Code: 13A01401 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

STRENGTH OF MATERIALS – II

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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

(a) What is meant by principal plane and principle stresses?

(b) Sate maximum shear stress theory.

(c) Calculate the thickness of the metal required for a C.I. water main 800 mm diameter, for water under a static head of 100 m, if the permissible tensile stress is 20 N/mm^2. Consider the unit weight of water is 10 kN/m^3.

(d) What are the assumptions made in Lame' theory?

(e) Find the power transmitted by shaft 50 mm in diameter at 2.5 Hz if the maximum permissible shear stress is 80 N/mm^2.

(f) Write short notes on carriage leaf springs.

(g) What are the limitations of Euler' formula?

(h) Define equivalent length and slenderness ratio of column.

(i) Mention the assumption made in unsymmetrical bending.

(j) What is meant by shear centre?

PART – B

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

UNIT – I

2 (a) The stresses on two perpendicular planes through a point in a body are 560 MPa (tensile) and 280 MPa (compressive) along with shear stress of 150 MPa. Determine: (i) Principle stresses and location of the planes on which they act. (ii) Maximum shear stress and the plane at which they act.

(b) Explain the procedure of Mohr circle for stresses on oblique section of body subjected to direct stresses in two mutually perpendicular directions.

OR

3 In a material the principal stresses are 60 N/mm^2, 48 N/mm^2 and -36 N/mm^2. Calculate the: (i) Total strain energy. (ii) Volumetric strain energy. (iii) Shear strain energy. (iv) Factor of safety on total strain energy criterion if the material yields at 120 N/mm^2. Take E = 2 x 10^5 N/mm^2 and poison's ratio is 0.3.

UNIT – II

4 A steel cylinder is 2000 mm long, 1000 mm diameter, thickness of metal 10 mm. After being filled with water at atmospheric pressure, more water is pumped in until the pressure is 2 N/mm^2. On relieving the pressure, the water let out measured 2900 cm^3. If E for steel is 2 x 10^5 N/mm^2 and Poisson's ratio is 0.3, estimate the bulk modulus of water. Assume the ends to remain flat.

OR

5 A steel tube 240 mm external diameter is to be shrunk on another steel tube of 80 mm internal diameter. The common diameter at junction of the two tubes is to be 160 mm after shrinking–on. The original difference of diameters of the two tubes at the common junction is 0.08 mm. Calculate the hoop stresses in each tube after shrinking-on and also the radial pressure of the common surface. Take E = 200 GPa.

Contd. in page 2

UNIT – III

6 (a) A solid shaft transmits100 kW of power at 160 rpm. Find the diameter of the shaft if the permissible shear stress is 70 MPa. The maximum torque transmitted in each revolution exceeds mean by 20 %.

(b) At a certain cross section of a shaft 100 mm in diameter, there is a bending moment of 5 kN.m and a twisting moment of 7.5 kN.m. Calculate the maximum direct stress induced in the section, and specify the position of the plane on which it acts.

OR

7 (a) A truck weighing 20 kN and moving at 6 km/h has to be brought to rest by a buffer. Find how many springs, each of 15 coils will be required to store the energy of motion during a compression of 200 mm. The spring is made out of 25 mm diameter steel rod coiled to a mean diameter of 200 mm. Take $G = 0.945 \times 10^5$ N/mm^2.

(b) An open coil helical spring made up of 10 mm diameter wire and of mean diameter of 100 mm has 12 coils, angle of helix being 15^0. Determine the axial deflection and the intensity of bending stress under axial load of 500 N. Take G= 80 GPa and E = 200 GPa.

UNIT – IV

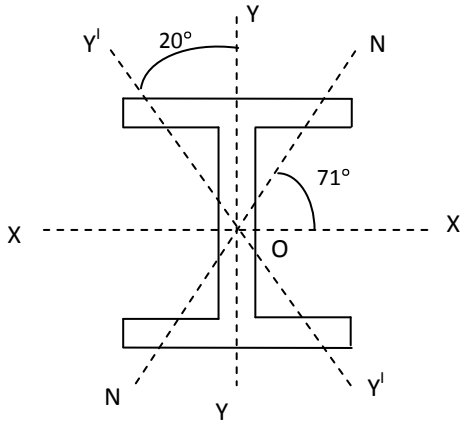
8 Derive the expression of Euler's crippling load for column both ends in fixed condition.

OR

9 Compare the crippling loads given by Euler's and Rankine's formulae for a tubular strut 2.25 m long having outer and inner diameters as37.5 mm and 32.5 mm loaded through pin-jointed at both the ends. Take E = 200GPa; yield stress = 315 MPa; a= 1/7500. If the elastic limit stress is taken as 200 MPa, then for what length of the strut does the Euler's formula ceases to apply.

UNIT – V

10 An ISWB 200 mm x 140 mm rolled steel beam is freely supported over a span of 2 m as shown in figure below. It is subjected to a bending moment of 10 kNm at the central section, the trace OY^1 of the plane loading being inclined at 20^0 to the principal axis OY. If I_{xx} = 2642.5 cm^4 and I_{yy} = 328.8 cm^4, locate then neutral axis and calculate the maximum bending stress induced in the section.



OR

11 A curved beam is in the form of full continuous circle in plane with a radius of 4 m and is supported continuously on six supports. The beam carrying a uniformly distributed load of 2 kN/m length inclusive of its own weight. Determine the bending moment and twisting moment at salient locations. The coefficients C_1, C_2 and C_3 are 0.089, 0.045 and 0.009 respectively. Plot the bending moment and twisting moment diagram.

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