PVP 14

Code: ME4T1

II B.Tech II Semester Regular/Supplementary Examinations - April 2019

MECHANICS OF SOLIDS - II
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11 x 2 = 22 M

1. a) State Clapeyron's theorem of three moments.
   b) What are the assumptions made for pure torsion of a Circular shafts?
   c) What is double integration method?
   d) What do you mean by statically indeterminate beam?
   e) Differentiate between straight and curved beams.
   f) What are the limitations of Euler's formula for buckling of columns?
   g) Define the terms: column and crippling load.
   h) State the criteria for the thin or thick cylinders.
   i) What are the assumptions in the analysis of thin cylinders?
   j) Write the expression for power transmitted by a shaft.
   k) Briefly describe the procedure of Macaulay's method.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Derive the torsion equation. 8 M

   b) A solid circular shaft transmits 75kW power at 200rpm. Calculate the shaft diameter, if the twist in the shaft is not to exceed one degree in 2m length of shaft and shear stress is not exceed 50 N/mm^2. Assume the modulus of rigidity of the material of the shaft as 100 N/mm^2. 8 M

3. 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 16 M
   (i) Deflection under each load
   (ii) Maximum deflection
   (iii) The point at which the maximum deflection occurs.
   Take $I=85\times10^6$ mm^4 , $E = 2\times10^5$ N/mm^2

4. Derive Winkler-Bach formula for the given curved beam from first principles. Also sketch stress distribution across the depth of the section. 16 M

5. a) Derive the equivalent length of column fixed at one end and hinged at the other. 8 M

b) A steel pipe outside diameter 130mm, wall thickness 12.5mm supports an axial load of 25kN, which is applied at an eccentricity of 175mm from the pipe centerline. The column is fixed at its base, free at its upper end and its length is 4m. Determine maximum stress in the pipe. Take E=200GPa. 8 M

6. a) A cylindrical vessel whose ends are closed by means of rigid flange plates is made of steel plate 3 mm thick. The internal length and diameter of vessel are 50 cm and 25 cm respectively. Determine the longitudinal and circumferential stresses in the cylindrical shell due to an internal fluid pressure of 3 MN/m^2 the vessel. Take: E = 200 GN/m^2, and 1/m=0.3 6 M

b) Derive Lame's equations for a thick cylinder subjected to internal fluid pressure only. State your assumptions. 10 M