Code: 15A01401

R15

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

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 principal plane?

(b) A point in a strained material is subjected to a compressive stress of 25 MPa. Determine the shear stress at an angle 45° with the direction of load.

(c) Differentiate between thin and thick shell.

(d) Explain Lame's equation.

(e) State the assumption made in the theory of pure torsion.

(f) List out various types spring with their uses.

(g) State the classification of columns.

(h) What is eccentric column?

(i) What is centroidal principal axes of a section?

(j) What is curved beam?

PART – B

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

UNIT – I

2 A rectangular steel bar is subjected to a tensile stress of 100 MPa as well as a shear stress of 40 MPa. Determine the principal stresses and the principal planes. Find also what stress acting alone can produce the same maximum strain. Take $\mu = 0.3$.

OR

3 In steel member at a point the major principal stress is 200 MPa and the minor principal stress is compressive. If the tensile yield point of the steel is 250 MPa, find the value of the minor principal stress at which yielding will commence, according to each of the following criteria of failure: (i) Maximum shear stress theory. (ii) Maximum total strain theory. (iii) Maximum shear strain theory.

UNIT – II

4 (a) Explain briefly the effect of internal pressure on the dimensions of a thin cylindrical shell.

(b) A cylindrical shell is 2.5 m long which is closed at the ends, has an internal diameter of 1 m and wall thickness of 10 mm. Determine the circumferential and longitudinal stresses induced and also change in the dimensions of the shell, if it is subjected to an internal pressure of 1 MPa. Take E = 210 GPa and $\mu = 0.3$.

OR

5 (a) Derive the Lame's equation for the stress in a thick cylinder.

(b) In a thick cylindrical shell of internal diameter 160 mm and external diameter 240 mm the maximum stress permitted is 20 MPa. The external pressure is 6 MPa. What is the internal pressure can be applied.

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UNIT – III

6 (a) Prove the relationship for a solid circular shaft $\frac{T}{J} = \frac{G\theta}{l}$.

(b) A solid circular shaft is transmit 300 kW at 120 rpm. Determine the diameter of the shaft, if shear stress is not to exceed 70 Mpa. What percentage saving in weight would be obtained if this shaft was replaced by a hollow one whose internal diameter $\frac{2}{3}$ of the external diameter. The length, material and maximum shear stress being the same.

OR

7 (a) Derive an expression for deflection of a leaf spring.

(b) A closely coiled spring is to have a stiffness of 900 N/m in compression, with a maximum load of 45 N and a maximum shearing stress of 120 MPa. The solid length of the spring is 45 mm. Find the wire diameter, mean coil radius and number of coils. Take G = 0.4 x 10^5 MPa.

UNIT – IV

8 (a) Determine the crippling load on a column when both ends of columns are hinged.

(b) An angular section 240 x 120 x 20 mm is used as 6 m long column with both ends are fixed. What is the crippling load for the column? Take E = 210 GPa.

OR

9 Design a hollow circular mild steel column, 6 m long, one end fixed and other end is hinged, to carry an axial load of 500 kN. Take the factor of safety as 3. The internal diameter is 0.65 times of the external diameter. The Rankine's constants are 320 MPa and $\frac{1}{7500}$.

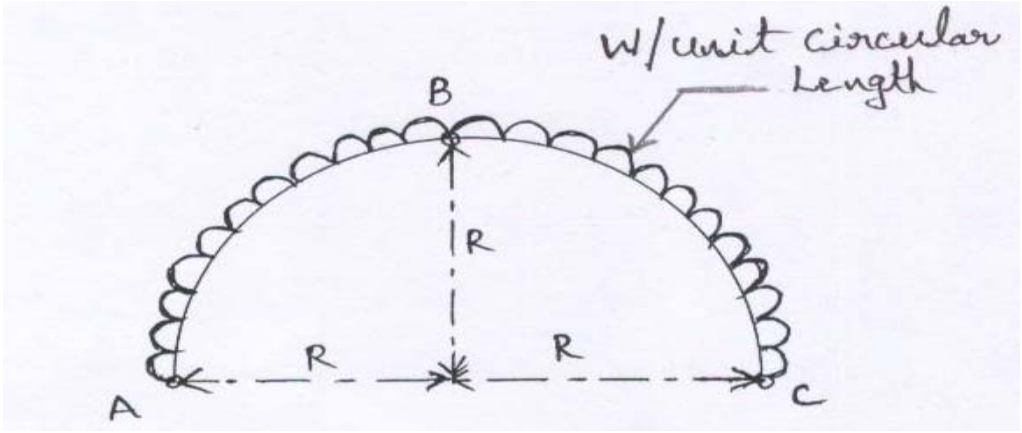
UNIT – V

10 (a) What is unsymmetrical bending?

(b) Determine the principal moments of inertia for an unequal angle section 200 x 150 x 10 mm.

OR

11 A curved beam as shown in figure below is semicircular in plan and supported on three equally spaced supports. The beam carries a uniformly distributed load *w* per unit of the circular length. Analyze the beam and sketch the bending moment and twisting moment diagrams.



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