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Program **B.Tech civil**
Subject **Mechanics of Material**
Assignment **No 2**

Q NO 1. A solid shaft of 80 mm diameter rotates with 280 rpm. If permissible shear stress is 130 MPa, find torque.

Given data . As we know that

$$D = 80\text{mm}$$

$$N = 280 \text{ rpm}$$

$$\tau = 130 \text{ MPa}$$

Sol.

$$\frac{T}{J} = \frac{T_{Max}}{R}$$

$$J = \frac{\pi D^4}{32} = \frac{\pi(0.08)^4}{32}$$

$$J = 4.096 \times 10^{-5}$$

$$T = \frac{T_{max} \times J}{R} = \frac{130 \times 10^6 \times 4.096 \times 10^{-5}}{280}$$

$$T = \frac{5324.8}{280}$$

$$T = 19.017 \text{ pa}$$

Q NO 2. External and internal diameter of a propeller shaft is 500mm and 250mm respectively. Find maximum shear stress developed in the cross section when a twisting moment of 60KN-m is applied. If span of shaft is 6m, also find twisting angle of shaft. Take modulus of rigidity, $G = 0.8 \times 10^3 \text{ N/mm}^2$.

Given data..

$$D = 500\text{mm}$$

$$d = 250\text{mm}$$

$$T = 60 \text{ KN-m}$$

$$L = 6\text{m}$$

Sol. As we know that

$$T = \frac{\pi}{16} \times \tau \times D (4) \frac{d(4)}{D}$$

$$60 \times 1000000 = \frac{3.142}{16} \times \tau \times 500(4) - 250(4)/500$$

$$\tau = 3.708 \text{ KN/mm}^2$$

$$\tau/R = G \Theta/l \dots\dots\dots$$

$$R = D/2 \dots\dots 500/2 = 250\text{mm} = 0.081 \text{ radians}$$