Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2140603 **Date:28/05/2018**

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.**

Q.1	**(a)**	Differentiate between direct stress and bending stress.	**03**
	(b)	Explain various types of framed structures with distinguishing features of each.	**04**
	(c)	A steel bar 1.2 m long and rectangular in section 40 mm x 80 mm is subjected to an axial load of 2 kN. Find the maximum stress if (i) The load is applied gradually (ii) The load is applied suddenly, and (iii) The load is applied after falling through a height of 10 cm. What are the strain energies in each of the above cases? Take E = 200 GPa.	**07**
Q.2	**(a)**	Draw neat sketch of kernel of the following cross-sections (i). Rectangular block 200 mm x 300 mm (ii) Circular section of 300 mm diameter	**03**
	(b)	Find SI and KI for the structures shown in fig.1 (i),(ii)	**04**
	(c)	A retaining wall 1 m wide at top,4 m wide at base and 7 m high is retaining soil on its vertical face to a height of 6 m. Determine the maximum and minimum intensities of stress. Check the stability of wall if co- efficient of friction between the soil and wall masonry is 0.6. Weight of masonry is 24 kN/m^3, weight of soil is 16 kN/m^3 and angle of repose of soil is 30°.	**07**
		OR	
	(c)	A masonry pier of 3 m x 4 m supports a vertical load of 100 kN as shown in fig. 2. Find the stresses developed at each corner of the pier. Draw stress distribution diagram .what additional load should be placed at the center of the pier, so that there is no tension anywhere in the pier.	**07**
Q.3	**(a)**	Explain in brief about stability of structures	**03**
	(b)	Using Conjugate beam method determine slope and deflection at center of simply supported beam of length 8 m subjected to point load of 60 kN at center. Take EI constant.	**04**
	(c)	A simply supported, 14 m long girder AB is subjected point loads 12 kN and 8 kN at 3 m and 9.5 m respectively from support A. Find deflection under the load 12 kN. Take E = 200 GPa and I = 160 x $10^6 mm^4$. Use Macaulay's method	**07**
		OR	
Q.3	**(a)**	A cylindrical shell of 500 mm diameter is required to withstand an internal pressure of 4 MPa. Find the minimum thickness of the shell, if maximum tensile strength in the plate material is 400 MPa and efficiency of the joint is 65%. Take FOS as 4.	**03**
	(b)	State moment area theorems and discuss its usefulness in analysis of beam.	**04**
	(c)	Analyse the truss shown in fig.3	**07**

Q.4 **(a)** A steel fixed beam AB of span 6 m is 60 mm wide and 100 mm deep. The support B sinks down by 6 mm. Find the fixing moment at A and B. Take E = 200 GPa **03**

(b) Derive Euler's formula of critical load for column having both ends hinged. **04**

(c) A circular arch to span 25 m with central rise 5 m is hinged at the crown and carries a point load of 100 kN at 6 m from the left support. Calculate (i) The reactions at the supports. (ii) The reactions at crown (iii) Moment at 5 m from the left support. **07**

OR

Q.4 **(a)** A light flexible cable 18 m long is supported at two ends at same level. The supports are 16 m apart. The cable is subjected to UDL of 1 kN/m of horizontal length over its entire span. Determine the reactions developed at the support. **04**

(b) A fixed beam AB of span 6 m is carrying a UDL of 4 kN/m over left half of the span. Draw S. F. D. and B. M. D. **10**

Q.5 **(a)** Give advantages of fixed beam. **03**

(b) Derive fix end moments for a beam subjected to rotation of support by 'Ɵ' **04**

(c) A propped cantilever beam of span 4 m carries a point load of 100 kN at mid span. Analyse the beam using consistent deformation method and draw S.F.D. and B.M.D. **07**

OR

Q.5 **(a)** Define (i) Strain energy (ii) Proof resilience (iii) Modulus of Resilience **03**

(b) A masonry wall 6 m high is of rectangular section 3 m wide and 1 m thick. A horizontal wind pressure of 1.2 kN/m^2 acts on 3m side. Find the maximum and minimum stresses. Take unit weight of masonry 24 kN/m^3 **04**

(c) An axial pull of 100 kN is applied to a steel bar 2 m long and 1000 mm^2 in cross section. If modulus of elasticity of material is 200 KN /mm^2. Find the maximum instantaneous stress, maximum instantaneous extension, strain energy and modulus of resilience. **07**

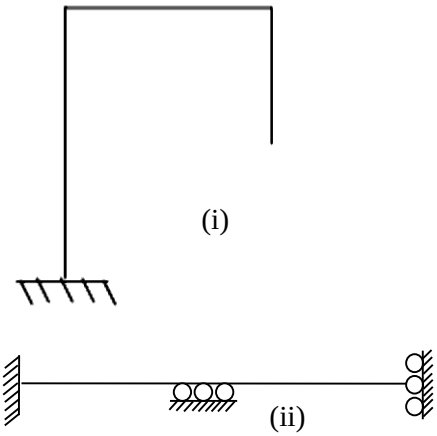

Fig. 1 Q:2 (b)

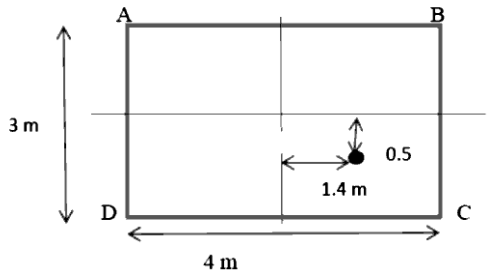

Fig. 2 Q:2 (c) OR

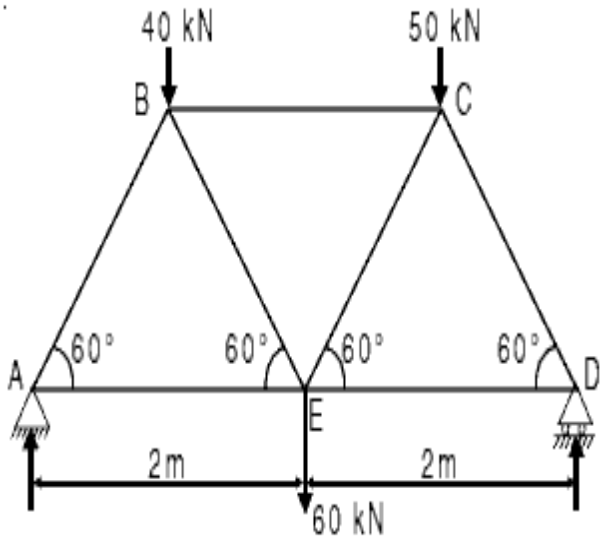

Fig. 3 Q:3 (c) OR