- 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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