Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: X 20603 **Date: 22/01/2013**

Subject Name: Structural Analysis -I

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)** Explain resilience, proof resilience and modulas of resilience. **07**

(b) Find position of maximum deflaction and maximum deflaction for beam shown in fig. 1, using Macaulay's method. E = 2 x 10^5 MPa and I = 4.3 x 10^8 mm^4. **07**

Q.2 **(a)** Find the deflaction under point load for a beam shown in fig. 2. E = 2 x 10^5 MPa and I = 1 x 10^8 mm^4. Use Conjugate beam method. **07**

(b) A hollow CI column 200 mm outside diameter and 150 mm inside diameter, 8 m long has both ends fixed. It is subjected to axial compressive load. Factor of safety = 6, Constant a = 1/1600, f_c = 560 MPa. Determine safe Rankine load. **07**

OR

(b) A hollow CI column is 4 m long with both ends fixed. Determine minimum diameter of column if it has carry a safe load of 250kN with factor of safety of 5. Take internal diameter as 0.8 times external diameter. Take f_c = 550 MPa and constant a = 1/1600. **07**

Q.3 **(a)** Prove that maximum shear stress at any point in the thin cylinder, subjected to internal fluid pressure is given by
(p x d / 8t) **07**

(b) A hollow shaft of internal diameter 10 cm, is subjected to pure torque and attains a maximum shear stress q on the outer surface of the shaft. If the strain energy stored in the hollow shaft is given by (τ^2/3C) x V, determine the external diameter of the shaft. **07**

OR

Q.3 **(a)** Show that in thin cylindrical shells subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress. **07**

(b) Determine the diameter of a solid shaft which will transmit 90 kW at 160 rpm. Also determine the length of the shaft if the twist must not exceed 1^0 over entire length. The maximum shear stress is limited to 60 MPa. Take modulas of rigidity = 8 x 10^4 MPa. **07**

Q.4 **(a)** Draw neat sketches of kernel of the following cross sections **07**

(i) Rectangular cross section 200 mm x 300 mm

(ii) Hollow circular cylinder with ext. dia. = 300 mm and thickness 50 mm

(iii) Square 400 cm^2 area.

(b) Find the permissible span for a steel cable suspended between supports at the same level, if the central dip is $1/10^{th}$ of the span and the permissible stress is 120 MPa. Specific weight of steel is 78 **07**

kN/m^3. Assume cable to hang in a parabolic curve.

OR

Q.4	**(a)**	A short column of rectangular cross section 80 mm by 60 mm carries a load of 40 kN at a point 20 mm from longer side and 35 mm from shorter side. Determine maximum compressive and tensile stresses in the section.	**07**
Q.4	**(b)**	A three hinged parabolic arch hinged at crown and springings has a horizontal span of 12 m and central rise of 2.50 m. it carries a UDL of 30 kN/m horizontal run over the left hand half of the span. Calculate the reactions at the end hinges. Also calculate the value of normal thrust, shear force and bending moment at 1.5 m from left hand hinge.	**07**
Q.5	**(a)**	Draw SFD, BMD and AFD for the portal frame shown in fig. 3.	**07**
	(b)	A train of loads shown in fig. 4 crosses a simply supported beam of span 18 m from left to right. Calculate maximum SF and BM at section 8 m from left to right.	**07**

OR

Q.5	**(a)**	Draw SFD, BMD and AFD for the portal frame shown in fig. 5.	**07**
	(b)	Explain Influence line diagram. Differentiate between ILD of bending moment and normal bending moment diagram.	**07**

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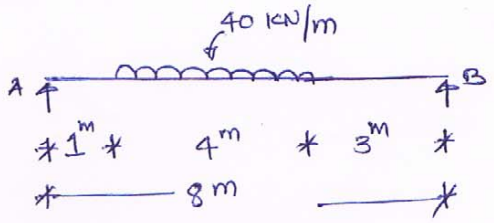

Fig. 1 (Q.1 (b))

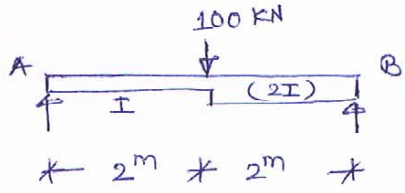

Fig. 2 (Q.2 (a))

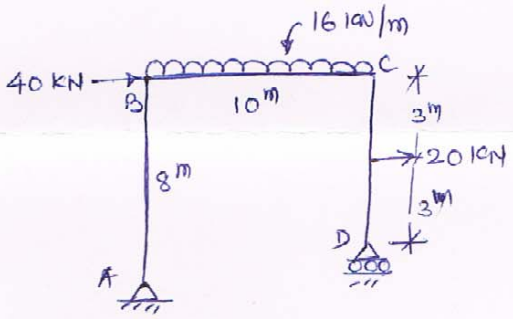

Fig. 3 (Q.5 (a))

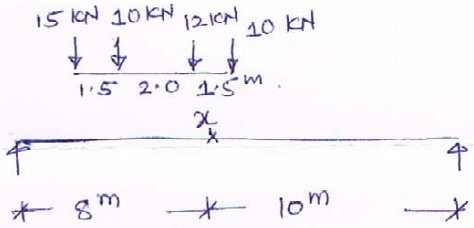

Fig. 4 (Q.5 (b))

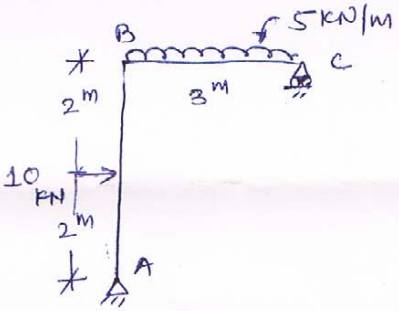

Fig. 5 (OR Q.5 (a))