PVP 14

Code: ME4T1

II B. Tech II Semester Regular/Supplementary Examinations
October - 2020

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) A solid shaft of 150 mm diameter is used to transmit torque. Compute the maximum torque transmitted by the shaft if the maximum shear stress induced in the shaft is 45 N/mm^2.
b) A solid circular shaft of diameter 100 mm is subjected to a torque of 10 kN-m. Determine the shear stress.
c) If a solid circular shaft of steel 2 cm in diameter is subjected to a permissible shear stress of 10 kN/cm^2, then the value of the twisting moment will be?
d) A cantilever beam carries a load W uniformly distributed over its entire length. If the same load is placed at the free end of the same cantilever, then the ratio of maximum deflection in the first case to that in the second case will be?
e) A cantilever beam of length L, moment of inertia I, Young's modulus E carries a concentrated load W at the

middle of its length. What is the slope of cantilever at the free end.

f) State the Clapeyron's theorem of three moments.

g) Write the assumptions made in derivation of stresses in a curved beam.

h) Find the slenderness ratio of the column has a rectangular cross-section of 10 x 20 mm and a length of 1 m.

i) If diameter of a long column is reduced by 20%, the percentage of reduction in Euler buckling load would be?

j) A thick-walled hollow cylinder having outside and inside radii of 90 mm and 40 mm respectively is subjected to an external pressure of 800 MN/m^2. Find the radius at which the maximum circumferential stress in the cylinder will occur.

k) A cylindrical pipe of diameter 1m and thickness 10 mm is subjected to internal fluid pressure of 0.8 N/mm^2. Find the circumferential stress developed in the pipe.

PART – B

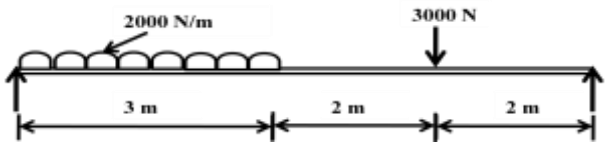
Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) What must be the length of a 5 mm diameter aluminum wire so that it can be twisted through one complete revolution without exceeding a shear stress of 42 MPa? Take G= 27 GPa. 8 M

b) A solid shaft has to transmit 75 kW power at 200 rpm. Take allowable shear stress as 70 MPa, estimate the suitable diameter of the shaft if the maximum torque transmitted at each revolution exceeds the mean by 30%. 8 M

3. Evaluate the slopes at the supported ends, the deflections at the mid span and under the load 3000N of the beam loaded as shown in Figure given below. 16 M



4. A crane hook carries a load of 7.5 kN and the load line is at a distance of 20 mm from the inner edge of the section which is trapezoidal. The load line also passes through the centre of curvature of the hook. The dimensions of the central horizontal trapezoidal section are: inner width =30 mm; outer width = 15 mm and depth =30 mm. Calculate the maximum and minimum stresses. Also plot the variation of stress across the section. 16 M

5. a) 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 GN/m^2 and factor of safety =3. 6 M

b) A hollow cylinder CI column is 4 m long with both ends fixed. Estimate the minimum diameter of the column if it has to carry a safe load of 250 kN with a factor of safety of 5. Take the internal diameter as 0.8 times the external diameter. Take σ_c = 550 MPa and a=1/1600 in Rankine's formula. 10 M

6. a) At atmospheric pressure a thin spherical shell has a internal diameter 750 mm and thickness 10 mm. Find the hoop stress induced and change in diameter and volume when the fluid pressure increased to 1.6 N/mm^2. Take E= 200 GPa and v= 0.3. 6 M

b) Estimate the maximum hoop stress across the section of a pipe of external diameter 600 mm and internal diameter 440 mm, when the pipe is subjected to an internal fluid pressure of 9 N/mm^2. Sketch the radial pressure distribution and hoop stress distribution across the section. 10 M