Reg. No. : | | | | | | | | | | |

Question Paper Code: 34075

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Mechanical Engineering

01UME405 – STRENGTH OF MATERIALS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define principal planes and principal stresses.
2. Define: Resilience.
3. What do you mean by the point of contraflexure?
4. Write the equation for the simple bending theory.
5. Distinguish between closed coil helical spring and open coil helical spring.
6. What kind of stress introduced when an axial load acts on a closed and open coiled spring?
7. State the limitations of Euler's formula.
8. State the condition for the use of Macaulay's method.
9. Define principal planes and principal stresses.
10. What are types of stress in a thin cylindrical vessel subjected to internal pressure?

PART - B (5 x 16 = 80 Marks)

11. (a) A steel rod of 20*mm* diameter passes centrally through a copper tube of 50*mm* external diameter and 40*mm* internal diameter. The tube is closed at each end by rigid plates of negligible thickness. The nuts are tightened lightly home on the projecting parts of the rod. If the temperature of the assembly is raised by 50 ˚*C*, calculate the stress developed in copper and steel. Take *E* for steel and copper as 200 GN/m^2 and 100 GN/m^2 and α for steel and copper as 12 x 10^{-6} per ˚*C* and 18 x 10^{-6} per ˚*C*. (16)

Or

(b) A bar of 30mm dia is subjected to a pull of 60kN.The measured extension on a gauge length of 200mm is 0.09mm and the change in dia 0.0039 mm. calculate the poison, s ratio and the value of elastic constants. (16)

12. (a) A Simply supported beam 6 *m* span carries an UDL of 20 *kN/m* for left half of span and two point loads of 25 *kN* end 35 *kN* at 4 *m* and 5 *m* from left support. Find maximum shear force (SF) and bending moment (BM) and their location drawing SF and BM diagrams. (16)

Or

(b) Derive the shear stress equation for a rectangular cross section. (16)

13. (a) It is required to design a closed coiled helical spring which shall deflect 1*mm* under an axial load of 100 *N* at a shear stress of 90 *MPa*. The spring is to be made of round wire having shear modulus of 0.8 x 10^5 *MPa*. The mean diameter of the coil is 10 times that of the coil wire. Find the diameter and length of the wire. (16)

Or

(b) A helical spring of circular cross-section wire 18 mm in diameter is loaded by a force of 500N. The determine the maximum shear stress in the material of the spring. What number of coils must mean coil diameter of the spring is 125mm. The modulus of rigidity is 80 kN/mm^2. the spring have for its deflection to be 6 mm. (16)

14. (a) Using Moment area method, drive an expression for deflection of a simply supported beam subjected to uniformly distributed load for entire span. (16)

Or

(b) A beam *AB* of length 8 *m* is simply supported at its ends and carries two point loads of 50 *kN* and 40 *kN* at a distance of 2 *m* and 5 *m* respectively from left support *A*.

Determine, deflection under each load, maximum deflection and the position at which maximum deflection occurs. Take $E = 2 \times 10^5$ N/mm^2 and $I = 8.5 \times 10^6$ mm^4. (16)

15. (a) A point in a strained material the horizontal tensile stress is 80 N/mm^2 and the vertical compressive stress is 140 N/mm^2 The shear stress is 40N/mm^2. Find the principal stresses and the principal planes. Find also the maximum shear stress and its planes. (16)

Or

(b) A thin cylinder 1.5 *m* internal diameter and 5 *m* long is subjected to an internal pressure of 2 N/mm^2. If the maximum stress is limited to 160 N/mm^2, find the thickness of the cylinder. E = 200 kN/mm^2 and Poisson's ratio = 0.3. Also find the changes in diameter, length and volume of the cylinder. (16)