1. Which equation is commonly used to calculate the bending stress in spur and helical gears according to AGMA standards?

a) Euler’s equation
b) Hooke’s law
c) AGMA Bending stress equation
d) Pascal’s principle

Answer: c) AGMA Bending stress equation

Explanation: The AGMA (American Gear Manufacturers Association) Bending stress equation is widely used in gear design to calculate the bending stress on gear teeth, considering factors such as tooth geometry, load distribution, and material properties.

2. What is the primary mode of failure in gear teeth due to excessive bending stress?

a) Shear failure
b) Fatigue failure
c) Torsional failure
d) Creep failure

Answer: b) Fatigue failure

Explanation: Fatigue failure occurs in gear teeth due to repeated loading and unloading, which leads to the propagation of cracks and ultimately fracture, primarily caused by bending stresses.

3. The AGMA Contact stress equation is primarily used to calculate:

a) Surface wear of gear teeth
b) Tooth deflection
c) Contact stress between gear teeth
d) Shear stress distribution

Answer: c) Contact stress between gear teeth

Explanation: The AGMA Contact stress equation is employed to estimate the stress at the contact point between gear teeth, which is crucial for assessing the gear's load-bearing capacity and potential for tooth surface failure.

4. What property does the form factor account for in gear design?

a) Material strength
b) Tooth geometry
c) Lubrication
d) Thermal conductivity

Answer: b) Tooth geometry

Explanation: The form factor in gear design accounts for the variation in stress concentration along the tooth profile, considering factors such as tooth shape, size, and curvature.

5. Which equation is used to determine the beam strength of gear teeth?

a) Euler-Bernoulli equation
b) Navier-Stokes equation
c) Lewis equation

d) Poisson’s equation

Answer: c) Lewis equation

Explanation: The Lewis equation is utilized to calculate the beam strength of gear teeth, considering the tooth dimensions, material properties, and loading conditions.

6. What is the purpose of the virtual number of teeth in gear design?

a) To account for tooth wear
b) To improve gear meshing efficiency
c) To calculate the contact ratio
d) To simplify gear calculations

Answer: c) To calculate the contact ratio

Explanation: The virtual number of teeth is used to calculate the contact ratio, which indicates the extent of tooth engagement between mating gears and affects factors such as load distribution and gear noise.

7. Which material property is crucial for ensuring surface strength and wear resistance in gears?

a) Young’s modulus
b) Hardness
c) Thermal conductivity
d) Electrical resistivity

Answer: b) Hardness

Explanation: Hardness is critical for ensuring surface strength and wear resistance in gears, as it determines the material's ability to withstand abrasive forces and maintain dimensional stability under load.

8. What is the primary mode of failure due to excessive surface wear in gear teeth?

a) Pitting
b) Scoring
c) Wear fatigue
d) Spalling

Answer: a) Pitting

Explanation: Pitting is a form of surface fatigue failure in gear teeth caused by repeated contact stresses and sliding motion, leading to the formation of small pits and ultimately surface roughening and material loss.

9. Which factor is considered in gear design to ensure strength against wear?

a) Surface roughness
b) Lubrication viscosity
c) Material hardness
d) Tooth profile geometry

Answer: c) Material hardness

Explanation: Material hardness is crucial in gear design to ensure strength against wear, as harder materials are more resistant to abrasive forces and can withstand prolonged contact without significant surface damage.

10. What is a key consideration in the design of helical gears compared to spur gears?

a) Contact ratio
b) Tooth profile
c) Axial thrust
d) Form factor

Answer: c) Axial thrust

Explanation: Helical gears generate axial thrust due to their inclined tooth profiles, which must be considered in their design to prevent excessive axial loading and ensure proper gear alignment and performance.

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