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

Question Paper Code: 31745

B.E. / B.Tech. DEGREE EXAMINATION, MAY 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. Distinguish between rigid and deformable bodies.
2. Define: Resilience.
3. What do you mean by the point of contraflexure?
4. State the theory of simple bending.
5. How will you find maximum shear stress induced in the wire of a close-coiled helical spring carrying an axial load.
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. Mention the advantage of Macaulay method.
9. Define principal planes and principal stresses.
10. Write any four applications of thin cells.

PART - B (5 x 16 = 80 Marks)

11. (a) A Mild steel rod of 20 mm diameter and 300 mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together, and the composite bar is subjected to an axial pull of 40 kN. If E for steel and copper is 200 GN/m^2 and 100 GN/m^2 respectively, find the stresses developed in the rod and the tube also find the extension of the rod. (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 cantilever of 2m length carries a point load of 20 kN at 0.8 m from the fixed end and another point of 5 kN at the free end. In addition, a u.d.l. of 15 kN/m is spread over the entire length of the cantilever. Draw the S.F.D, and B.M.D. (16)

Or

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

13. (a) A steel shaft ABCD having a total length of 2400 mm is contributed by three different sections as follows. The portion AB is hollow having outside and inside diameters 80 mm and 50 mm respectively, BC is solid and 80 mm diameter. CD is also solid and 70 mm and the total angle of twist. Maximum permissible shear stress is 50 Mpa and shear modulus 0.82 x 105 MPa. (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) Find the Euler critical load for a hollow cylindrical cast modulus of cast iron as 80 kN/mm^2. Compare this load with that given by Rankine formula. iron column 150

mm external diameter, 20 mm wall thickness if it is 6 m long with hinged at both ends. Assume Young's Using Rankine`s constants a =1/1600 and 567 N/mm^2. (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 closed cylindrical vessel made of steel plates 5 mm thick with plane ends, carries fluid under pressure of 6 N/mm^2. The diameter of the cylinder is 35cm and length is 85 cm. Calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take E =$2.1x10^5$ N/mm2 and 1/m = 0.286. (16)