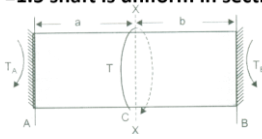
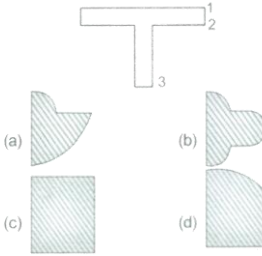


01. For the circular shaft AB, as shown in the figure, a torque 'T' is applied at the section XX at C, such that $b/a = 1.5$ shaft is uniform in section $\frac{z}{z_0} = ?$



- a. 3
b. 1.5
c. 0.67
d. 0.5
02. Which of the following diagrams indicates the shear stress distribution for the beam as shown in the figure?



03. A 40 mm diameter shaft is subjected to a twisting moment M_t . If max shear stress developed in shaft is 5 N/mm^2 , what is the value of the twisting moment?

- a. 628.8 Nm
b. 638.4 Nm
c. 62.8 Nm
d. 30.4 Nm

04. Torsion applied to a circular shaft results in a twist of 1° over a length of 1 m. the maximum shear stress induced is 120 N/mm^2 and the modulus of rigidity of the shaft material is $0.8 \times 10^5 \text{ N/mm}^2$. What is the radius of the shaft

- a. $300/\pi$
b. $180/\pi$
c. $90/\pi$
d. $270/\pi$

05. A solid shaft rotating at 180 rpm is subjected to a mean torque of 5000 Nm. What is the power transmitted by the shaft in KW?

- a. $25/\pi$
b. $20/\pi$
c. $60/\pi$
d. $270/\pi$

06. A circular shaft which has diameter of 100 mm is subjected to a torque of 5 kN-m. the max shear stress, in N/mm^2 , induced shaft would be

- A. $\frac{160}{\pi}$ B. $\frac{120}{\pi}$
C. $\frac{125}{\pi}$ D. $\frac{80}{\pi}$

07. A solid circular shaft subjected to a torque T produce maximum shear stress f_s which is the maximum principal value in the material. The corresponding diameter of the shaft should be

- A. $3\sqrt{\frac{\pi f_s}{16T}}$ B. $3\sqrt{\frac{32T}{\pi f_s}}$
C. $3\sqrt{\frac{\pi}{16Tf_s}}$ D. $3\sqrt{\frac{16T}{\pi f_s}}$

08. If
A = cross-sectional area
E = Young's modulus of elasticity
G = Modulus of rigidity
I = Moment of inertia
J = Polar moment of inertia

- a. AE
b. GE
c. EI
d. GJ

09. In a circular shaft of diameter d, subjected a torque T, the maximum shear stress induced is

- a. Proportional to d^3
b. Proportional to d^4
c. Inversely Proportional to d^3
d. Inversely Proportional to d^4

10. Which of the following terms represents the torque corresponding to a twist of one radian in a shaft over its unit length?

- a. Torsional stress
b. Torsional rigidity
c. Flexural rigidity
d. Moment of resistance

11. If a shaft turning at N r.p.m and the mean torque to which the shaft is subjected is T N - m, the power transmitted by the shaft in kW would be

- A. $\frac{2\pi NT}{45000}$ B. $\frac{2\pi NT}{60000}$
C. $\frac{2\pi NT}{30000}$ D. $\frac{2\pi NT}{33000}$

12. If a shaft rotates at 100 r.p.m and is subjected to a torque of 3000 N-m, the power transmitted in kW would be

- a. 30π
b. 15π
c. 20π
d. 10π

13. The ratio of torsional moments of resistance of a solid circular shaft of diameter D to that of a hollow shaft with external diameter D and internal diameter d is

(Both the shaft are of the same material)

- A. $\frac{D^4}{D^4-d^4}$ B. $\frac{D^4-d^4}{D^4}$
C. $\frac{D^3}{D^3-d^3}$ D. $\frac{D^3-d^3}{D^3}$

14. A bar AB of diameter 40mm and 4m long is rigidly fixed at its ends. A torque 600 N-m is applied at a section of the bar, 1m from end A. the fixing couples T_A and T_B at the supports A and B, respectively are

- a. 200 N-m and 400 N-m
b. 300 N-m and 150 N-m
c. 450 N-m and 150 N-m
d. 300 N-m and 100 N-m

15. A solid circular shaft has been subjected to a pure torsion moment. The ratio of maximum shear stress to maximum normal stress at any point would be

- a. 1 : 2
b. 1 : 1
c. 2 : 3
d. 2 : 1

16. Which of the following terms represents the torque that produces a twist of one radian in a shaft of unit length?

- a. Torsional stress
b. Torsional rigidity
c. Flexural rigidity
d. Moment of resistance

17. A 60 mm dia. Shaft is subjected to a torque of 6 kN-m. $G = 8 \times 10^4 \text{ N/mm}^2$. The maximum shear stress induced in the shaft in N/mm^2 will be

- A. $8000/9\pi$
B. $4000/9\pi$
C. $12000/9\pi$
D. $16000/9\pi$

18. The circular shaft of diameter D is subjected to a torque T . the maximum shear stress of the shaft will be

- a. Proportional to D^3
- b. Proportional to D^2
- c. Inversely Proportional to D^3
- d. Inversely Proportional to D^4

19. A hollow shaft of 16 mm outside diameter 12 mm inside diameter is subjected to a torque of 40 N-m. the shear stresses at the outside and inside of the material of the shaft are respectively

- a. 62.75 N/mm² and 50.00 N/mm²
- b. 72.75 N/mm² and 54.54 N/mm²
- c. 79.75 N/mm² and 59.54 N/mm²
- d. 80.75 N/mm² and 40.00 N/mm²

20. A metal shaft of solid circular section rotates at 160 rpm and is subjected to a torque of 1500 Nm. What is the power, in kW, transmitted by the shaft?

- a. 32π
- b. 16π
- c. 12π
- d. 8π

21. What is the power transmitted by a 100 mm diameter solid shaft at 150 rpm without exceeding maximum stress of 60 N/mm² ?

Take $\pi^2 = 10$.

- a. 187.5 kW
- b. 18.75 kW
- c. 1.875 kW
- d. 1875 kW

