

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV(New) EXAMINATION – SUMMER 2016

Subject Code:2140603

Date:06/06/2016

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	Short Questions	14
	1 Determine Structural indeterminacy of the structures shown in figure 1 (a) .	
	2 Determine Structural indeterminacy of the structures shown in figure 1 (b) .	
	3 Determine Kinematic indeterminacy of the structures shown in figure 1 (a) .	
	4 Determine Kinematic indeterminacy of the structures shown in figure 1 (b) .	
	5 Define Principle of superposition.	
	6 Define Maxwell's reciprocal theorem.	
	7 Define Crippling load.	
	8 Define Crushing load.	
	9 Define strain energy.	
	10 Define Structural indeterminacy	
	11 Define Kinematic indeterminacy	
	12 Define Proof Resilience	
	13 Define Column	
	14 Define strut	
Q.2	(a) Differentiate Plane frame and Grid	03
	(b) Find reaction at support for the beam shown in figure 2 with using Consistence deformation method.	04
	(c) A Raft footing is supporting a vertical load of 150 kN as shown in figure 3 . Compute the stresses at each corner of the pier. Draw stress distribution diagram also.	07
	OR	
	(c) Analyses the fixed beam as shown in figure 4 and draw the shear force diagram, Bending moment diagram.	07
Q.3	(a) Differentiate Conjugate beam and real beam	03
	(b) Derive an equation to determine deflection at center for the simply supported beam subjected to uniformly distributed load over an entire span.	04
	(c) Calculate deflection at point B and C for the beam as shown in figure 5 using any method. Take $EI = 32000 \text{ kN.m}^2$.	07
	OR	
Q.3	(a) State the theorems of moment area method.	03
	(b) Show that for a three hinged parabolic arch carrying a uniformly distributed load over the whole span, the Bending moment at any section is zero.	04
	(c) Calculate slope and deflection at point C for the beam as shown in figure 6 using conjugate beam method. Take $EI = 32000 \text{ kN.m}^2$.	07

- Q.4 (a)** Calculate fixed end moments if left support of fixed beam is rotates clockwise by an amount ' θ '. **03**
- (b)** Derive Euler's crippling load formula for the long column Fixed at both ends. **04**
- (c)** Determine the strain energy stored in a truss loaded as shown in **figure 7**. Take $E = 200 \text{ GPa}$ and area of all members of truss is 400 mm^2 . **07**

OR

- Q.4 (a)** Derive the equation of the strain energy stored in a member due to Torsion. **03**
- (b)** An unknown weight falls through 100 mm on a collar rigidly attached to the lower end of a vertical bar, 3 m long and 3 cm in diameter. If the maximum instantaneous extension is known to be 3.5 mm, what is the corresponding stress and the value of unknown weight? Take $E = 2 \times 10^5 \text{ N/mm}^2$. **04**
- (c)** Determine the ratio of strain energy stored in the simply supported beam AB of span 5m carries a 25 kN load at a central point and the same load uniformly distributed over its entire span. **07**
- Q.5 (a)** Define and Explain core and Kernel of a section with suitable example. **03**
- (b)** A cylindrical vessel 2.5 m long and 400 mm in diameter with 8 mm thick plates is subjected to an internal pressure of 2.5 MPa. Calculate the change in length, change in diameter and change in volume of the vessel. Take $E = 200 \text{ GPa}$ and Poisson's ratio = 0.3 for the vessel material. **04**
- (c)** A cast iron column of solid section has to transmit load of 450 kN. Calculate the diameter if the column is 5 meters long, both ends fixed. Use Rankine's formula. Taking $f_c = 350 \text{ N/mm}^2$, Rankine's constant $\alpha = 1/2000$ and factor of safety is 3. **07**

OR

- Q.5 (a)** Write advantages of Three Hinge parabolic arch over a Simply supported beam. **03**
- (b)** The cables of a suspension bridge of 100m span are suspended from piers which are 12m and 6m respectively above the lowest point of the cable. The load carried by each cable is 1 kN/m of span. Find:
(i) horizontal pull in the cable at the pier
(ii) Maximum Tension in the cable at the pier. **04**
- (c)** A cylindrical chimney 60 m high of varying circular section is 6 m external diameter at Bottom and 3 m diameter at top. The internal diameter of chimney is 2.5m. It is subjected to a horizontal wind pressure of 1400 N/mm^2 . If the coefficient of wind pressure is 0.7. The self-weight of Chimney 16000 kN. Find the maximum & minimum stresses at the base of the section. **07**

