Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

Summer Examination-2018

Subject Name : Structural Analysis - I

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

Semester : 3 Date : 26/03/2018 Time : 02:30 To 05:30 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)	Give the units of stress.	1
b)	What is the unit of strain?	1
c)	Give Hooke's law.	1
d)	Define modulus of rigidity.	1
e)	Give the basic relation for bending of beams.	1
f)	Draw a simply supported beam and write the number of reactions it may have.	1
g)	If a person is standing on a beam of length (L), give the maximum moment that will be generated in beam.	1
h)	Define angular deformation.	1
i)	Give the definition of resilience.	1
j)	The relation for strain energy due to sudden load is _____.	1
k)	What is impact factor?	1
l)	The modulus of resilience for a steel bar axially pulled is _____. The instantaneous stress is 100MPa and $E=2x10^5$MPa.	1
m)	Moment area method is used for _____.	1
n)	The poisson's ratio for structural elements is in the range _____.	1

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

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

a) Explain what is principal stress and simple stress. Also explain the types of simple stresses with neat sketch & formula. 8

b) What is Hooke's law. Explain all the elastic constants. 6

Q-3 Attempt all questions (14)

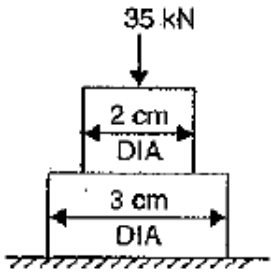
a) Explain the three dimensional stress system for solid body. 6

b) Explain the tension test of mild steel bar. Draw and explain with neat sketches. Also draw the stress-strain curve for HYSD bars. 8

Q-4 Attempt all questions (14)

a) Explain strain energy with suitable example. Also explain resilience for a deformable body. 6

b) A stepped bar is subjected to an axial compressive load of 35kN. Find the maximum and minimum stress produced. 6



c) Explain complementary shear stress. 2

Q-5 Attempt all questions (14)

a) Explain the failure of short and long columns. Write the assumptions made in Euler's column theory. 6

b) A solid round bar of 3m long and 5cm in diameter is used as strut with different support conditions. Determine the crippling load for (i) both ends hinged (ii) one end fixed and other free (iii) both ends of strut fixed (iv) one end fixed and other free. Take $E=2x10^5$ MPa. 8

Q-6 Attempt all questions (14)

a) A rectangular column is 300mm x 400mm in dimensions. The column carries an eccentric point load of 360kN on one diagonal at a distance of quarter diagonal length from a corner. Calculate the stresses at all four corners. Draw stress distribution diagrams for any two adjacent sides. 7

b) Explain the middle one-third rule for rectangular columns (i) solid column (ii) hollow column. 7

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

a) A horizontal beam 10m long is carrying a uniformly distributed load of 1kN/m. The beam is supported on two supports 6m apart. Find the position of the supports, so that bending moment is as small as possible. Also draw the shear force and bending moment diagrams. 10

b) A vertical bar is fixed at its upper end and of uniform strength carries an axial tensile load of 600kN. The bar is 20m long and having weight per unit volume as 0.00008MPa. If the area of bar at lower end is 400sq.mm, find the area of bar at upper end. 4

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

a) Determine slope and deflection at free end of a cantilever beam having span of 3m and loaded with **U.D.L** of 12kN/m throughout length using first principle of double integration method. 6

b) Calculate deflection at point C and D for a beam shown in figure. Take $E=200kN/mm^2$ and $I=118x10^6\ mm^4$. 8