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

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEM-II Examination-Dec-2011

Subject code: X20603 **Date: 28/12/2011**
Subject Name: Structural Analysis-I
Time: 10.30 am -1.00 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)**	Analyse the frame in **Fig.-1**, and draw axial force, shear force and bending moment diagram.	**07**
	(b)	Find Statically Inderminacy of the structure as shown in **Fig.-2**.	**07**
Q.2	**(a)**	What diameter of shaft will be required to transmit 80kW at 80 r.p.m., if the maximum torque is 30per cent greater than the mean and the limit of torsional stress is to be 56MPa? If the modulus of rigidity is 84GPa, what is the maximum angle of twist in 3m length.	**07**
	(b)	A hollow shaft of diameter ration 3/5 is required to transmit 800kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not exceeding 63MPa and the twist in a length of 3m is not to exceed 1.4degrees. Calculate the minimum external diameter satisfying these conditions.	**07**
		OR	
	(b)	A steel cylinder 90cm long, 15cm internal diameter is made from plates of 5mm thick. It is subjected to an internal pressure of 7MPa. The increase in volume due to internal pressure is $16cm^3$. Estimate the value of Poisson's ration and modulus of rigidity. Assume E=210GPa.	**07**
Q.3	**(a)**	A cantilever beam having span '*L*' is loaded with '*w*' per unit length. Derive equation for maximum slope and maximum deflection in term of '*w*' and '*L*'	**07**
	(b)	A simply supported beam loaded as shown in **Fig.-3.** Find the slope at *B* and deflection at *C*. Take E=210GPa, $I=9600cm^4$. Use Macaulay's method.	**07**
		OR	
Q.3	**(a)**	Determine the maximum possible span for a cable supported at its two ends (on level supports), if the central sag is limited to 10 percent of the span, and if the permissible tensile stress is 150MPa. Assume the unit weight of the steel as $78.5kN/m^3$. Take parabolic profile of cable having span / rise ratio is 10.	**07**

(b) A three hinged parabolic arch of 18metre span and 3m central rise carries a point load of 6kN at 3m horizontally from the left hand hinge. Calculate the maximum positive and negative bending moment. Also draw the bending moment diagram. **07**

Q.4 **(a)** A steel specimen 1.5cm^2 in cross section stretches 0.005cm over a 5cm gauge length under an axial load of 30kN. Calculate strain energy stored in the specimen at this point. If the load at the elastic limit for the specimen is 50kN, calculate the elongation at elastic limit and the proof resilience. **07**

(b) A bar 1.2cm internal diameter and 2cm external diameter gets stretched by 0.3cm under a steady load of 8kN. What stress would be produced in the bar by weight of 800N which falls 8 cm before commencing the stretching of the rod which is initially unstressed? E=200GPa. **07**

OR

Q.4 **(a)** Consider a simply supported beam *AB* of span 25m as shown in **Fig.-4**. Two point loads of 50kN each, 5m apart, followed at 2.5m by a uniform load of 5kN/m, 5 m long, cross from left to right. Using influence lines , determine the maximum values of support reactions at *A* and *B*. **07**

(b) Consider the simply supported beam with overhangs, *ABCD* , loaded as shown in **Fig.-5** Using influence lines, determine (i) the reaction at *C* (ii) the bending moment at *E* (iii) the shear force at *E*. **07**

Q.5 **(a)** Find the maximum and minimum stress intensities induced on the base of masonry wall 4 metre high, 2 m wide and 1.2 m this subjected to a horizontal wind pressure of 1200N/m^2 acting on 2 metre side. The density of masonry may be taken as 22400N/m^3. **07**

(b) A beam of rectangular section of 50mm to 100mm carries a uniformly distributed load of 20kN/m over a span of 2 m and an axial compressive force of 5kN. Calculate (i) maximum fibre stress, (ii) fibre stress at a point 0.5 m from the left end of the beam and 30mm below the neutral axis. **07**

OR

Q.5 **(a)** A built up beam as shown in **Fig-6** is simply supported at ends. Computer is length given that when it is subjected to a load of 40kN per meter length, it deflects by 1cm. Find out the safe load if this beam is used in a column with both ends fixed. Assume a factor of safety 4. Use Euler's formula E=210GPa **07**

(b) A concrete pier 1.5mx1.5m in section and 6m long carries a compressive load '*P*', lying at a point on the top which is 50cm from each of the two adjacent faces. What is the maximum value of '*P*', if no tensile stress is produced in the bas? Take weight of concrete pier as 2x10^4 N/m^3. **07**

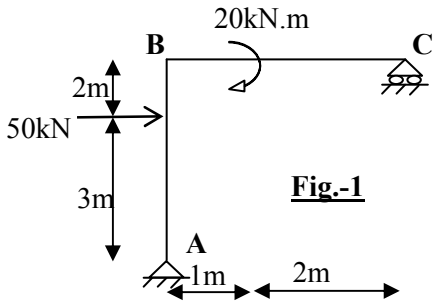

Fig.-1

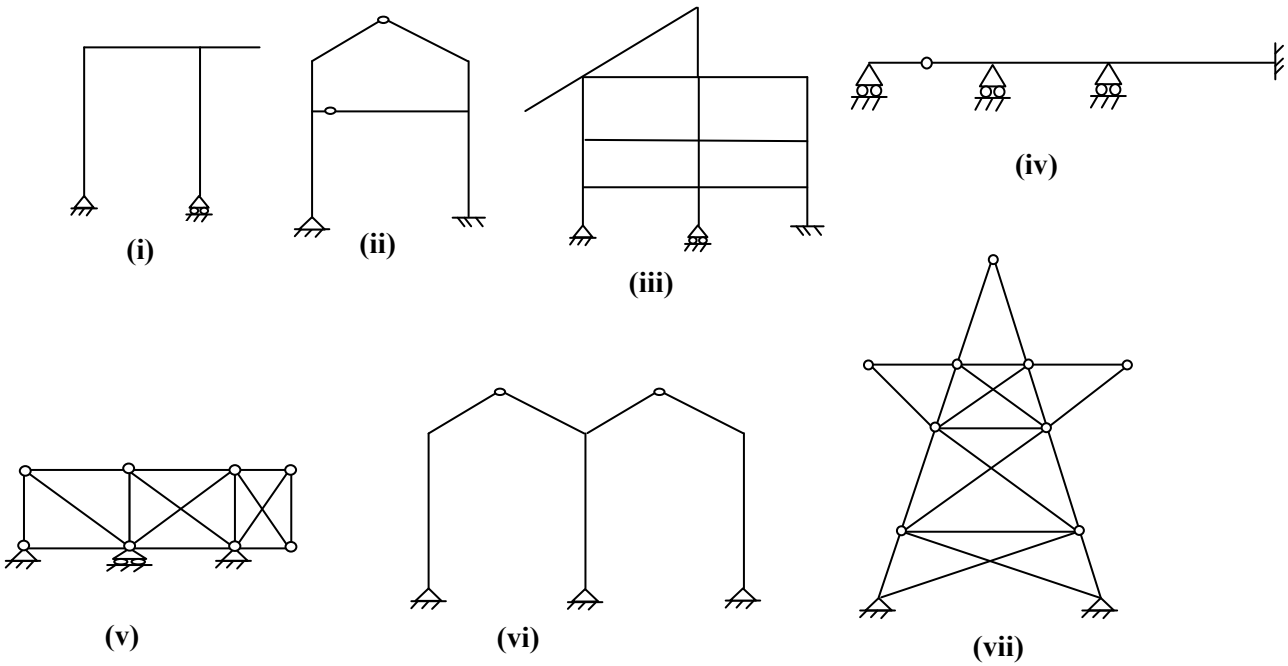

Fig.-2

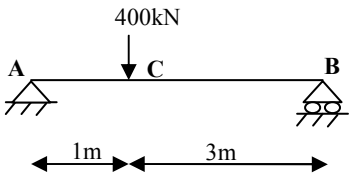

Fig.-3

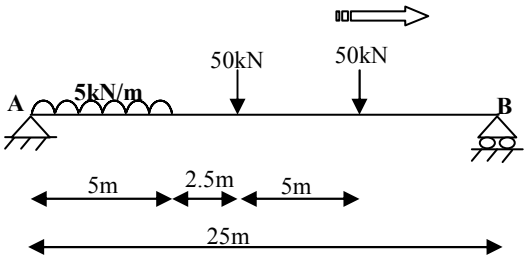

Fig.-4

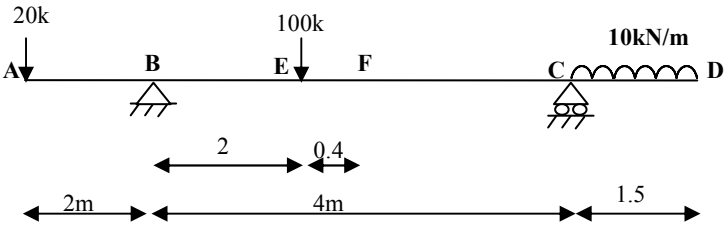

Fig.-5

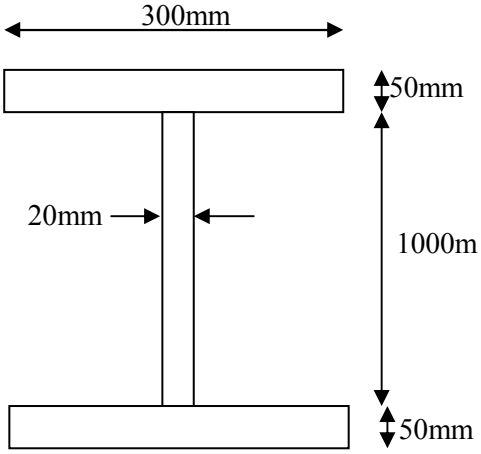

Fig.-6

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