## Answers with Explanation (Objective)

**1. Ans. (d)** $\tau = \frac{T \times r}{J} = \frac{16T}{\pi d^3}$

**2. Ans. (a)**

**3. Ans. (a)**

**4. Ans. (c)** $\tau = \frac{16T}{\pi d^3}$ or $T = \frac{\tau \pi d^3}{16}$ for same material $\tau$ = const.

$\therefore T \alpha\ d^3$ or $\frac{T_2}{T_1} = \left(\frac{d_2}{d_1}\right)^3 = \left(\frac{60}{30}\right)^3 = 8$

**5. Ans. (b)**

**6. Ans. (d)**

**7. Ans. (b)** Shear stress $= \frac{16T}{\pi d^3}$ and normal stress $= \frac{32T}{\pi d^3}$

:. Ratio of shear stress and normal stress = 1: 2

**8. Ans. (c)**

**9. Ans. (a)** $\tau = \frac{16T}{\pi d^3}$

**10. Ans. (c)** $\tau = \frac{16T}{\pi d^3}$, $240 = \frac{16T}{\pi d^3}$ if diameter doubled d′ = 2d, then $\tau' = \frac{16T}{\pi (2d)^3} = \frac{240}{8} = 30 MPa$

**11. Ans. (c)** $\tau = \frac{16T}{\pi d^3}$ As T & d both are same $\tau$ is same

**12. Ans. (d)**

**13. Ans. (b)** $\frac{T}{J} = \frac{\tau}{R}$

**14. Ans. (b)**

**15.** Ans. (b) $\frac{T}{J} = \frac{\tau}{R}$ Here T & $\tau$ are same, so $\frac{J}{\tau}$ should be same i.e. polar modulus of section will be same.

**16. Ans. (c)** $\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{L}$ or $\tau = \frac{GR\theta}{L}$ $\therefore \tau \propto \frac{1}{L}$

**17. ans. (b)** $\frac{T}{J} = \frac{G\theta}{L} = \frac{\tau}{R}$ gives $T = \frac{\tau J}{R} = \frac{\sigma_s \times \frac{\pi}{32}(D^4 - d^4)}{\frac{D}{2}} = \frac{\pi}{16}\sigma_s \frac{(D^4 - d^4)}{D}$

**18. Ans. (d)** $\frac{T}{J} = \frac{\tau}{r}$ or $T = \frac{\tau J}{r}$

$or \frac{\tau J_s}{r_s} = \frac{\tau_h J_h}{r_h}; \left[r_s = r_h = \frac{D}{2}\right]$