Code: 13A01301 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

STRENGTH OF MATERIALS – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Sketch the stress – strain diagram for mild steel.

(b) Write down the expressions for stress intensities due to gradually applied load, suddenly applied load and impact load.

(c) Define point of contraflexure and give an example.

(d) What is the relation between rate of loading, SF and BM.

(e) List the assumptions made in the theory of simple bending.

(f) Sketch the shear stress distribution across an I, T sections.

(g) State Mohr's theorems for slopes and deflections.

(h) A propped cantilever AB of span L is subjected to a u.d.l. of intensity w/m. Determine the reaction at the simply supported end and moment at the fixed end.

(i) Write down the relations between real beam and a conjugate beam.

(j) Define core of a section and sketch it for a rectangular section a x b.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 A steel tube 45 mm external diameter and 3 mm thick encloses centrally a solid copper bar of 30 mm diameter. The bar and the tube are rigidly connected together at the ends at a temperature of 30^0c. Find the stress in each metal, when heated to 180°C. Also find the increase in length, if the original length of the assembly is 300 mm. The coefficients of expansion of steel and copper are 1.08 x 10^{-5} and 1.7 x 10^{-5} respectively per °C. Take E = 2.1 x 10^5 N/mm^2 for steel and 1.1 x 10^5 N/mm^2 for copper.

OR

3 A rectangular block 250 mm x 100 mm x 80 mm is subjected to axial loads as follows:

480 kN Tensile in the direction of its length

900 kN Tensile on the 250 mm x 80 mm face

1000 kN Compressive on the 250 mm x 100 mm face.

Assuming Poisson's ratio as 0.25, find the strains in the direction of each force in terms of E. If E = 2 x 10^5 N/mm^2, find the modulus of rigidity and Bulk modulus for the material. Also, calculate the change in the volume of the block.

UNIT – II

4 An overhanging beam of length L carries a u.d.l of w/m on its whole length. It has one support at its left end and the other support is at a distance "a" from the other end. Find the value of "a" so that the maximum B.M for the beam is as small as possible. Also, find the maximum B.M for this condition.

OR

5 A simply supported beam is having a span of 6 m. A uniformly varying load having an intensity of zero at a distance of 1 m. from left end to 20 kN/m at a distance of4 m. from left end acts on the beam. A point load of 30 kN also acts on the beam at a distance of 1 m. from right end. Sketch S.F.D and B.M.D indicating all the salient points.

Contd. in page 2

UNIT – III

6 A cast iron beam is of an I-section with top flange 80 mm x 20 mm, bottom flange 160 mm x 40 mm, web 200 mm deep x 20 mm thick. The beam is supported on a span of 5 m. If the tensile stress is not to exceed 20 N/mm^2, find the safe u.d.l which the beam can carry. Also, find the maximum compressive stress. Sketch the bending stress distribution.

OR

7 A beam is of triangular in section having a base "b" and height "h". It is placed with its base horizontal. If at a certain section of the beam, the shear force is "S", find the maximum shear stress and the shear stress at the neutral axis. Sketch the shear stress distribution.

UNIT – IV

8 A simply supported beam is having a span of 8 m. A point load of 48 kN acts on the beam at a distance of 2 m. from left end. A u.d.l of 10 kN/m also acts over a distance of 4 m. from right end. Take E = 200 kN/mm^2 and I = 6.50 x 10^8 mm^4. Using Macaulay's method, Find the: (i) Slope at left end. (ii) Deflection under point load. (iii) Maximum deflection.

OR

9 An overhanging beam is having a span of 5 m. It has one support at its left end and the other support is at a distance of 1 m. from the right end. It carries a point load of 2 kN at a distance of 2 m. from left end and a u.d.l of 1 kN/m acts over a distance of 1 m. from right end. Using Moment-Area method, find the slope and deflection at the right end of the beam.

UNIT – V

10 A beam ABCD is simply supported at its ends A and D over a span of 30 m. It is made up of 3 portions AB, BC and CD, each 10 m. in length. The M.I. of these portions are I, 3I and 2I respectively, where I = 2 x 10^{10} mm^4. The beam carries a point load of 150 kN at B and a point load of 300 kN at C. Using Conjugate beam method, calculate the: (i) Slope at B. (ii) Deflection at C.

OR

11 A masonry chimney having the shape of a frustum of a cone is 25 m. high. The external diameter at the top and the internal diameter at the bottom is 2 m. The chimney is 0.5 m thick at the base. If the weight of the chimney is 1800 kN, find the uniform horizontal wind pressure that may act per unit projected area of the chimney in order that tension at the base may be just avoided.

*****