Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C Sem-III Examination May 2011

Subject code: X30603

Subject Name: Structural Analysis II

Date:25/05/2011 **Time: 10.30 am – 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)**	Draw bending moment diagram for the frame as shown in **figure-1** using slope deflection method.	**07**
	(b)	Draw bending moment diagram for the frame as shown in **figure-1** using moment distribution method.	**07**
Q.2	**(a)**	Draw bending moment diagram for the beam as shown in **figure-2** using moment distribution method.	**07**
	(b)	For the beam as shown in **figure -3** ,construct the influence lines for (I) the shear at the cross section to the left of A,(II) the shear at D,(III)the bending moment at A and (IV) the bending moment at D.	**07**
		OR	
	(b)	One propped cantilever beam *AB* having *A* end is fixed and *B* end is propped. Draw influence line diagram for support reaction at *B* using Muller-Breslau principle. Compute the ordinates at intervals of 2m.	**07**
Q.3	**(a)**	Draw shear force and bending moment diagram of beam as shown in **figure-4** using flexibility matrix method. Choose moments as a redundant.	**07**
	(b)	Draw shear force and bending moment diagram of beam as shown in **figure-4** using stiffness matrix method.	**07**
		OR	
Q.3	**(a)**	Analyze the plane truss as shown in **figure-5** using flexibility matrix method. Take E=200kN/mm^2, A=800mm^2(diagonal member), A=1200mm^2 (other member). Find only diagonal redundant.	**07**
	(b)	Analyze the plane frame as shown in **figure-6** using stiffness matrix method.	**07**
Q.4	**(a)**	An unequal angle 60mmx40mmx6mm is used as a strut for a length of 3m. The strut may be considered as hinged at top and fixed at bottom. Using Euler's formula, calculate the safe load the column can carry, at a factor of safety of 2.0. Take E=2x10^{5}N/mm^2.	**07**
	(b)	A cast iron column of hollow cylindrical section 5 meters long, with ends firmly built-in, has to carry an axial load of 300kN. Determine the section, using a factor of safety of 8. Internal diameter to be 8/10 of the external diameter. Rankine's constants for C.I. are f_c =550 N/mm^2; a =1/1600.	**07**
		OR	
Q.4	**(a)**	A slender strut, 1800mm long and of rectangular section 30mm x 12 mm transmits a longitudinal load P acting at the center of each end. The strut was slightly bend about is minor principal axis before loading. If P is increased from 500N to 1500N, the deflection at the middle of the length increases by 4mm. Determine the amount of deflection before loading. Find also the total deflection and the maximum stress when P is 2000N. Take E=2.15x10^5 N/mm^2	**07**

Q.4 **(b)** A steel column made of a 4, long channel section, 300mmx 100mm, is fixed at both the ends, The thickness of flange is 11.6mm while the thickness of web is 6.8mm. Using Rankine's formula, calculate the load it can carry with a factor safety of 3. Take $f_c = 330$ N/mm^2 and Rankine's constant = 1/7500. **07**

Q.5 **(a)** A three hinged parabolic arch, hinged at the crown and springing has a horizontal span of meters and a central rise of 2.5m. It carries a uniformly distributed load of 30kn per horizontal meter run over the left hand half of the span. Calculate the reactions at the end hinges. Also calculate the values of the normal thrust, shear force and bending moment at 1.5m, from the left hand hinges. **07**

(b) A parabolic arched rib, span 30meters, central rise 6m, is hinged at the ends. It carries a uniformly distributed load of 20kN per horizontal meter run extending over 12 meter from the left hinge towards the center. Calculate the horizontal thrust, the reactions at the the hinges. Take moment inertia at a section $I = I_0 \sec\theta$ where θ is the inclination of the arch at the section to the horizontal and I_0 is the moment of inertia of the section at the crown. **07**

OR

Q.5 **(a)** A three hinged parabolic arch of 20metre span and 4m central rise carries a point load of 4kN at 4 m horizontally from the left hand hinges. Calculate the normal thrust and shear force at the section under the load. Also calculate the maximum bending moment positive and negative. **07**

(b) A parabolic arch, hinged at the ends has a span 30m and rise 5m. A concentrated load of 12kN acts at 10m from the left hinge. The second moment of area varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Also calculate the maximum bending moment anywhere on the arch. **07**

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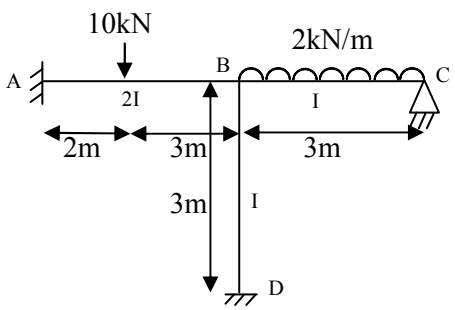

Figure-1

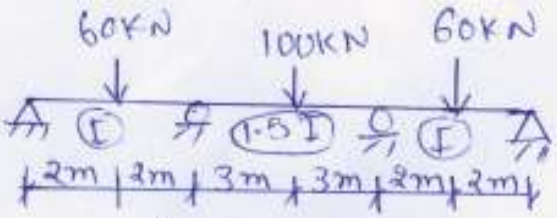

Figure-2

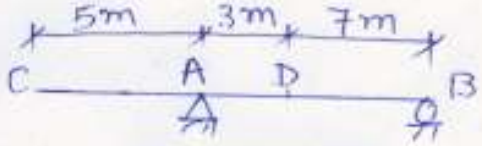

Figure-3

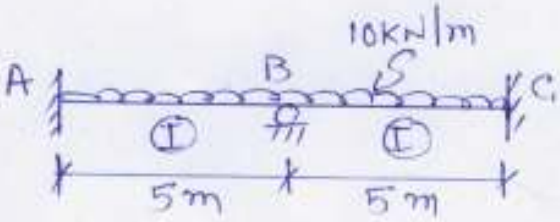

Figure-4

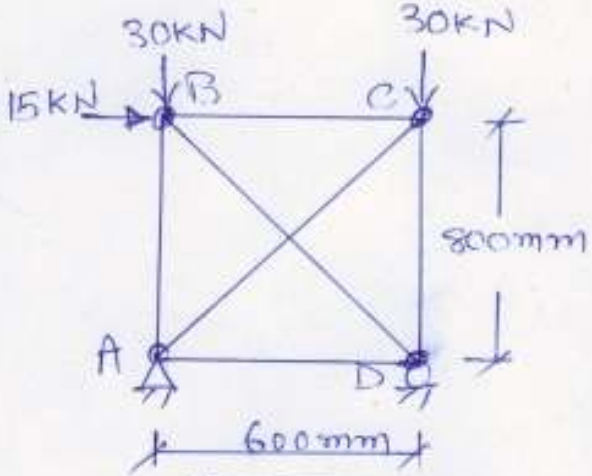

Figure-5

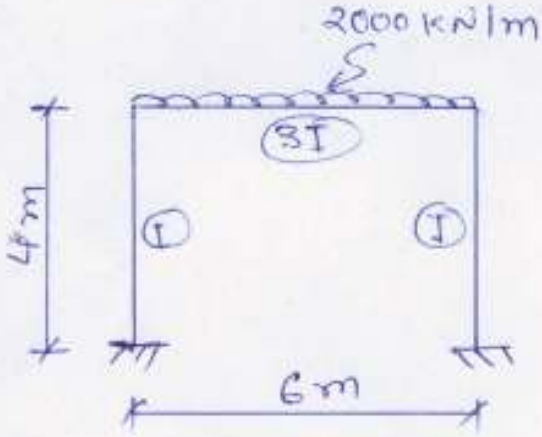

Figure-6

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