Code: 13A01308

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2015

MECHANICS OF SOLIDS

(Mechanical 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) Define resilience and proof resilience.
(b) Define volumetric strain.
(c) Differentiate between a cantilever and a simply supported beam.
(d) What are the sign conventions for shear force and bending moment in general?
(e) What do you understand by neutral axis and moment of resistance?
(f) What is section modulus?
(g) What are the assumptions made in Torsion of circular shafts?
(h) What is moment – area method? Where is it conveniently used?
(i) Define thin cylinders.
(j) Differentiate between a thin cylinder and a thick cylinder.

PART - B

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

UNIT - I

2 A steel tube of 30 mm external diameter and 20 mm internal diameter encloses a copper rod of 15 mm diameter to which it is rigidly joined at each end. If at a temperature of 10℃ there is no longitudinal stress, calculate the stresses in the rod and tube when the temperature is raised to 200℃. Take E for the steel and copper as 2.1 x 10^5 N/mm^2 and 1 x 10^5 N/mm^2 respectively. The value of coefficient of linear expansion of steel and copper is given as 11 x 10^{-6} per ℃ and 18 x 10^{-6} per ℃ respectively.

(OR)

3 Derive an expression for young's modulus in terms of bulk modulus and Poisson's ratio.

UNIT - II

4 A simply supported beam of length 10 m carries the uniformly distributed load 10 kN/m and two point loads 50 kN and 40 kN at 4m apart from a distance of 4 m from the right end. Draw the S.F and B.M diagrams for the beam. Also calculate the maximum bending moment.

(OR)

5 A horizontal beam 10 m long is carrying a uniformly distributed load of 1 kN/m. The beam is supported on two supports 6 m apart. Find the position of the supports, so that B.M on the beam is as small as possible. Also draw the S.F and B. M diagrams.

UNIT - III

6 Prove the relation, M/I =f/y=E/R.

(OR)

7 An I – section beam 350 mm x 150 mm has a web thickness of 10 mm and flange thickness of 20 mm. If the shear force acting on the section is 40 kN, find the maximum shear stress developed in the I –section. Sketch the shear stress distribution across the section.

UNIT - IV

8 Derive an expression for the shear stress produced in a circular shaft which is subjected to torsion. What are the assumptions made in Torsion?

(OR)

9 A beam of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Find (i) Deflection under each load (ii) Max deflection and (iii) The point at which max deflection occurs. Take E = 2 x 10^5 N/mm^2 and I = 85 x 10^6 mm^4.

UNIT - V

10 A spherical vessel 2.5 m diameter is subjected to an internal pressure of 42 N/mm^2. Find the thickness of the plate required if max stress is not to exceed 250 N/mm^2 and joint efficiency is 75%.

(OR)

11 What do you mean by Lami's equation? How will you derive these equations?

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