Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III(OLD) EXAMINATION – SUMMER 2019

Subject Code: 130604 Date: 11/06/2019

Subject Name: Structural Analysis-I

Time: 02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Differentiate static and kinematic indeterminacy. Also explain these terms with respect to fixed beam. **07**

(b) A cylindrical shell of length 3 m and internal diameter 1m has a thickness of 12 mm. If the shell is subjected to an internal pressure of 1 N/mm^2, find circumferential & longitudinal stresses, maximum shear stress, and the change in the volume. Take $E = 200 \times 10^3 N/mm^2$, $\mu = 0.27$. **07**

Q.2 **(a)** (1) Define: Strain energy, modulus of resilience, Influence line **07**
(2) Derive an expression of slope at supports for the simply supported beam Subjected to point load at the centre of the beam by conjugate beam method.

(b) Find the slope and deflection at the point B & C for the beam as shown in fig. 1 By moment area method. Take $I= 5 \times 10^8 mm^4$, $E= 2 \times 10^5 N/mm^2$ **07**

OR

(b) A hollow cast iron section having external dia 250mm and thickness 25mm is used as 4.5m long column with both ends fixed. Find safe crippling load by (a) Euler's and (b) Rankine's formula. Take FOS=3.5 and maximum comp.stress=500 N/mm^2 & constant $\alpha=1/1600$, $E=0.14\times10^5 N/mm^2$ **07**

Q.3 **(a)** A simple support beam has span of 20m and loaded by a train of wheels as shown in the fig 2. Calculate the maximum bending moment and shear force induced at 8m from left support. **07**

(b) (1) State the Maxwell Reciprocal theorems. **07**
(2) Define proof resilience, Modulus of resilience & Core of section.

OR

Q.3 **(a)** A three hinged parabolic arch of span 12 m and rise 2.5m carries uniformly distributed load of 30 kN/m over the left half of the span. Calculate the reactions at the end hinges. Calculate the bending moment, radial shear and normal thrust at a distance of 3m & 7.5 m from the left Support. **07**

(b) Find static indeterminacy and kinematic indeterminacy of structures given in Fig.3 and Fig.4. **07**

Q.4 **(a)** A simply supported beam loaded as shown in fig 5. If for the beam $I = 160 \times 10^6 mm^4$ and E = 200 GPa. Calculate the deflection under loads using Macaulay's method. **07**

(b) Draw S.F.D & B.M.D &axial force diagram for the rigid jointed portal frame shown in fig 6. **07**

OR

Q.4 **(a)** A suspension cable having the left support is 4.75 m above the right support has a span of 50m and a maximum dip of 6m. The cable is loaded with a uniformly distributed load of 28 kN/m throughout its length. Find the maximum tension in the cable. **07**

(b) Differentiate between statically determinate structures and statically **07**

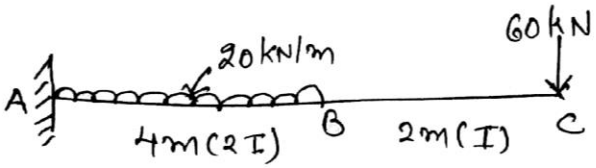
indeterminate structures. Also give advantages and disadvantages of indeterminate structures.

Q.5	**(a)**	Derive the expression for longitudinal stress for a thin cylindrical vessel subjected to internal fluid pressure *p*.	**07**
	(b)	Draw core diagrams with formulas for rectangular and circular sections.	**07**

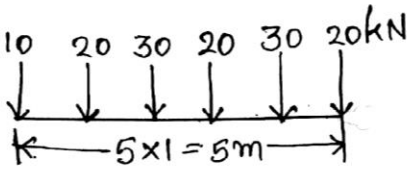
OR

Q.5	**(a)**	A short column rectangular section 250mm × 200mm is subjected to a load of 400KN at a point 50 mm from longer side and 100 mm from shorter side. Find maximum and minimum stresses in the column.	**07**
	(b)	Derive Euler's formula for column with both ends are hinged.	**07**

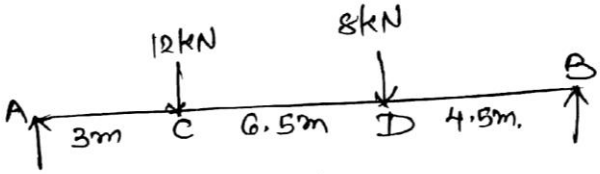
S.A - I



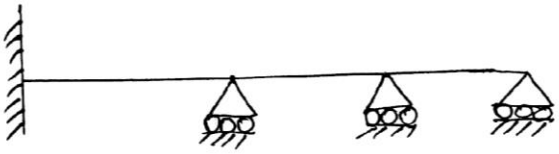
(Fig :- 1)



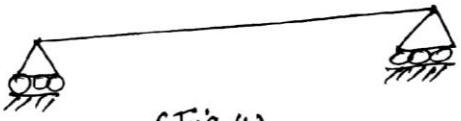
(Fig : 2)



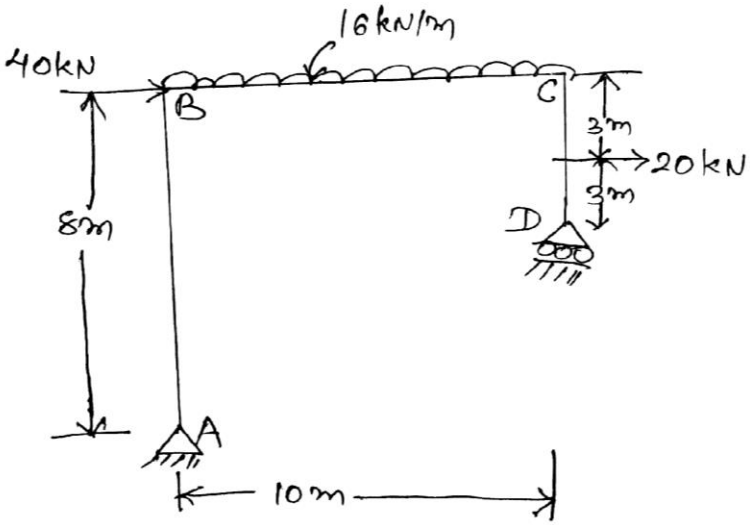
(Fig 5)



(Fig : 3)



(Fig 4)



(Fig : 6)

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