Enrollment No: _____ **Exam Seat No:**_____

C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name : Structural Analysis-I

Subject Code : 4TE03STA1 **Branch :** B. Tech.(Civil)

Semester : 3 **Date :** 05/12/2015 **Time :** 2:30 To 5:30 **Marks :** 70

Instructions:

(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) When shear force at a point is zero, then bending moment at that point will be 01
(A) zero (B) maximum (C) minimum (D) infinity

b) The buckling load for a given column depends upon 01
(A) cross sectional area of column (B) length and least radius of gyration
(C) modulus of elasticity of column material (D) all of the above

c) If slender ratio for a column is 100, then it is said to be 01
(A) short column (B) long column (C) medium column

d) Which of the following is a proper sequence? 01
(A) elastic limit, proportional limit, yielding, failure
(B) yielding, proportional limit, elastic limit, failure
(C) proportional limit, elastic limit, yielding, failure
(D) none of the above

e) The self-weight of the beam will be taken as 01
(A) point load (B) uniformly distributed load
(C) uniformly varying load (D) none of these

f) Maximum strain energy which can be stored in a body per unit volume, at elastic limit is called, 01
(A) modulus of resilience (B) resilience (C) proof resilience (D) all of the above

g) A bar 54 mm in diameter is 4 m long. An axial load of 180 kN is suddenly applied to it find the maximum instantaneous stress. 01
(A) 157.19 N/mm^2 (B) 257.25 N/mm^2 (C) 201.20 N/mm^2 (D) 98.1 N/mm^2

h) The slenderness ratio is the ratio of 01
(A) M.I to area of column
(B) length of column to least radius of gyration
(C) least radius of gyration to area of column
(D) least radius of gyration to length of column

i) Fixed end moment at hinged support is 01
(A) maximum (B) minimum (C) zero (D) none of these

j) Castingliano's first theorem is used for finding 01
(A) slope (B) deflection (C) A & B both (D) none of these

k) a) Homogeneous material is always isotropic, 01
b) Isotropic material is always homogeneous.
(A) 'a' true & 'b' falls (B) 'b' true & 'a' falls
(C) 'a' true & 'b' true (D) 'a' falls & 'b' falls

l) Fixed end moment for udl on entire span of fixed beam 01
(A) wl/4 (B) $wl^2/8$ (C) wl/8 (D) $wl^2/12$

m) Strain energy due to torsion for solid shaft 01
(A) $\tau^2V/14G$ (B) $4\tau^2/G$ (C) $\tau^2V/4G$ (D) $\tau^2G/4V$

n) Define poisson's ratio. 01

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

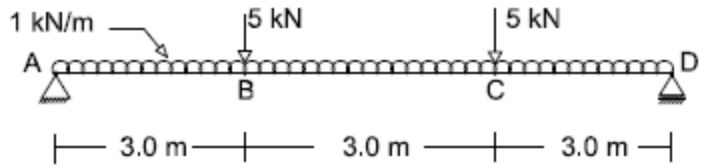
(a) A rectangular column section 250 mm x 150 mm carries two equal point loads. One at center and other at 150 mm side edge along centroidal axis. Find value of point load if maximum resultant stress is not to exceed 20 N/mm^2. 05

(b) A rectangular column of size 500 mm x 250 mm carriers an eccentric load of 1000 kN on the axis bisecting the thickness at 150 mm from centroidal axis. Find maximum and minimum resultant stress and draw stress diagram. 05

(c) Derive an equation for elongation of a bar of uniformly circular section. 04

Q-3 **Attempt all questions** **(14)**

(a) Draw shear force and bending moment diagram for a beam shown in figure. 07

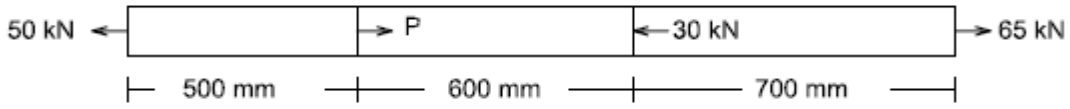


(b) A simply supported beam 8m span, subjected to two point loads 50kN and 80kN at 2.5 m from each support it is also subjected to u.d.l of 25 kN/m on full length, find reactions at the supports. 07

Q-4 **Attempt all questions** **(14)**

(a) Draw and explain the stress-strain curve for mild steel. 07

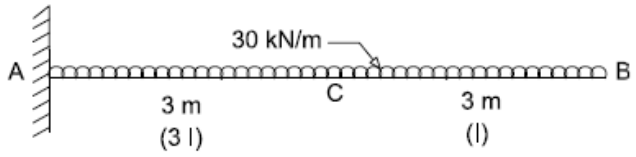
(b) A circular bar having 200 mm^2 area is subjected to the axial load as shown in figure. Find the value of P and the total elongation. Take E = 200 kN/ mm^2. 07



Q-5 **Attempt all questions** **(14)**

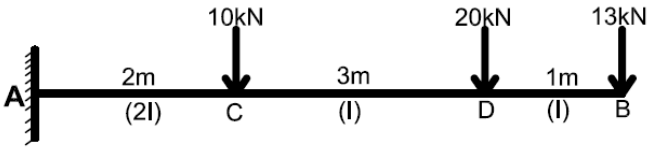
(a) A steel bar 1 m in length is subjected to a pull such that the maximum stress is equal to 150 N/mm^2. It's cross section is 200 mm^2 over a length of 950 mm and for the middle 50 mm length the sectional area is 100 mm^2. If E = 2 x 10^5 N/mm^2. Calculate strain energy stored in the bar. 07

(b) Determine δ_B and δ_C for a cantilever beam shown in figure. Take EI = 10 x 10^{13} N.mm^2. 07



Q-6 **Attempt all questions** **(14)**

(a) Find slope and deflection by moment area method at point B for beam shown in figure. 07



E = 2 x 10^5 N/mm^2 I = 5 x 10^8 mm^4

(b) A 'T' section is having flange with 100 mm and total depth 80 mm. the thickness of flange and web is 10 mm. the length of column is 3.0 m and it is hinged at both ends. If E = 2.1× 10^5 N/mm^2, find Euler's buckling load. 07

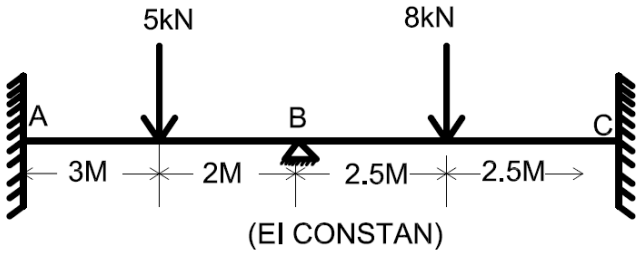
Q-7 **Attempt all questions** **(14)**

(a) Derive kernel (core) of section for rectangular and circular section. 07

(b) Compare the strength of solid circular column and hollow circular column using Euler's formula. For hollow circular column internal diameter is 7/10 times the external diameter. Both the columns have same cross sectional area, same length, same material and hinged at both ends. 07

Q-8 **Attempt all questions** **(14)**

(a) A beam ABC, 10 m long, fixed at ends A and C is continuous over joint B and is loaded as shown in fig. using slope deflection method, compute the end moments and plot the bending moment diagram. Also, sketch the deflected shape of the beam. The beam has constant EI for both the spans. 10



(b) What is effective length for column when: 04
(i) both end hinged, (ii) both end fixed, (iii) one end fixed and other end hinged, (iv) one end fixed and other end free.