $kN.m^2$.	**07**
		OR	
Q.4	**(a)**	What do you mean by Limit of eccentricity? Also explain the necessary conditions?	**03**
	(b)	A square column of 400 mm side carries a compressive load of 400 kN at an eccentricity of 100 mm on x-x axis as shown in Fig. (7). Find maximum stress and minimum stress at the base of column.	**04**
	(c)	A rectangular retaining wall section is 2 m wide. It retains water up to full height. Find the minimum height for following: a) When it is just at the point of overturning.	**07**

b) When it is just the point of sliding.
c) If no tensile stress is produced at the base of section.
The density of wall material and water is 22 kN/m^3 and 10 kN/m^3 respectively and take coefficient of friction as 0.5.

Q.5 **(a)** Draw SFD and BMD for a fixed beam carrying central unit point load. **03**

(b) A fixed beam of 6 m span carries udl of 80 kN/m over its entire span. Draw SFD and BMD for the beam using Area-moment method. Also find the point of contraflexure. **04**

(c) A three hinged parabolic arch has span L, central rise r, having two hinges at the same level. It is subjected to total load W, uniformly distributed over entire span. Show that there will be no B.M. at any point on the arch. Also calculate horizontal thrust at support. **07**

OR

Q.5 **(a)** A fixed beam AB of span 6 m carries udl of 90 kN/m over left 4 m length. Calculate support moments. **04**

(b) Draw SFD and BMD for the above mentioned beam in Q.5 (a). **03**

(c) Find forces in all the members of a truss shown in Fig. (8). **07**

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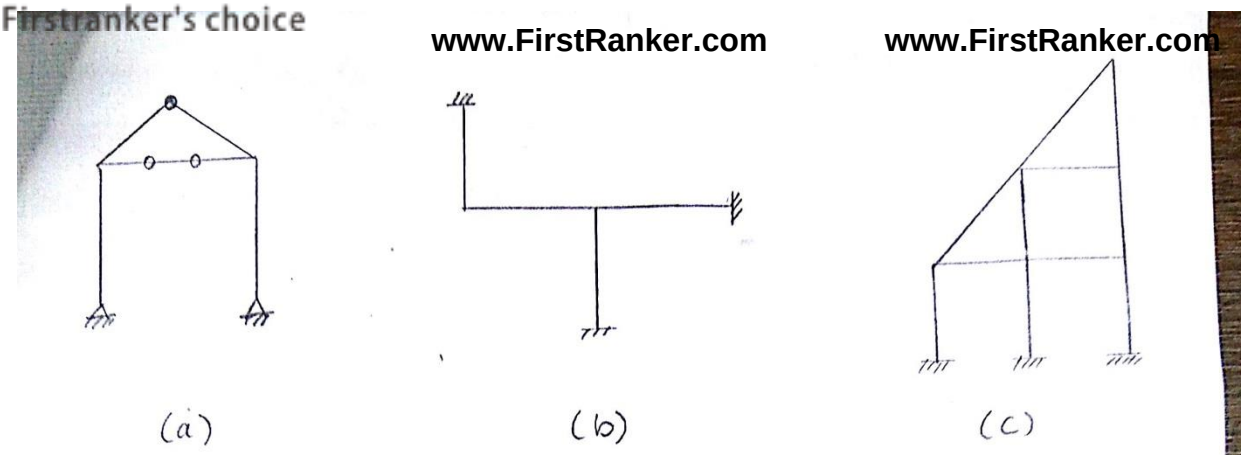

Fig. (1)

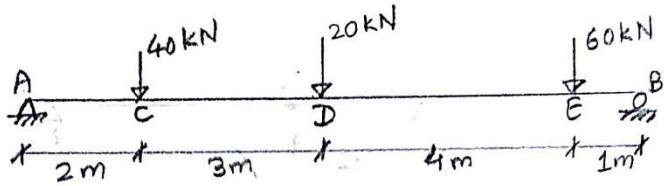

fig. (2)

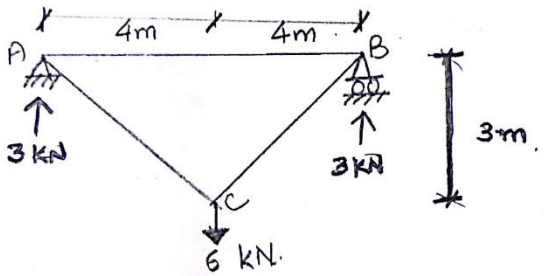

fig. (3)

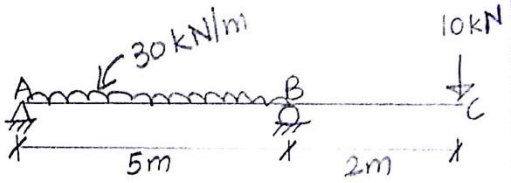

Fig. (4)

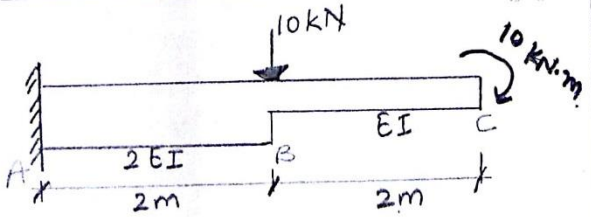

fig. (5)

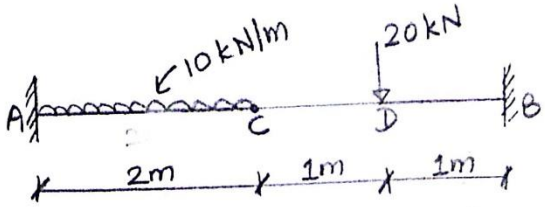

Fig. 6

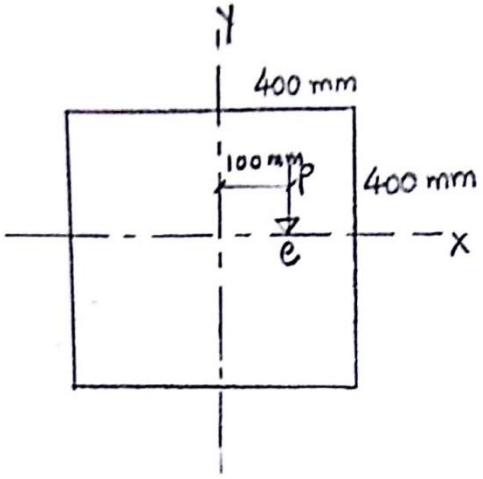

Fig. (7)

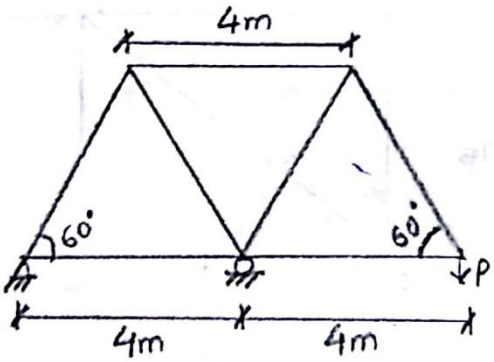

Fig. (8)