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Total No. of Pages : 02

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B.Tech.(ANE) (Sem.–3)

STRENGTH OF MATERIALS–I

Subject Code : ME-201

M.Code : 59001

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :

(a) Define Stress and strain and write their units.

(b) State and explain Hooke's law.

(c) Define Shear Force and give its sign conventions.

(d) Write the relation between loading, shear force and bending moment.

(e) Give the practical applications of flitched beams.

(f) Define Torsion rigidity and write its formula.

(g) State and explain circumferential stress in thin cylinders.

(h) Define Slenderness ratio.

(i) Define the terms : slope and deflection.

(j) Name various methods used to find slope and deflection.

SECTION-B

2. Draw and explain stress strain diagram for a ductile material.

3. The intensity of loading in a simply supported beam of 8 m span varies gradually from 2 kN/m at one end to 6 kN/m, at the other end. Draw the shearing force and bending moment diagrams for the beam.

4. Derive Bending Equation.

5. A close coiled helical spring has mean diameter of 75 mm and spring constant of 80 kN/m. It has 8 coils. What is the suitable diameter of the spring wire if maximum shear stress is not to exceed 250 MN/m^2? Modulus of rigidity of the spring wire material is 80 G N/m^2. What is the maximum axial load the spring can carry?

6. A solid round bar 60 mm in diameter and 2.5 m long is used as a strut. One end of the strut is fixed, while its other end is hinged. Find the safe compressive load for this strut, using Euler's formula. Assume, E = 200 G N/m^2 and factor of safety = 3.

SECTION-C

7. A steel tube 2.4 cm external diameter and 1.8 cm internal diameter encloses a copper rod 1.5 cm diameter to which it is rigidly connected at the two ends. If at a temperature of 10°C there is no longitudinal stress, calculate the stresses in the rod and the tube when the temperature is raised to 200°C. Give, $E_{steel} = 2.1 \times 10^5$ M/mm^2, $E_{copper} = 1.0 \times 10^5$ N/mm^2, thermal external coefficients for steel and copper are 11×10^{-6}/°C and 18×10^{-6}/°C respectively.

8. A cylindrical shell 3 m long which is closed at the ends has an internal diameter of 1 m and a wall thickness of 15 mm. Calculate the circumferential and longitudinal stresses induced and also change in the dimensions of the shell if it is subjected to an internal pressure of 1.5 MN/m^2. Take E = 200 GN/m^2, and Poisson's ratio = 0.3.

9. A timber beam of rectangular section 10 cm wide and 25 cm deep is simply supported over a span of 4 m. What uniformly distributed load in kN/m should the beam carry to produce a central deflection of 0.6 cm? Calculate the slope also. Take, E = 11 GN/m^2.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.