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

C.U.SHAH UNIVERSITY
Winter Examination-2015

Subject Name : Strength of materials

Subject Code : 2TE04SOM1 **Branch :** Diploma in Civil

Semester : IV **Date :** 18/11/2015 **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)**

(MCQ Type of Questions=1 mark*14=14 marks)

a) In a loaded beam, the point of contraflexture occurs at a section where 01
(A) bending moment is minimum
(B) bending moment is zero or changes sign
(C) bending moment is maximum
(D) shearing force is maximum

b) A beam is said to be of uniform strength, if 01
(A) B.M. is same throughout the beam
(B) deflection is same throughout the beam
(C) bending stress is same throughout the beam
(D) shear stress is same throughout the beam

c) Maximum bending moment in a beam occurs where 01
(A) deflection is zero
(B) shear force is maximum
(C) shear force is minimum
(D) shear force changes sign

d) The diagram showing the variation of axial load along the span is called 01
(A) shear force diagram (B) bending moment diagram
(C) thrust diagram (D) influence line diagram

e) A simply supported beam of span L carries a concentrated load W at its mid-span. The maximum bending moment M is 01
(A) $\frac{WL}{2}$ (B) $\frac{WL}{4}$ (C) $\frac{WL}{8}$ (D) $\frac{WL}{12}$

f) The shape of the bending moment diagram over the length of a beam, carrying a uniformly distributed load is always 01
(A) linear (B) parabolic (C) cubical (D) circular

g) The maximum bending moment for a simply supported beam with a uniformly distributed load *w*/unit length, is 01

(A) $\frac{wL}{2}$ (B) $\frac{wL^2}{4}$ (C) $\frac{wL^2}{8}$ (D) $\frac{wL^2}{12}$1

h) Which one of the following is slope equation for cantilever beam with point load at free end? 01

(A) $\theta_B = \frac{Wl^2}{2EL}$ (B) $\theta_B = \frac{Wl^2}{3EL}$ (C) $\theta_B = \frac{Wl^2}{4EL}$ (D) $\theta_B = \frac{Wl^2}{6EL}$

i) Which one of the following is deflection equation for cantilever beam with point load at free end? 01

(A) $y_B = \frac{Wl^3}{3EL}$ (B) $y_B = \frac{Wl^3}{4EL}$ (C) $y_B = \frac{Wl^3}{5EL}$ (D) $y_B = \frac{Wl^3}{6EL}$

j) The radius of gyration of a rectangular section (depth *D*, width *B*) from a centroidal axis parallel to the width is 01

(A) $\frac{D}{2}$ (B) $\frac{D}{\sqrt{3}}$ (C) $\frac{D}{2\sqrt{3}}$ (D) $\frac{D}{4\sqrt{3}}$

k) The range within which a load can be applied on a rectangular column, to avoid any tensile stress, is 01

(A) one-half of the base
(B) one-fifth of the base
(C) one-fourth of the base
(D) one-fifth of the base

l) The shape of the bending moment diagram over the length of a beam, having no external load, is always 01

(A) linear
(B) parabolic
(C) cubical
(D) circular

m) Rate of change of bending moment is equal to 01

(A) shear force (B) deflection (C) slope (D) rate of loading

n) The variation of the bending moment in the portion of a beam carrying linearly varying load is 01

(A) linear (B) parabolic (C) cubic (D) constant

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

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

(a) A simply supported beam ACDB in which AC = 2.0 m, CD = 6.0 m, DB = 2.0 m is supported at A and B. It carries point load of 40 kN each at C and D and U.D.L. 20 kN/m for a length of 6.0 m on CD. Draw S.F. and B.M. diagram. 07

(b) Derive the bending equation $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ with usual notation. 07

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

(a) A overhanging beam is simply supported over two support apart at 8 m distance with 2 m overhang on both side. The beam is subjected with U.D.L. of 20 kN/m over entire length. Draw S.F. and B.M. diagram of the beam. 07

(b) Define following terms: 07

(a) Shear force
(b) Bending moment
(c) Point of contraflexure
(d) Shear force diagram

(e) Bending moment diagram
(f) Statically determinate beam
(g) Statically indeterminate beam

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

(a) Write assumptions made in the theory of bending. 05

(b) What is core of section or kernel? Draw core for the rectangular section and hollow circular section. 05

(c) Explain sagging moment and hogging moment with figure. 04

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

(a) 3 m cantilever beam 200 mm x 300 mm in section is subjected to U.D.L. on entire span so that induced maximum bending stress is 125 N/mm^2. find the value of U.D.L. 07

(b) A square column of size 500 mm x 500 mm is acted by load on one of its edge. If maximum compressive stress is 15 N/mm^2, calculate minimum intensity of stress and its nature. 07

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

(a) What are the points to be kept in mind while drawing S.F. and B.M. diagrams. 05

(b) Explain slope and deflection with sketches. 05

(c) Differentiate between: Axial load and Eccentric load. 04

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

(a) 6 m long hollow rectangular steel section has external dimensions 60 mm x 80 mm and 6 mm thickness, is used as strut keeping one end hinged and other end fixed. Calculate appropriate inertia, effective length and Euler's load. Take E = 200 GPa. 07

(b) A hollow circular column having outer diameter 100 mm and thickness is 25 mm. The both ends of column are fixed. If Euler's crippling load is 505 kN and E = 100 GPa, calculate length of column. 07

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

(a) A propeller shaft is having 400 mm external diameter and 200 mm internal diameter. When shaft is subjected to twisting moment of 50 kN.m, find maximum shear stress in the shaft. Modulus of rigidity G = 0.8 x 10^5 N/mm^2. If length of shaft is 4 m find angle of twist. 07

(b) Write assumptions of Euler's formula and show the effective length of column for different end conditions. 07