

1. Which factor is considered in the design of a shaft subjected to combined bending, twisting, and axial loading?

- a) Yield strength
- b) Modulus of elasticity
- c) Fatigue factor
- d) Poisson's ratio

Answer: c) Fatigue factor

Explanation: When a shaft is subjected to combined bending, twisting, and axial loading, the fatigue factor is considered to ensure the shaft's endurance against cyclic loading and prevent failure due to fatigue.

2. What is the primary consideration in designing a shaft for rigidity?

- a) Material strength
- b) Diameter
- c) Surface finish
- d) Young's modulus

Answer: b) Diameter

Explanation: Rigidity in a shaft primarily depends on its diameter. Larger diameters offer greater rigidity, reducing deflection under load.

3. Which factor is accounted for in the design of a shaft to withstand dynamic loads?

- a) Shock factor
- b) Yield strength

- c) Ultimate strength
- d) Fatigue limit

Answer: a) Shock factor

Explanation: Dynamic loads induce sudden changes in force, requiring consideration of shock factors to prevent failure in shaft design.

4. In the design of keys and shaft couplings, what parameter is crucial for transmitting torque efficiently?

- a) Length
- b) Width
- c) Material density
- d) Clearance

Answer: b) Width

Explanation: The width of keys and shaft couplings is crucial for transmitting torque efficiently by ensuring sufficient surface area for load distribution.

5. What is the primary concern when designing a shaft under shock loading conditions?

- a) Fatigue strength
- b) Yield strength
- c) Surface hardness
- d) Thermal conductivity

Answer: a) Fatigue strength

Explanation: Shock loading introduces rapid and severe stress changes, making fatigue

strength a primary concern to prevent premature failure.

6. What factor is essential to consider for the design of a shaft subjected to fatigue loading?

- a) Static loading capacity
- b) Endurance limit
- c) Elastic modulus
- d) Thermal expansion

Answer: b) Endurance limit

Explanation: Endurance limit defines the maximum stress a material can endure indefinitely without failing under cyclic loading, crucial for shaft design under fatigue conditions.

7. Which characteristic of a shaft primarily influences its resistance to bending moments?

- a) Surface finish
- b) Cross-sectional area
- c) Material density
- d) Poisson's ratio

Answer: b) Cross-sectional area

Explanation: The cross-sectional area of a shaft determines its resistance to bending moments, with larger cross-sections offering greater resistance.

8. What parameter should be optimized in the design of keys to prevent shear failure?

- a) Length
- b) Clearance

- c) Material hardness
- d) Thickness

Answer: d) Thickness

Explanation: The thickness of keys should be optimized to withstand shear forces and prevent shear failure during operation.

9. What is the primary function of a shaft coupling in a mechanical system?

- a) Transmit torque
- b) Absorb shock
- c) Increase stiffness
- d) Reduce friction

Answer: a) Transmit torque

Explanation: Shaft couplings primarily serve to transmit torque from one shaft to another, ensuring power transfer within a mechanical system.

10. Which property is crucial for the material selection in designing shafts for high-speed applications?

- a) Toughness
- b) Ductility
- c) Fatigue resistance
- d) Thermal conductivity

Answer: c) Fatigue resistance

Explanation: In high-speed applications, shafts experience cyclic loading, necessitating

materials with high fatigue resistance to prevent premature failure.

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