Seat No.: _____ Enrolment No._____

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 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 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 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 = 2×10^5 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 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 N/mm^2, Rankine's constant α = 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 1400N/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**

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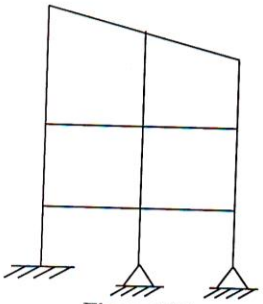

Figure 1(a)

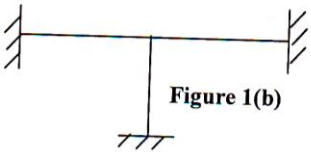

Figure 1(b)

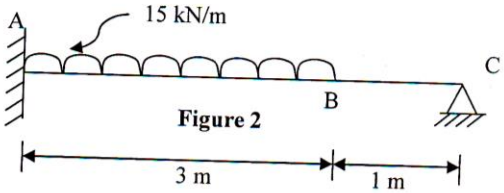

Figure 2

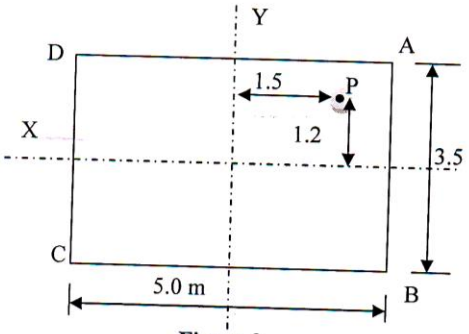

Figure 3

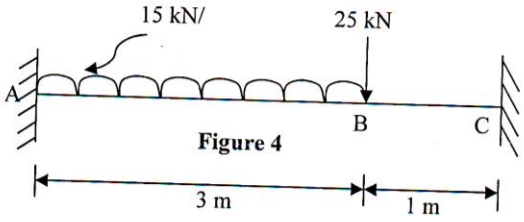

Figure 4

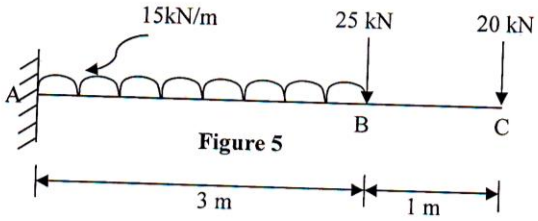

Figure 5

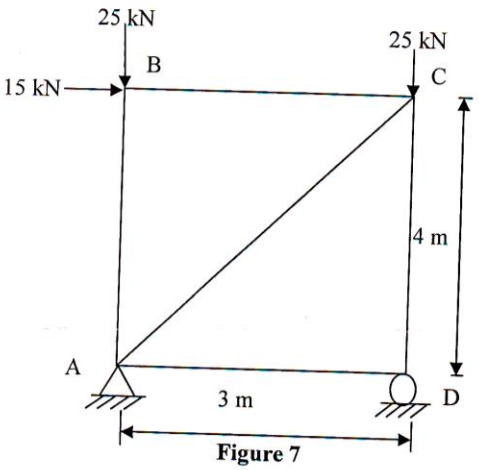

Figure 7

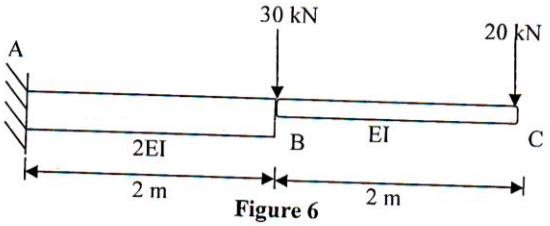

Figure 6