Enrollment No:-_____ Exam Seat No:-_____

C.U.SHAH UNIVERSITY

Summer-2015

Subject Code: 4TE03STA1 Subject Name: Structural Analysis-I

Course Name: B.Tech(Civil) Date: 6/5/2015

Semester:III Marks: 70

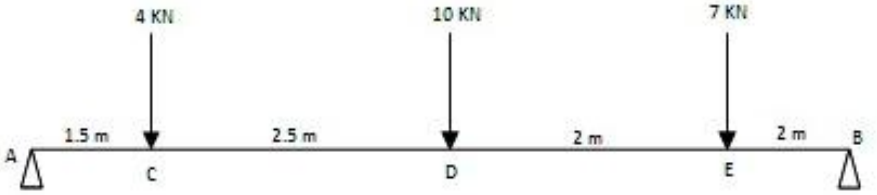
Time:02:30 TO 5:30

Instructions:

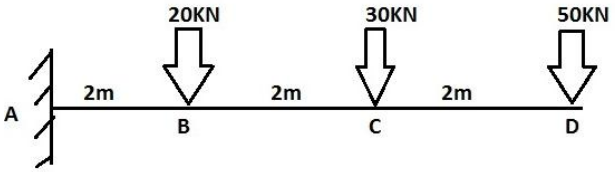
1) Attempt all Questions of both sections in same answer book/Supplementary.
2) Use of Programmable calculator & any other electronic instrument prohibited.
3) Instructions written on main answer book are strictly to be obeyed.
4) Draw neat diagrams & figures (if necessary) at right places.
5) Assume suitable & perfect data if needed.

SECTION-I

Q-1	(a)	Distinguish between: Axial loading and Transverse loading.	2
	(b)	What is prismatic and non prismatic bar?	2
	(c)	State Hooke's law.	1
	(d)	Define Elastic limit.	1
	(e)	What is Homogenous Material?	1
Q-2	(a)	Derive an equation for elongation of a bar of uniformly circular section.	5
	(b)	A bar 0.5m is rectangular in section with width 40 mm and thickness 30 mm. Calculate the change in dimensions when a tensile load of 120 KN is acting along its longitudinal axis if E = 200 KN/mm^2 and Poisson's μ = 0.25.	5
	(c)	Explain shear stress and shear strain.	4
		OR	
Q-2	(a)	Draw Shear force and Bending Moment Diagram for a beam shown in figure.	5



	(b)	Derive relation between uniformly distributed load (w), shear force (v) and bending moment (M).	5
	(c)	A steel bar 2m long and 20mm diameter is acted upon by 50 KN compressive force. If E= 2 X 10^5 N/mm^2 and Poisson's ratio is 0.25, find change in length and diameter.	4
Q-3	(a)	Draw S.F and B.M diagram for a beam shown in figure.	5



	(b)	A steel bar 50 mm in diameter and 2.5 m long has to transmit a shock energy	5

6-5

of 100 Nm. Calculate the maximum instantaneous stress and elongation produced , Take E= 2 X 10^5 N/mm^2.

(c) Discuss the relation between strain energy due to gradual load and strain energy due to sudden load. 4

OR

Q-3 (a) A Steel bar 1 meter in length is subjected to a pull such that the maximum stress is equal to 150kN/mm^2. Its cross-section is 200 mm^2 over a length of 950mm and for the middle 50 mm length the sectional area is 100mm^2. If E = 2 x 10^5 N/mm^2. Calculate strain energy stored in the bar. 5

(b) A 10 mm dia mild steel bar of length 1.5 m is stressed by a weight of 120 N drooping freely through 20 mm before commencing to stretch the bar. Find maximum instantaneous stress and the elongation produced in bar. Take E= 2 x 10^5 N/mm^2. 5

(c) Define the terms: (i) Strain energy, (ii) Resilience, (iii) Proof resilience, (iv) Modulus of resilience. 4

Section - II

Q-4 (a) Define long column and short column. 2

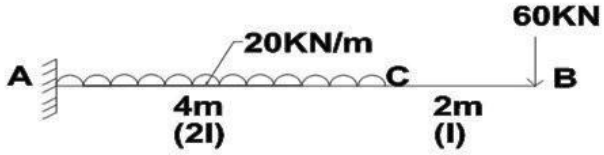
(b) Explain buckling of columns. 2

(c) Define slenderness ratio. 1

(d) Define radius of gyration (k). 1

(e) What is Castigliano's Theorem? 1

Q-5 (a) Find slope and deflection at point B for a cantilever beam shown in figure using. Castiglione's first theorem. Take EI = 10 x 10^{13} N.mm^2. 5

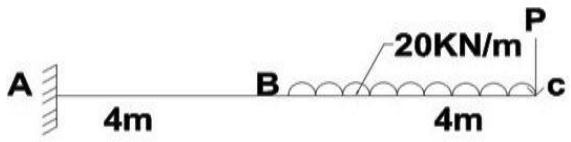


(b) A load of 2000KN is applied on a short concrete column 500mm x 500mm, reinforced with four Nos. of 10mm dia. steel bar. Find stresses in concrete and steel. Take value of E for steel as 2.1 x 10^5 N/mm^2 and for concrete 1.4 x N/mm^2. 5

(c) Define the terms: (i) Axial load, (ii) Eccentric load, (iii) Limit of Eccentricity, (iv) Core or Kernel of section. 4

OR

Q-5 (a) Determine vertical deflection at the free end of a cantilever beam shown in figure. Take E = 2 x 10^5n/mm^2 and I = 8 x 10^6 mm^4. Using Castiglione's first theorem. 5



(b) A 200mm long steel tube, 100 mm internal diameter and 10mm thick is surrounded by a brass tube of the same thickness and length. The composite section carries an axial compression of 100 KN, find the load carried by each tube and shortening of each tube. 5

(c) Write short notes on Middle third rule. 4

Q-6 (a) Drive kernel (Core) of section for rectangular and circular section. 5

(b) A rectangular column section ABCD having side AB = CD = 400 mm and BC = AD = 300mm carries a compressive load of 300 KN at corner B. Find stress at each corner A,B,C,D and draw stress- distribution diagram for each side. 5

(c) In a RCC column of size 250mm×250mm, 4 bars of 20 mm diameter are placed at each corner if modular ratio is 20 and stress in concrete is 10 N/mm^2 find out load carried by column. 4

OR

Q-6 (a) A short column rectangular section 250mm x 200 mm is subjected to a load of 400 KN at a point 50 mm from longer side and 100 mm from shorter side. Find maximum and minimum stresses in the column. 5

(b) The external and internal diameter of a hollow cast iron column is 200 mm and 150 mm respectively. If the column is hinged at both ends having a length of 4 m, determine the crippling load using rankine formula. Take fs = $550N/mm^2$ and α =1/1600. 5

(c) What is effective length for column when : 4
Both ends hinged,
Both end fixed,
One end fixed and other hinged,
One end fixed and other free.

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