PVP 17

Code: **17MEMD1T1**

I M.Tech - I Semester – Regular / Supplementary Examinations
December 2018

ADVANCED MECHANICS OF SOLIDS
(MACHINE DESIGN)

Duration: 3 hours Max. Marks: 60

Answer the following questions.

1. The state of stress at a point is characterized by the components

σ_x = 12.31 MPa, σ_y = 8.96 MPa, σ_z = 4.34 MPa

τ_{xy} = 4.20 MPa, τ_{yx} = 5.27 MPa, τ_{zx} = 0.84 MPa

a) Find the values of the principal stresses 9 M

b) Find the orientation of principal planes 6 M

(OR)

2. a) Name the various theories of failure available for ductile and brittle materials. 5 M

b) Explain any three theories of failure along with the relevant equations & applications. 10 M

3. a) Explain the concept of shear center. State its significance. 5 M

b) A 4-mm thick plate of steel is formed into the cross section shown in Figure 1. Locate the shear center for the cross section. 10 M

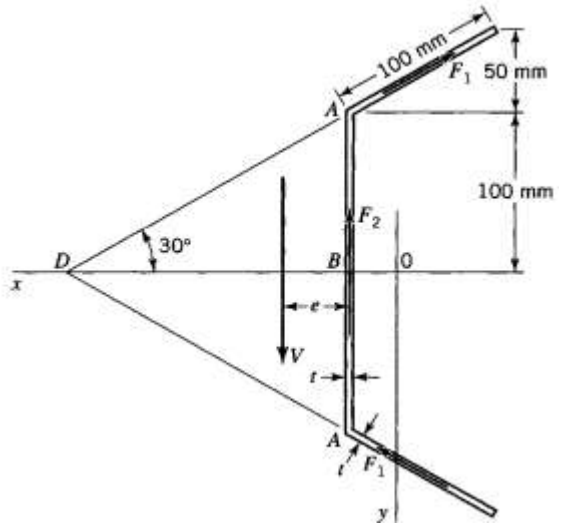

Figure 1

(OR)

4. A T-shaped cantilever beam of structural steel is subjected to a transverse load P at its free end (Figure 2). The beam is 6.1 m long. According to the Tresca yield criterion, the material yields when the maximum shear stress reaches 165 MPa. Determine the maximum load P. 15 M

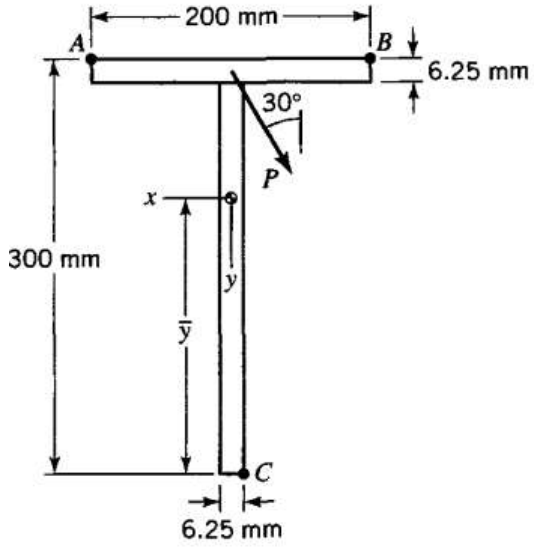

Figure 2

5. A crane hook has a trapezoidal section at A-A as shown in Figure 3. Plot the distribution of stresses across the section A-A. 15 M

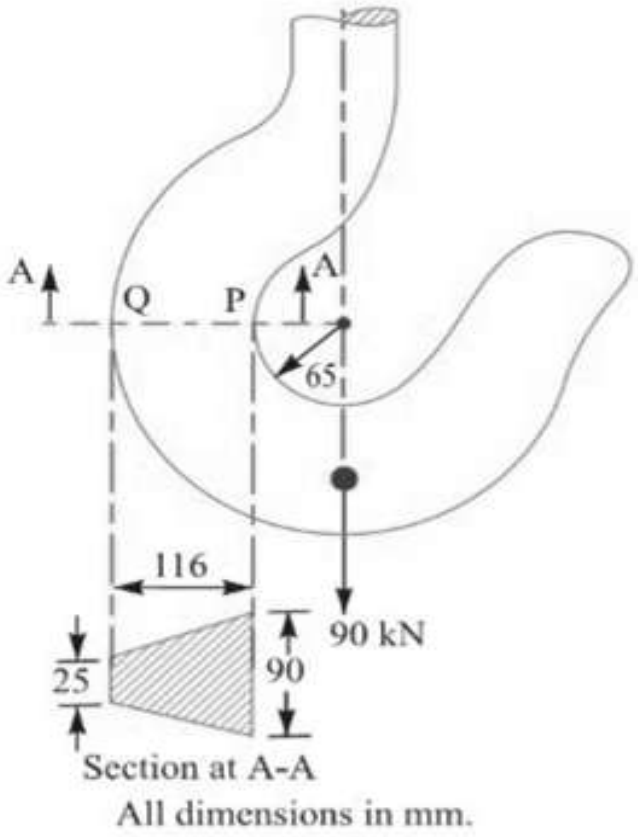

Figure 3

(OR)

6. Consider a solid disk of radius b subjected to an angular velocity ω. Determine the polar coordinate stresses σ_{rr} and $\sigma_{\theta\theta}$ in the disk as functions of ρ (density), υ (Poisson's ratio), r (distance from the center), b, and ω. 15 M

7. The two tubular sections 1 and 2 shown in Figure 4 have the same wall thickness ‘t’ and same circumference. Neglecting stress concentration, find the ratio of the shear stresses for
a) equal twisting moments in the two cases and
b) equal angles of twist in the two cases. 15 M

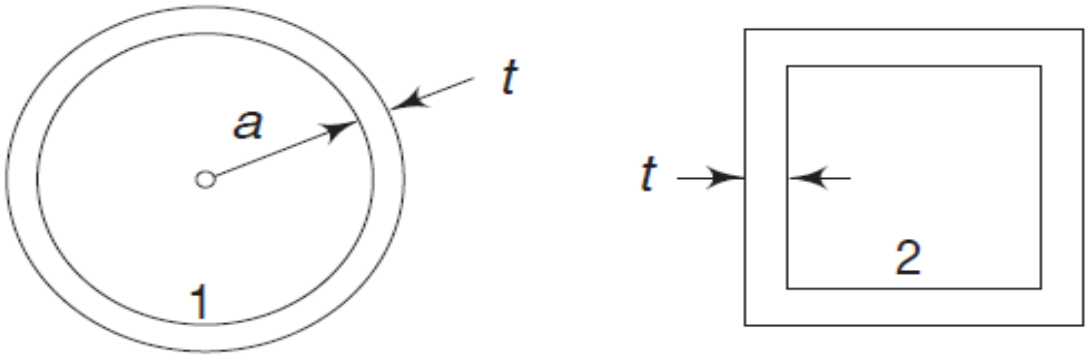

Figure 4

(OR)

8. The cantilever beam in Figure 5 is subjected to a uniformly distributed load ‘*w*’. Determine the deflection of the free end by including the shear strain energy effect also. 15 M

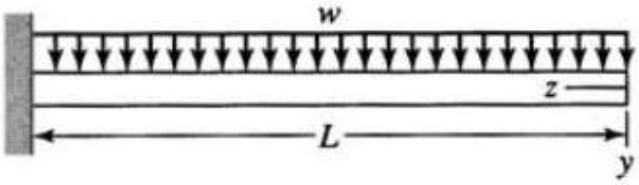

Figure 5