

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2140603

Date: 08/06/2017

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.

		MARKS
Q.1	Answer the following:	14
	1 Differentiate statically determinate and indeterminate structures.	
	2 Explain principle of superposition.	
	3 What is kernel or core of a section.	
	4 Draw core of a circular section having diameter D.	
	5 Write condition for no overturning in a retaining wall.	
	6 Define slenderness ratio.	
	7 Explain buckling load in a column.	
	8 Define radius of gyration.	
	9 Define thin cylindrical shell.	
	10 Explain hoop stress in a thin cylindrical shell.	
	11 What is longitudinal stress?	
	12 Explain Maxwell's reciprocal theorem.	
	13 Define resilience.	
	14 What is proof resilience?	
Q.2	(a) Write difference between conjugate beam and real beam.	03
	(b) Find SI and KI of structures as shown in fig.-1(a) and fig.-1(b).	04
	(c) Find deflection at C and slope at A for a simply supported beam as shown in fig.-2 by conjugate beam method.	07
	OR	
	(c) Derive relation among slope, deflection and radius of curvature.	07
Q.3	(a) Explain theorems of moment area method.	03
	(b) Write short note on different types of anchor cables.	04
	(c) Using Macaulay's method calculate slope at point C and deflection at point D for a simply supported beam as shown in fig.-3. Take EI=Constant.	07
	OR	
Q.3	(a) Differentiate between linear arch and actual arch.	03
	(b) Derive formula for slope and deflection at free end for a cantilever beam of span L and loaded with w over entire span.	04
	(c) A three hinged parabolic arch having span 25 m, central rise 5 m is loaded by UDL of 10 kN/m over left 10 m span. Calculate (a) direction and magnitude of reactions at end hinges and (b) BM, normal thrust and radial thrust at 6 m from left end.	07
Q.4	(a) Derive the formula for no tension condition at base for a dam.	03
	(b) Derive Euler's formula for crippling load a column having both ends hinged.	04

- (c) A masonry wall, 6m high is of solid rectangular section, 4m wide and 1.5m thick. A horizontal wind pressure of 1.3 kN/m^2 acts on the 4m side. Find maximum and minimum stresses induced on the base, if unit weight of masonry is 23 kN/m^3 . 07
- OR**
- Q.4** (a) A thin cylindrical shell with internal diameter 150mm and wall thickness 15mm is subjected to a steam pressure 12 N/mm^2 . Find circumferential and longitudinal stresses in the shell material. 03
- (b) Write advantages and disadvantages of fixed end beam. 04
- (c) A fixed end beam of span 7m carries a UDL of 35 kN/m over entire span and a point load of 45 kN at a distance 5m from left support. Calculate fixed end moments and draw BMD. Take $EI = \text{Constant}$. 07
- Q.5** (a) Derive formula for strain energy due to sudden loading. 03
- (b) A propped cantilever beam of span 6m is acted upon by a point load of 20 kN at a distance of 3m from fixed end. Calculate support reactions. 04
- (c) A 1.8m long rod of 30 mm^2 cross sectional area is hanged vertically. It receives a sliding collar of 150 N weight and a stopper at bottom end. The collar is allowed to fall on stopper through 250mm height. Determine the instantaneous stress induced in the rod and corresponding elongation. Also determine the strain energy stored in the rod. Take $E = 2 \times 10^5 \text{ N/mm}^2$. 07
- OR**
- Q.5** (a) Derive formula for strain energy due to shear loading. 03
- (b) A hollow rectangular column having outside dimensions $300 \text{ mm} \times 200 \text{ mm}$ and inside dimensions $200 \text{ mm} \times 100 \text{ mm}$ is fixed at both the ends. Find Euler's crippling load. Take $E = 2 \times 10^5 \text{ N/mm}^2$. 04
- (c) Determine the strain energy of a cantilever beam of span 3m having size 30mm width and 70mm depth (a) when 2 kN concentrated load is placed at free end, (b) when a UDL of 2 kN/m is applied over entire span. Take $E = 2 \times 10^5 \text{ N/mm}^2$. 07

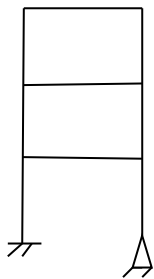


Fig.-1(a)

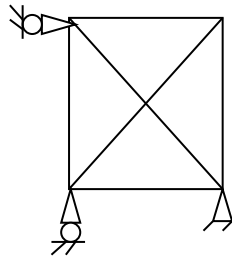


Fig.-1(b)

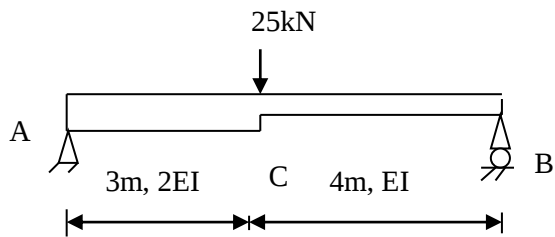
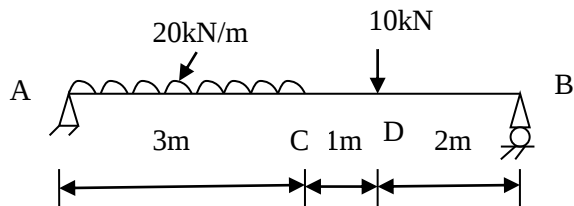


Fig.-2



***** Fig.-3