|  |  |  |
| --- | --- | --- |
| **FLUCTUATING LAOD**  1)   Line joining Syt (yield strength of the material) on mean stress axis and Se (endurance limit of the component) on stress amplitude axis is called as \_\_\_\_\_  a. Goodman line b. Soderberg line  c. Gerber line d. None of the above   |  | | --- | | Ans-d | |  | |
| 2)   Notch sensitivity (q) is given by the equation \_\_\_\_\_\_\_  where  Kf = fatigue stress concentration factor and  Kt = theoretical stress concentration factor  a. ( Kf + 1 ) / ( Kt – 1 ) b. ( Kf – 1 ) / ( Kt – 1 )  c. ( Kf + 1 ) / ( Kt + 1 ) d. ( Kf - 1 ) / ( Kt + 1 )   |  | | --- | |  | | Ans-b | |
| 3)   Which of the following conditions is true for repeated stress?  1. σm = 0 2. σm = σmax / 2 3. σm = σa  4. σmin = 0 5. σmin = – σmax    6. σa = σmax / 2  where  σm = mean stress and σa = stress amplitude  a. condition 2 and 3 b. condition 1, 3 and 5 c. condition 2, 4, and 6  d. condition 3,4, 5 and 6   |  | | --- | |  | | Ans-c | |
| 4)   In S-N diagram, the graph plotted between fatigue strength and number of stress cycles becomes horizontal for which type of materials?  a. Ferrous materials  b. Non-ferrous materials c. Both a. and b. d. None of the above   |  | | --- | |  | | Ans-a | |
| 5)   Match the following Group 1 items with Group 2 items and select the correct option  1. Size factor ----------------------------------------- A. Kc 2. Load factor ---------------------------------------- B. Kg 3. Temperature factor ------------------------------- C. Kb 4. Reliability factor --------------------------------- D. Kd  a. 1 – B, 2 – A, 3 – D, 4 – C  b. 1 – C, 2 – A, 3 – D, 4 – B  c. 1 – D, 2 – B, 3 – A, 4 – C  d. 1 – D, 2 – C, 3 – A, 4 – B   |  | | --- | | Ans-b | |  | |
| 6)   Which of the following equations is correct for Soderberg Criteria?  a. (σm / Sut) + (σa / Se) = (1 / Nf) b. (σm / Sut) - (σa / Se) = (1 / Nf) c. (σm / Syt) + (σa / Se) = (1 / Nf)  d. (σm / Sut) - (σa / Se) = (1 / Nf)   |  | | --- | |  | | Ans-c | |
| 7)   Calculate fatigue stress concentration factor, when theoretical stress concentration factor is 1.62 and notch sensitivity is equal to 0.9  a. 1.558  b. 3.358 c. 1.162 d. None of the above   |  | | --- | |  | | Ans-a | |
| 8)   According to Modified Goodman Diagram for fluctuating torsional shear stress, which line defines fatigue failure?  https://www.careerride.com/testimagehandler.ashx?id=10328  a. Line joining point Sys on mean stress and stress amplitude  b. Horizontal line QR at point Ses on stress amplitude  c. Polyline STRQ defines fatigue failure d. None of the above   |  | | --- | | Ans-b | |  | |
| 9)   In diagram shown below, what does angle θ correspond to?  https://www.careerride.com/testimagehandler.ashx?id=10329  a. It corresponds to actual stress point  b. It corresponds to point of intersection of fatigue failure line and static failure line  c. It corresponds to actual strain point d. None of the above   |  | | --- | |  | | Ans-a | |
| 10)   To predict failure in design components which failure criteria is not assumed, when mean stress and stress amplitude are nonzero?  a. Goodman criterion b. Soderberg criteria c. Gerber criteria d. None of the above  ans-d   |  | | --- | |  | | 11. Stress concentration is defined as the localization of high stresses due to irregularities present in the component and no changes of the cross section. a) True b) False  Ans-b  12. Stress Concentration Factor is the ratio of nominal stress obtained by elementary equations for minimum cross-section and highest value of actual stress near discontinuity. a) True b) False  Ans-b  13. If a flat plate with a circular hole is subjected to tensile force, then its theoretical stress concentration factor is? a) 2 b) 3 c) 4 d) 1  Ans-b 14. For an elliptical hole on a flat plate, if width of the hole in direction of the load decrease, Stress Concentration Factor will\_\_\_\_\_\_ a) Increase b) Decrease c) Remains constant d) Can’t be determined. Varies from material to material Ans-a  15. In which of the following case stress concentration factor is ignored? a) Ductile material under static load b) Ductile material under fluctuating load c) Brittle material under static load d) Brittle material under fluctuating load  Ans-a 16. Is it logical to use fluid analogy to understand the phenomenon of stress concentration? a) True b) False  Ans-a 17. Use of multiple notches in a V shaped flat plate will a) Reduce the stress concentration b) Increase the stress concentration c) No effect d) Cannot be determined  Ans-a 18. Which of the following reduces the stress concentration? a) Use of multiple notches b) Drilling additional holes c) Removal of undesired material d) Each of the mentioned  Ans-d 19. A flat plate 30mm wide and “t”mm wide is subjected to a tensile force of 5kN. The plate has a circular hole of diameter 15mm with the centre coinciding with the diagonal intersection point of the rectangle. If stress concentration factor=2.16, find the thickness of the plate if maximum allowable tensile stress is 80N/mm². a) 8mm b) 9mm c) 10mm d) 12mm Ans-b | |

**Design of Bearing**

1. Which of the following are functions of bearings?  
a) Ensure free rotation of shaft with minimum friction  
b) Holding shaft in a correct position  
c) Transmit the force of the shaft to the frame  
d) All of the listed

Ans-d

Explanation: Bearings are used for all the above listed purposes.

2. A radial bearing supports the load that acts along the axis of the shaft.  
a) True  
b) False

Ans-b Explanation: Radial bearing supports the load acting perpendicular to the axis of the shaft.

3. A\_\_\_\_\_\_\_ bearing supports the load acting along the axis of the shaft.  
a) Thrust  
b) Radial  
c) Longitudinal  
d) Transversal

Ans-a Explanation: Thrust bearing supports load acting along axis of shaft.  
4. Sliding contact bearings, also called plain bearings have no problem of wear.  
a) True  
b) False

Ans-b Explanation: Surface of shaft slide over surface of the bush resulting in friction and wear.

5. In steam and gas turbines, rolling contact bearings are used.  
a) True  
b) False

Ans-b Explanation: Sliding contact bearings are generally used.

6. Which of the following are true about plasticity?  
a) Permanent Deformation  
b) Ability to retain deformation under load or after removal of load  
c) Plastic deformation is greater than elastic deformation  
d) All of the mentioned

Ans-d Explanation: This is the basic definition of plasticity.  
7. Which of the following is measure of stiffness?  
a) Modulus of elasticity  
b) Modulus of plasticity  
c) Resilience  
d) Toughness

Ans-a Explanation: Stiffness is the ability of material to resist deformation under external load. Hence it is measured by modulus of elasticity.

8. Which of the following facts are true for resilience?  
a) Ability of material to absorb energy when deformed elastically  
b) Ability to retain deformation under the application of load or after removal of load  
c) Ability of material to absorb energy when deformed plastically  
d) None of the mentioned

ans a Explanation: Toughness is ability to store energy till proportional limit during deformation and to release this energy when unloaded.

9. Modulus of resilience is defined as  
a) Strain energy per unit volume  
b) Strain energy per unit area  
c) Independent of strain energy  
d) None of the mentioned

Ans-a Explanation: Modulus of resilience is strain energy per unit volume.

10. In gear boxes and small size motors, rolling contact bearings are used.  
a) True  
b) False

Ans-a Explanation: In small size applications, rolling contact bearings are preferred.

11. Deep groove ball bearings creates a lot of noise.  
a) Yes  
b) They create very less noise  
c) Depends on the application  
d) No reference frame for comparison is mentioned  
Ans-b Explanation: They create very less noise due to point contact.

12. There is problem of alignment in deep groove ball bearings.  
a) Yes  
b) No, it is self-aligning  
c) It aligns itself only in some particular cases  
d) Can’t be determined  
Ans-a Explanation: It is not self-aligning.

13. Deep groove ball bearing has immense rigidity.  
a) True  
b) No it has point contact and hence low rigidity  
c) It has surface contact  
d) It has line contact  
Ans-b Explanation: Due to point contact, rigidity is not so good.

14. Cylindrical load bearing has lower load capacity as compared to deep groove ball bearing.  
a) True  
b) False

Ans-b Explanation: Cylindrical load bearing has a line contact and hence higher load capacity.

15. Angular contact bearing can take thrust as well as radial loads.  
a) True  
b) False

Ans-a Explanation: The line of reaction at the contact surfaces makes an angle with axis of bearing and thus has two components, hence allowing it to take both type of loads

16. In angular contact bearings, \_\_\_\_ bearings are required to take thrust load in both directions.  
a) 1  
b) 4  
c) 2  
d) 3

18. Taper rolling supports  
a) Axial loads  
b) Thrust loads  
c) Both axial and thrust loads  
d) None of the mentioned

Ans-c Explanation: The line of reaction makes an angle with the axis of bearing and hence both type of loads can be carried.

19. Which of the following isn’t the property of taper roller?  
a) High rigidity  
b) Easy dismantling  
c) Take low radial and heavy loads  
d) All are the properties of tapper roller  
Ans-c Explanation: Due to line contact it can take high radial and thrust loads.

20. Which of the following cannot take radial load?  
a) Cylindrical Roller bearing  
b) Taper roller bearing  
c) Thrust ball bearing  
d) None of the listed  
Ans-c Explanation: There is no inclination in the line of reaction and hence only thrust loads can be carried.

21. Which of the following cannot tolerate misalignment?  
a) Angular contact bearing  
b) Cylinder roller bearing  
c) Thrust ball bearings

Ans-d  
d) All of the listed  
22. Cylinder roller creates lesser noise than deep groove ball bearing.  
a) True  
b) False  
Ans-b Explanation: Due to line contact, cylinder roller creates far more noise.

**Introduction to GEAR**

1. The common normal to the curves of the two teeth must not pass through the pitch point.  
a) True  
b) It must pass  
c) It may or may not pass  
d) None of the listed  
Answer: b  
Explanation: The common normal must pass through the point where two mating gears meet.

2. Which of the following can be used for power transmission in intersecting shafts.  
a) Spur Gear  
b) Helical Gear  
c) Bevel Gear  
d) None of the listed  
Answer: c  
Explanation: Bevel gears are used for power transmission in case of intersecting shafts.

3. Is it possible to transmit power between shafts lying in different planes using gears?  
a) Yes  
b) No

Answer: a  
Explanation: Worm or crossed helical gears can be used in this case for power transmission.

4. The two gears are said to have conjugate motion if  
a) They have constant angular velocity ratio  
b) Variable angular velocity ratio  
c) Infinitely small angular velocity ratio  
d) None of the mentioned  
Answer: a  
Explanation: Two gear are said to have conjugate motion and tooth profiles are said to have conjugate curves if they have constant angular velocity ratio.

5. Which of the following is not true about gears?  
a) Positive drive  
b) Constant velocity ratio  
c) Transmit large power  
d) Bulky construction  
View Answer

Answer: d  
Explanation: They have compact construction.

6. Gear drive don’t require precise alignment of shafts.  
a) True  
b) False  
Answer: b  
Explanation: A minute level of misalignment isn’t tolerated in gears.

7. Spur gears can be used only when the two shafts are parallel.  
a) True  
b) False  
Answer: a  
Explanation: The teeth are cut parallel to the axis of shaft.

8. The teeth of the helical gears are cut parallel to the shaft axis.  
a) True  
b) False  
Answer: b  
Explanation: They are cut at an angle with the shaft axis.

9. Herringbone gear can be used in  
a) Intersecting shafts only  
b) Parallel shafts only  
c) Both intersection and parallel shafts  
d) None of the mentioned  
Answer: b  
Explanation: It consist of two helical gears with the opposite hand of the helix.

10. Bevel gears impose \_\_\_\_ loads on the shafts.  
a) Radial and thrust  
b) Radial  
c) Thrust  
d) Neither radial nor thrust Answer: a  
Explanation: Bevel gears have the shape of a truncated cone and tooth is cut straight or spiral.

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11. Which of the following are true for worm gears?  
a) Worm is in the shape of threaded screw  
b) Threads on the worm have small lead  
c) Worm imposes high thrust loads  
d) Characterised by low speed reduction ratio  
Answer: d  
Explanation: They are characterised by high speed reduction ratio.

12. Greater the velocity ratio, smaller the gearbox.  
a) True  
b) Greater the gearbox  
c) Size of gearbox remains unaffected  
d) None of the listed  
Answer: b  
Explanation: Greater velocity leads to increase in size of gear wheel which results in size of gearbox.

13. Required velocity ratio is 60:1, which of the following are recommended?  
a) Worm  
b) Spur  
c) Bevel  
d) None of the mentioned  
Answer: a  
Explanation: For high speed reduction ratio, worm gears are recommended.

14. For a constant velocity ratio, the common normal to the tooth profile at point of contact must pass through a continuously variable point.  
a) True  
b) It pass through a fixed point  
c) Constant velocity ratio isn’t required, hence variable point is preferred  
d) None of the listed  
Answer: b  
Explanation: It must pass through a fixed point called pitch to maintain a constant velocity ratio.

This set of Advanced Machine Design Questions & Answers focuses on **“Terminology of Spur Gears”.**

1. In cycloidal gears contact area is  
a) Comparatively smaller  
b) Comparatively larger  
c) Can’t be determined  
d) None of the listed  
Answer: b  
Explanation: Convex flank on one tooth meets with concave on the other thus increasing the contact area.

2. Involute gears have greater contact area as compared to cycloidal gears.  
a) True  
b) False  
Answer: b  
Explanation: There is mating of two convex surfaces and hence lesser contact area.

3. Cycloidal teeth consist of  
a) Hypocycloid curve  
b) Epicycloid gear  
c) Both hypocycloid curve and epicycloid curve  
d) None of the mentioned  
Answer: c  
Explanation: It consist of both and thus are hard to manufacture.

4. Pressure angle remains constant in case of involute profile.  
a) True  
b) False  
Answer: a  
Explanation: The common normal always passes through the pitch point and thus maintain the constant inclination.

5. Pressure angle is \_\_\_\_\_ in case of cycloidal teeth.  
a) Constant  
b) Variable  
c) zero  
d) None of the listed  
Answer: b  
Explanation: Cycloidal teeth consist of two profiles.

6. Velocity ratio is the ratio angular velocity of driving gear to that of driven gear.  
a) True  
b) False  
Answer: a  
Explanation: Velocity ratio is simply the angular velocities ratio.

7. Velocity ratio and transmission ratio are the same thing.  
a) True  
b) False  
Answer: b  
Explanation: Transmission ratio is measured between first and last gear.

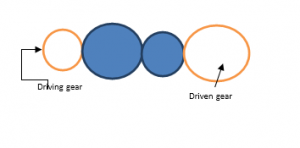
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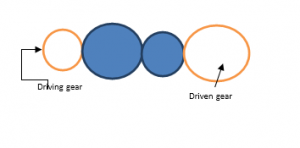
8. Contact ratio is always  
a) =1  
b) >1  
c) <1  
d) Can’t be determined  
Answer: b  
Explanation: Some overlapping is essential for continuous transfer of power.

9. Product of diametric pitch and circular pitch is?  
a) π  
b) 1/π  
c) None of the listed  
d) 2  
Answer: a  
Explanation: CP=πd/z and circular pitch=z/d.

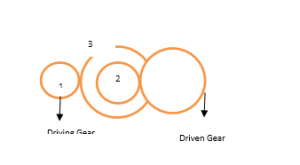
10. Diameteral pitch is 5, then calculate module of the gear.  
a) 0.2  
b) 0.4  
c) 5  
d) 10  
Answer: a  
Explanation: Module is the inverse of diameteral pitch.

This set of tricky Machine Design Questions & Answers focuses on **“Gear Trains”.**

1. If driving gear rotates CW, driven gear will rotate?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/tricky-machine-design-questions-answers-q1.png)  
a) ACW  
b) CW  
c) Both CW and ACW  
d) Can’t be determined  
Answer: a  
Explanation: If there are even number of intermediate gears between driving gears and driven gears, first and last gear rotate in the opposite direction.

2. If driving gear rotates ACW, driven gear will rotate in which direction?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/tricky-machine-design-questions-answers-q1.png)  
a) ACW  
b) CW  
c) Both CW & ACW  
d) Can’t be determined  
Answer: a  
Explanation: Number of idler gears are even, then first and last gear rotate in same direction.

3. A compound gear train consists of at least 3 shafts connected to each other.  
a) True  
b) False  
Answer: b  
Explanation: A compound gear train is characterised by one shaft carrying two gears atleast.

4. If driving gear rotates in CW, then driven gear will rotate in?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/tricky-machine-design-questions-answers-q4.png)  
a) CW  
b) ACW  
c) CW & ACW  
d) Can’t be determined  
Answer: a  
Explanation: 3-ACW,2-ACW and driven gear CW.

5. If centre distance between the two gears on same shaft is unequal to the centre distance on the other two gears on the second shaft, then this gear train is called reverted gear train.  
a) True  
b) False  
Answer: b  
Explanation: The centre distance is equal in both the shafts.

6. If one gear is fixed while the other gear has motion of two types i.e. rotary about its own axis and rotation about axis of fixed gear, than the gear train is \_\_\_\_\_  
a) Epicyclic gear train  
b) Reverted gear train  
c) Kepler gear train  
d) None of the mentioned  
Answer: a  
Explanation: Definition of epicyclic gear train.

7. Which of the following are true about epicyclic gear train?  
a) Fixed gear is called sun gear  
b) Rotating gear are called earth gear  
c) Crank is called sun carrier  
d) None of the listed  
Answer: a  
Explanation: Rotating gears are called planet gears.

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8. Epicyclic gears are not generally recommended due to bulky construction.  
a) True  
b) False  
Answer: b  
Explanation: Epicyclc gears have compact construction.

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“System of Gear Tooth”.**

1. There are \_\_\_\_ standard systems for the shape of gear teeth.  
a) 1  
b) 2  
c) 3  
d) 4  
Answer: c  
Explanation: 14.5⁰ full depth involute system, 20⁰ full depth involute system and 20⁰ stub involute system.

2. When the number of teeth reaches infinity, circle radius approaches infinity the gear becomes an infinite loop.  
a) True  
b) False  
Answer: b  
Explanation: It becomes a rack with straight sided teeth.

3. Which of the following statements are not true?  
a) Increasing pressure angle improves the tooth strength  
b) Contact duration is decreased with increase in pressure angle  
c) 20⁰ pressure angle has quieter operation then 14.5⁰  
d) All of the statements are true  
Answer: c  
Explanation: Lower the pressure angle, quieter is the operation. Lower the pressure angle, lower is the breadth of the tooth at root.

4. 20⁰ stub involute system have comparatively smaller interference.  
a) True  
b) False  
Answer: a  
Explanation: They have shorter addendum and shorter dedendum.

5. Which of the following have stronger teeth?  
a) Stub teeth  
b) Full depth teeth  
c) Both have equal strength  
d) Can’t be determined  
Answer: a  
Explanation: Smaller moment arm of bending force leads to stronger stub teeth.

6. As the module increases, index of size of gear decreases.  
a) True  
b) False  
Answer: b  
Explanation: Module is the measure of size of index of the gear tooth.

7. Crowning is an abrasive process that debars the gear strength.  
a) True  
b) False  
Answer: b  
Explanation: Crowningis used to strengthen the tooth.

8. Inaccuracies in tooth profile lead to concentration of pressure on the middle of tooth.  
a) True  
b) False  
Answer: b  
Explanation: Inaccuracies lead to shift of pressure at the end of tooth which can be improved by crowning.

9. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the centre distance.  
a) 280mm  
b) 269mm  
c) 350mm  
d) 305mm  
Answer: a  
Explanation: C=m(z(p)+z(g))/2.

10. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate pitch circle diameter of the pinion.  
a) 95mm  
b) 105mm  
c) 115mm  
d) 125mm  
Answer: d  
Explanation: D=5×25.

11. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the pitch circle diameter of the gear.  
a) Cannot be determined  
b) 31mm  
c) 475mm  
d) 575mm  
Answer: d  
Explanation: D=5×115.

12. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the addendum.  
a) None of the listed  
b) 4.75mm  
c) 5.25mm  
d) 5mm  
Answer: d  
Explanation: H=m=5mm.

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13. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the dedendum.  
a) 4.75mm  
b) 5mm  
c) 6.25mm  
d) 6.68mm  
Answer: c  
Explanation: H=1.25xm=1.25x5mm.

14. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the tooth thickness.  
a) 6.23mm  
b) 5.44mm  
c) 7.854mm  
d) 8.16mm  
Answer: c  
Explanation: T=1.5708xm=1.5708x5mm.

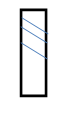
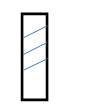
15. A pair of spur gears consist of 25 teeth pinion meshing with a 115 teeth gear. The module is 5mm. Calculate the bottom clearance.  
a) None of the listed  
b) 1.75mm  
c) 2.5mm  
d) 1.25mm  
Answer: d  
Explanation: C=0.25m=0.25x5mm.

This set of Tough Machine Design Questions focuses on **“Helical Gears”.**

1. Among spur gear and helical gear, which has smooth engagement and thus lesser noise?  
a) Helical Gears  
b) Spur Gears  
c) Both have equal noises  
d) Can’t be determined  
Answer: a  
Explanation: There is a gradual pick up of load in helical gears and hence smooth operation.

2. There is same type of tooth meshing in helical and spur gear.  
a) True  
b) False  
Answer: b  
Explanation: In spur gears contact occurs along entire face width which leads to impact condition while in helical contact begins from a single point and then there is gradual increase in load.

3. Among the normal module and transverse module, which one has greater value?  
a) Normal Module  
b) Transverse Module  
c) Both have equal module  
d) Insufficient information  
Answer: b  
Explanation: Normal Module=Transverse modulexCos(helix angle).

4. Below is a representation of a helical gear. Blue lines in the figure signify?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/tough-machine-design-questions-q4.png)  
a) Pinion right handed helical teeth  
b) Pinion left handed helical teeth  
c) Both right and left handed  
d) Symmetric helical teeth  
5. Below is a representation of a helical gear. Blue lines in the figure signify?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/tough-machine-design-questions-q5.png)  
a) Pinion right handed helical teeth  
b) Pinion left handed helical teeth  
c) Both right and left handed  
d) Symmetric helical teeth  
Answer: b  
Explanation: The lines are slopping upwards to the right side.

6. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the transverse module.  
a) 4.3mm  
b) 4.1mm  
c) 3.9mm  
d) 3.7mm  
Answer: a  
Explanation: m=4/Cos(22⁰).

7. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the transverse pressure angle in degrees.  
a) 17.9  
b) 20.4  
c) 19.6  
d) 18.4  
Answer: b  
Explanation: tanᾰ=tan(19⁰)/Cos(22⁰).

8. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the axial pitch.  
a) None of the listed  
b) 34.2mm  
c) 33.4mm  
d) 29.6mm  
Answer: c  
Explanation: p=πx(transverse module)/tan(22).

9. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the pitch circle diameter of pinion.  
a) 64.7mm  
b) 52.6mm  
c) 56.6mm  
d) 68.8mm  
Answer: a  
Explanation: d=zxm/Cos(22).

10. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the pitch circle diameter of the gear.  
a) 172.6mm  
b) 142.6mm  
c) 180.3mm  
d) 202.4mm  
Answer: a  
Explanation: d=zxm/Cos(22).

11. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the centre distance.  
a) 125.4mm  
b) 132.6mm  
c) 118.65mm  
d) 145.4mm  
Answer: c  
Explanation: C=Sum of diameter of pinion and gear/2.

12. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate addendum circle diameter of the pinion.  
a) 59.2mm  
b) 72.7mm  
c) 65.4mm  
d) None of the listed  
Answer: b  
Explanation: D(a)=m[z/Cos(22) + 2].

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13. A pair of parallel helical gears consist of 15 teeth pinion meshing with a 40 teeth gear. The helix angle is 22⁰ and normal pressure angle 19⁰. The normal module is taken as 4mm. Calculate the dedendum circle diameter of the pinion.  
a) 64.5mm  
b) 54.7mm  
c) 59.2mm  
d) None of the listed  
Answer: b  
Explanation: D(f)=m[z/Cos(22) – 2.5].

14. The direction of tangential component for a driving gear is same to the direction of rotation.  
a) True  
b) False  
Answer: b  
Explanation: The direction is opposite and not same.

15. If tangential component of force on tooth is 200N and helix angle is 25⁰, calculate the axial component of the force.  
a) 200N  
b) 302.5N  
c) 93.26N  
d) 215.6N  
Answer: c  
Explanation: P(a)=200xtan(25).

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“Strength of Helical Gears”.**

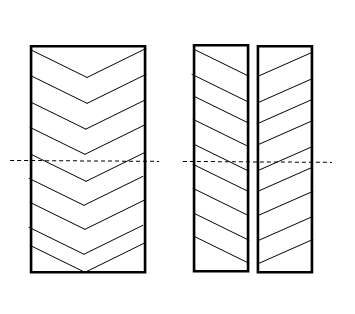
1. Lewis form factor is based on real number of teeth.  
a) True  
b) False  
Answer: b  
Explanation: It is based on virtual umber of teeth only.

2. Beam strength indicates the maximum value of radial force that a tooth can transmit without fatigue failure.  
a) True  
b) False  
Answer: b  
Explanation: It indicates maximum force for bending failure and not fatigue failure.

3. A pair of helical gears consist of 25 teeth pinion gear meshing with a 90 teeth gear. Calculate the ratio factor.  
a) 0.74  
b) 0.88  
c) 1.57  
d) 1.44  
Answer: c  
Explanation: Ratio factor Q=2×90/90+25.

4. A pair of helical gears consist of 25 teeth pinion gear meshing with a 90 teeth gear. Calculate the material constant k If surface hardness is 260BHN.  
a) 0.64N/mm²  
b) 0.88N/mm²  
c) 1.08N/mm²  
d) 2.66N/mm²  
5. A pair of helical gears consist of 25 teeth pinion gear meshing with a 90 teeth gear. Calculate the wear strength If surface hardness is 260BHN. Also face width=35mm, module=4mm and helix angle=25⁰.  
a) 443.5N  
b) 1125.6N  
c) 7971.9N  
d) 1014.2N  
Answer: c  
Explanation: S=bQdK/cos²Ɯ where Ɯ=25⁰, d=zm/cosƜ, Q=2×90/90+25, K=0.16x[BHN/100]².

6. A pair of helical gears consist of 25 teeth pinion gear meshing with a 90 teeth gear. Calculate the tangential force If surface hardness is 260BHN. Also face width=35mm, module=4mm and helix angle=25⁰. The velocity of operation is 3.5m/s and service factor 1.5.  
a) 1136.5N  
b) 3983.7  
c) 2012.6N  
d) 3226.5N  
Answer: b  
Explanation: S=1.5xP/C where C=5.6/5.6+√v and S=bQdK/cos²Ɯ where Ɯ=25⁰, d=zm/cosƜ, Q=2×90/90+25, K=0.16x[BHN/100]².

7. Which of the following is herringbone gear?  
[](https://www.sanfoundry.com/wp-content/uploads/2017/06/machine-design-questions-answers-strength-helical-gears-q7.png)  
a) Left one  
b) Right one  
c) Both  
d) None  
Answer: a  
Explanation: Herringbone gear is without any groove.

8. The net axial force acting on bearing is zero in case of double helical gears while none zero in case of herringbone gears.  
a) True  
b) False  
Answer: b  
Explanation: It is zero in both the cases.

9. Helix angle of herringbone and double helical gears is relatively higher.  
a) True  
b) False  
Answer: a  
Explanation: There is no thrust force and hence higher angles are permitted.

10. A herringbone speed reducer consist of 20 teeth pinion driving a 100 teeth gear. The normal module of gear is 2mm. The face width of each half is 30mm and Lewis factor is 0.4. If permissible bending stress is 500N/mm², then calculate the beam strength.  
a) 15000N  
b) 12000N  
c) 8000N  
d) 10000N  
Answer: b  
Explanation: S=mbσY.

11. A herringbone speed reducer consist of 20 teeth pinion driving a 100 teeth gear. The normal module of gear is 2mm. The face width of each half is 30mm and Lewis factor is 0.4. Calculate the ratio factor Q.  
a) 1.2  
b) 1.4  
c) 1.7  
d) 1.4  
Answer: c  
Explanation: Q=2×100/100+20.

12. A herringbone speed reducer consist of 20 teeth pinion driving a 100 teeth gear. The normal module of gear is 2mm. The face width of each half is 30mm and Lewis factor is 0.4. Calculate the material constant K if surface hardness is 400BHN.  
a) 1.25 N/mm²  
b) 4.05 N/mm²  
c) 3.25N/mm²  
d) 2.56N/mm  
Answer: c  
Explanation: K=0.16x[BHN/100]².

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13. Helical gears mounted on parallel shafts are called crossed helical gears.  
a) True  
b) False  
Answer: b  
Explanation: Crossed helical gears are the helical gears mounted on non-parallel shafts.

14. Crossed helical gears have very low load carrying capacity.  
a) True  
b) False  
Answer: b  
Explanation: There is point contact and hence very less area and thus wear is comparatively rapid.

15. Calculate the shaft angle for same hand of helix if helix angle of two gears are 20⁰ and 17⁰.  
a) 17⁰  
b) 20⁰  
c) 37⁰  
d) 3⁰  
Answer: c  
Explanation: For same hand of helix, shaft angle=sum of helix angles of two gears.

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“Bevel Gears”.**

1. There are \_\_\_\_ common types of bevel gears.  
a) 1  
b) 2  
c) 3  
d) 4  
Answer: b  
Explanation: Spiral and straight.

2. Straight bevel gears are easy to design and manufacture and give reasonably good service with quieter operation.  
a) True  
b) No, noise problem  
c) No, vibration problem  
d) None of the listed  
Answer: b  
Explanation: They produce a lot of noise while working.

3. Which of the following creates smoother motion?  
a) Straight bevel gears  
b) Spiral bevel gears  
c) Equal for straight and spiral  
d) None of the mentioned  
Answer: b  
Explanation: Spiral bevel gear has smooth engagement which results in quieter operation.

4. When the pitch angle is greater than 90⁰, it is called external bevel gear.  
a) True  
b) Internal  
c) Helical  
d) Herringbone  
Answer: b  
Explanation: For external bevel gear, pitch angle is less than 90⁰.

5. For crown bevel gear, pitch angle is  
a) <90  
b) =90  
c) >90  
d) None of the listed  
Answer: b  
Explanation: Crown gears are characterised by pitch angle of 90⁰.

6. If pitch angle is >90, the bevel gear is?  
a) Internal  
b) External  
c) Crown  
d) Static  
Answer: a  
Explanation: Nomenclature.

7. Miter gears are the bevel gears mounted on shaft which are intersecting at angle greater than 90.  
a) True  
b) False  
Answer: b  
Explanation: The shafts which are intersecting at 90.

8. Crown gears having a pitch angle of 90⁰ are mounted on shafts intersecting at an angle  
a) =90  
b) <90  
c) >90  
d) None of the listed  
Answer: c  
Explanation: Application of crown gear according to its structure.

9. Which of the following are characteristics of skew bevel gears?  
a) Straight teeth  
b) Mounted on parallel shafts  
c) Mounted on intersecting shafts  
d) All of the mentioned  
Answer: a  
Explanation: They are used in non-parallel and non-intersecting shafts.

10. Hypoid gears are based on surfaces that are paraboloids of revolution.  
a) True  
b) False  
Answer: b  
Explanation: They are hyperboloids of revolution.

11. When two hyperboloids are rotated, the resulting motion is  
a) Sliding  
b) Turning  
c) Combination of turning and sliding  
d) Rotary  
Answer: c  
Explanation: There is turning as well as sliding motion.

12. In hypoid bevel gears, shafts may continue past each other.  
a) True  
b) False  
Answer: a  
Explanation: Offset of the shaft is quite considerable in case of hypoid gears.

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“Terminology of Bevel gears”.**

1. If pitch angle and addendum angles are 5⁰ and 12⁰ respectively, then face angle is equal to?  
a) 17⁰  
b) 7⁰  
c) 5⁰  
d) 12⁰  
Answer: a  
Explanation: Face angle=pitch angle+ addendum angle.

2. If pitch angle is 8⁰ and dedendum angle is 4⁰, then find root angle.  
a) 12⁰  
b) 4⁰  
c) 8⁰  
d) None of the listed  
Answer: b  
Explanation: Root angle=pitch angle-dedendum angle.

3. If back cone distance is 12mm and module at large end of the tooth is 4mm, then formative number of teeth will be?  
a) 3  
b) 6  
c) 4  
d) 12  
Answer: b  
Explanation: Formative number=2r/m.

4. If back cone distance is 12mm and module at large end of the tooth is 4mm, and virtual number of teeth is 12 then find the diameter of the tooth.  
a) 5  
b) 4  
c) 3  
d) 2  
Answer: d  
Explanation: 12/z = 2×12/4.

5. Calculate the cone distance of in a pair of bevel gears if pitch circle diameter of pinion and gear are 20mm and 24mm respectively.  
a) 44mm  
b) 22mm  
c) 15.6mm  
d) 20.2mm  
Answer: c  
Explanation: A=√(20/2)²+(24/2)².

6. Calculate the pitch angle if pitch circle diameter of the pinion and gear are 150mm and 210mm.  
a) 28.14⁰  
b) 35.54⁰  
c) 36.22⁰  
d) 63.22⁰  
Answer: b  
Explanation: tanϒ=D(p)/D(g)=150/210.

7. Calculate the radius of pinion at midpoint along the face width if PCD of pinion is 150mm and of gear is 210mm. Also face width of the tooth is 35mm.  
a) 56.35mm  
b) 64.83mm  
c) 66.57mm  
d) 58.69mm  
Answer: b  
Explanation: r=(Dp/2)-(bsinϒ/2).

8. Calculate the tangential component of gear tooth force if power transmitted is 6kW and diameters of pinion and gear are 150mm and 210 mm with face width of tooth being 35mm. Power is transmitted at 3000rpm.  
a) 1668N  
b) 2946N  
c) 3000N  
d) 3326N  
Answer: b  
Explanation: P=M/r. r=(Dp/2)-(bsinϒ/2) where ϒ is ptch angle and is calculated by tanϒ=D(p)/D(g)=150/210.

9. Calculate the radial component of gear tooth force if power transmitted is 6kW and diameters of pinion and gear are 150mm and 210 mm with face width of tooth being 35mm. Power is transmitted at 3000rpm. Also pressure angle is 20⁰.  
a) 996.6N  
b) 332.6N  
c) 489.2N  
d) 739.2N  
Answer: d  
Explanation: P radial=P tangential x[tan20 Cos ϒ].

10. Calculate the axial component of gear tooth force if power transmitted is 6kW and diameters of pinion and gear are 150mm and 210 mm with face width of tooth being 35mm. Power is transmitted at 3000rpm. Also pressure angle is 20⁰.  
a) 660.05N  
b) 528.06N  
c) 448.21N  
d) 886.6N  
Answer: b  
Explanaton: P radial=P tangential x[tan20 Sin ϒ].

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11. The pinion of a face gear is a  
a) Spur gear  
b) Helical gear  
c) Either spur or helical  
d) None of the mentioned  
Answer: c  
Explanation: Face gear consist of a spur or helical gear mating with a conjugate gear of disk form.

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“Strength of Bevel gears”.**

1. Lewis equation is used to obtain \_\_\_\_ strength of bevel gears.  
a) Beam  
b) Abrasive  
c) Wear  
d) Corrosive  
Answer: a  
Explanation: According to Lewis equation, Beam strength=product of module, face width of elemental section, permissible bending stress and Lewis form factor.

2. Beam strength of the bevel gear is independent of the cone distance.  
a) True  
b) False  
Answer: b  
Explanation: In other form S=mbσY[1- b/A] where A= cone distance.

3. Beam strength indicates the maximum value of the \_\_\_\_\_\_\_\_\_\_\_ force at the large end of the tooth that the tooth can transmit without bending.  
a) Tangential  
b) Radial  
c) Axial  
d) None of the listed  
Answer: a  
Explanation: Beam strength is analysed by using the pitch radius at the larger end of the tooth.

4. Wear strength of the bevel gear can be calculated by using \_\_\_\_\_\_\_\_ equation.  
a) Buckingham  
b) Lewis  
c) Newtonian  
d) Rayleigh  
Answer: a  
Explanation: Bevel gear is considered to be equivalent to a formative spur gear in a plane which is perpendicular to the large end and hence Buckingham equation is applied.

5. If back cone distance is 10mm, then pitch circle diameter of the formative pinion is given by?  
a) 10mm  
b) 20mm  
c) 5mm  
d) 10√2 mm  
View Answer

Answer: b  
Explanation: PCD=2xr.

6. The wear strength indicates the maximum value of radial force at the large end of the tooth that the tooth can transmit without pitting failure.  
a) True  
b) False  
Answer: b  
Explanation: It indicates the maximum value of tangential force.

7. If velocity is 5m/s, then velocity factor for a cut teeth is  
a) 0.55  
b) 0.66  
c) 1.55  
d) 1.66  
Answer: a  
Explanation: C=6/6+v.

8. If velocity is 5m/s, then velocity factor for generated teeth is  
a) 0.71  
b) 1.1  
c) 0.9  
d) 1.71  
Answer: a  
Explanation: C=5.6/5.6+√v.

9. Calculate the ratio factor Q if a pair of bevel gear consist of 25 teeth pinion meshing with a 40 teeth gear.  
a) 1.964  
b) 1.438  
c) 1.554  
d) 0.998  
Answer: b  
Explanation: tanϒ=25/40 or ϒ=32⁰. Q=2×40/ [40+25xtan(32)].

10. If surface hardness for a par of bevel gears is 400BHN, then material constant is  
a) 3N/mm²  
b) 2.56N/mm²  
c) 0.98N/mm²  
d) 1.44N/mm²  
Answer: b  
Explanation: K=0.16x[BHN/100]².

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11. Calculate the wear strength for a pair of bevel gears having face width=20mm, module=5mm, No of teeth on pinion and gear 25 and 40 respectively and PCD of pinion=75mm.  
a) 3668.5N  
b) 4884.5N  
c) 5126.6N  
d) 4117.3N  
Answer: b  
Explanation: S=0.75xbxQxDxK/Cos ϒ. Tan ϒ=25/40 or ϒ=32⁰. Q=2×40/ [40+25xtan(32)] K=0.16x[BHN/100]².

12. If service factor is 1.4 & tangential ad dynamic load is 1180N and 1500N respectively, then calculate the effective load.  
a) 3662N  
b) 2889N  
c) 3152N  
d) 2236N  
Answer: c  
Explanation: Effective load=1.4×1180 + 1500.

This set of Machine Design Multiple Choice Questions & Answers (MCQs) focuses on **“Worm Gears”.**

1. Worm gear drives are used to transmit power between two non-intersecting shafts which are generally at right angles to each other.  
a) True  
b) False  
Answer: a  
Explanation: This is how the worm gear design fits into use.

2. The worm and worm wheel both are threaded screw.  
a) True  
b) Worm wheel is a toothed gear  
c) Worm is a toothed gear  
d) None of the listed  
Answer: b  
Explanation: Worm wheel is a toothed gear.

3. Which of the following is not true about worm gears?  
a) Compact  
b) Smooth and silent operation  
c) Low speed reduction  
d) All the mentioned are true  
Answer: c  
Explanation: Speed reduction can be high up to 100:1.

4. Is it possible to use worm gears in cranes for lifting purpose?  
a) True  
b) No self-locking and hence not possible  
c) Possible up to a threshold load  
d) None of the listed  
Answer: a  
Explanation: Worm gears support self-locking operation and hence are advantageous to use in lifting operations.

5. The power transmitting capacity of worm gears is high although efficiency is low.  
a) True  
b) False  
Answer: b  
Explanation: Both power transmitting capacity and efficiency of worm gears are low.

6. Can worm gears be used in steering mechanism?  
a) True  
b) False  
Answer: a  
Explanation: In steering mechanism, efficiency is of little importance but major requirement is of large mechanical advantage.

7. The worm helix angle is the \_\_\_\_\_ of the worm lead angle.  
a) Complement  
b) Half  
c) Double  
d) Supplement  
Answer: a  
Explanation: Worm helix angle+worm lead angle=90⁰.

8. If worm helix angle is 30⁰, then worm should have at least \_\_\_ threads.  
a) 5  
b) 6  
c) 7  
d) 8  
Answer: a  
Explanation: The permissible helix angle is 6⁰ and hence there should be at least five threads i.e. 30/6.

9. A pair of worm gear is written as 2/40/12/6. Calculate the centre distance.  
a) 40mm  
b) 156mm  
c) 200mm  
d) 80mm  
Answer: b  
Explanation: C=m(q+z)/2 where m=6mm, q=12 and z=40.

10. A pair of worm gear is written as 2/40/12/6. Calculate the speed reduction.  
a) 2  
b) 20  
c) 15  
d) 6  
Answer: b  
Explanation: i=40/2.

11. A pair of worm gear is written as 2/40/12/6. Calculate the pitch circle diameter of worm wheel.  
a) 72mm  
b) 240mm  
c) 260mm  
d) 320mm  
Answer: b  
Explanation: d=mxz where m=6mm and z=40.

12. A pair of worm gear is written as 2/40/12/6. Calculate the throat diameter of the worm wheel.  
a) 220.5mm  
b) 246.4mm  
c) 190.44mm  
d) 251.7mm  
Answer: d  
Explanation: d(t)=m[z+4cosϒ-2] where ϒ=9.46⁰ is the lead angle. tanϒ=2/12, z=40 and m=6mm.

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13. A pair of worm gear is written as 2/40/12/6. Calculate the root diameter of the worm wheel.

a) 186.22mm  
b) 250.4mm  
c) 225.6mm  
d) 250.44mm  
Answer: c  
Explanation: d=m[z-2-0.4cosϒ] where ϒ=9.46⁰ is the lead angle. tanϒ=2/12, z=40 and m=6mm.

14. If tangential force on worm is 1500N, then axial force on worm wheel will be?  
a) 1500N  
b) 3000N  
c) 1500√2 N  
d) 750N  
Answer: a  
Explanation: P₂(axial)=P₁(tangential).