[HPSSSC - JE (ME) MACHINE DESIGN]
[SET-II]

1. The range of pressure angle for spur gears leads to
   (a) Minimum axial thrust
   (b) Greater backlash
   (c) More interference
   (d) Wide base and stronger tooth

Ans: (b)

2. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I	List-II
A. Helical gears	1. Non-interchangeable
B. Herring bone gears	2. Zero axial thrust
C. Worm gears	3. Quiet motion
D. Hypoid gears	4. Extreme speed Reduction

Codes:	A	B	C	D
(a)	1	2	3	4
(b)	3	2	1	4
(c)	3	1	4	2
(d)	3	2	4	1

Ans: (d)

3. Match the types of gears with their most appropriate description:

List-I Type of gears	List-II Description
P. Helical	1. Axis non-parallel and non-intersecting
Q. Spiral bevel	2. Axis parallel and teeth are inclined to the axis
R. Hypoid	3. Axis parallel and teeth are parallel to the axis
S. Rack & Pinion	4. Axis are perpendicular and intersecting, and teeth are inclined to the axis
	5. Axis are perpendicular and used for large speed reduction
	6. Axis parallel and one of the gears has infinite

Codes:
   (a) P-2, Q-4, R-1, S-6
   (b) P-1, Q-4, R-5, S-6
   (c) P-2, Q-6, R-1, S-2
   (d) P-6, Q-3, R-1, S-5

Ans: (a)

4. Residual stress are present in
   (a) Cold drawn and ground shafts
   (b) Hot rolled shafts
   (c) Cast and turned to size shafts
   (d) Forged and turned to size shafts

Ans: (a)

5. Which one of the following loadings is considered in design of axles?
   (a) Bending moment only
   (b) Twisting moment only
   (c) Combined bending moment and torsion
   (d) Combined action of bending moment, twisting moment and axial thrust

Ans: (c)

6. When a shaft of diameter d is subjected to pure torsional load T, the maximum shear stress f_s induced in the shaft is prescribed by the relation:

   (a) $f_s = \frac{8T}{\pi d^3}$ (b) $f_s = \frac{16T}{\pi d^3}$

   (c) $f_s = \frac{32T}{\pi d^3}$ (d) $f_s = 64\frac{8T}{\pi d^3}$

Ans: (b)

7. In square threads, the depth d and pitch p of threads are related by the identity
   (a) d = 0.25 p
   (b) d = 0.5 p
   (c) d = 0.75 p
   (d) d = p

Ans: (b)

8. The balls in a ball bearing are subjected to
   (a) shear stresses
   (b) compressive stresses
   (c) tensile stresses
   (d) fatigue

Ans: (d)

9. A needle roller bearing scores over ball bearing in respect of

(a) smooth operation
(b) less friction
(c) small area
(d) large ratio of load capacity to size

Ans: (d)

10. What tapers in a tapered roller bearing?
(a) Inner race
(b) Outer race
(c) Roller
(d) Cage

Ans: (c)

11. Thrust bearing of pivoted segment type provides
(a) Uniform distribution of pressure
(b) Uniform distribution of wear
(c) Easy flow of lubrication oil
(d) A converging oil film

Ans: (d)

12. Suggest the two important parameters concerning the working of self-lubricated and boundary lubricated bearings
(a) Length and diameter
(b) Velocity and load
(c) Pressure and velocity
(d) Load and pressure

Ans: (c)

13. Which is true in respect of solid lubricants?
(a) High coefficient of friction
(b) Quick heat dissipation
(c) More chances of journal wear an scouring
(d) Use recommended when hydrodynamic lubrication cannot be accommodated

Ans: (d)

14. The bearings are normally designed for a value of bearing characteristic atleast
(a) Equal to the bearing modulus
(b) Two times the bearing modulus
(c) Three times the bearing modulus
(d) Four times the bearing modulus

Ans: (c)

15. Small l/d ratio for bearings is not good from consideration of
(a) Strength
(b) Stiffness
(c) Vibration
(d) Space
(e) Preventing side leakage

Ans: (c)

16. Which of the following does not belong to the category of sliding contact bearings?
(a) Pivot bearing
(b) Ball bearing
(c) Bush bearing
(d) Foot step bearing

Ans: (b)

17. Which h amongst the followings is not a journal bearing?
(a) Pivot bearing
(b) Bush bearing
(c) Hanger bearing
(d) Plummer block

Ans: (a)

18. If d is the diameter of shaft, then in designing a sleeve coupling, the length of sleeve is prescribed by the identity
(a) 1.5 d (b) 2 d
(c) 3 d (d) 3.5 d

Ans: (d)

19. A bushed pin flexible coupling is used join the shafts which are
(a) Inclined
(b) Not coplanar
(c) Not in exact alignment
(d) Change position during operation

Ans: (c)

20. Which amongst the followings is a flexible coupling?

(a) Compression coupling
(b) Flange coupling
(c) Universal coupling
(d) Sleeve coupling

Ans: (a)

21. In a flange coupling, the weakest element should be
(a) key (b) bolt
(c) flange (d) shaft

Ans: (a)

22. A key connecting a flange coupling to a shaft is likely to fail in
(a) shear (b) tension
(c) torsion (d) bending

Ans: (a)

23. Match List-I (different systems) with List-II (associated terminology) and select the correct answer using the codes given below the lists.

List-I	List-II
A. Riveted joints	1. Nipping
B. Welded joints	2. Angular movement
C. Leaf springs	3. Fullering
D. Knuckle joints	4. Fusion

Codes:	A	B	C	D
(a)	3	2	1	4
(b)	1	2	3	4
(c)	1	4	3	2
(d)	3	4	1	2

Ans: (d)

24. In journal bearing design, the factor $\frac{ZN}{p}$ is called the bearing modulus number where Z is absolute viscosity of the lubricant, N is speed of journal in rpm and p is bearing pressure on the projected bearing area. The value of $\frac{ZN}{p}$ corresponding to the minimum amount of frictions is called the bearing modulus K. For hydrodynamic lubrication of bearing, $\frac{ZN}{p}$ should be
(a) larger than K
(b) smaller than K
(c) equal to K
(d) equal to zero

Ans: (a)

25. A key connecting a flange coupling to shaft is likely to fail in
(a) shear (b) tension
(c) torsion (d) bending

Ans: (a)

26. Which key is preferred for the condition where a large amount of impact type torque is to be transmitted in both directions of rotation?
(a) Woodruff key
(b) Feather key
(c) Gib-head key
(d) Tangent key

Ans: (d)

27. Identify the key that fits in a key way of the hub and has its bottom so shaped that it embraces the curved surface of the shaft
(a) Flat saddle key
(b) Hollow saddle key
(c) Kennedy key
(d) Woodruff key

Ans: (b)

28. The feather keys are generally
(a) loose in shaft and tight in hub
(b) tight in shaft and loose in hub
(c) loose in both shaft and hub
(d) tight in both shaft and hub

Ans: (a)

29. The woodruff key is generally
(a) square
(b) rectangular

(c) semi-circular
(d) trapezoidal
Ans: (c)

30. Which key is provided in pairs at right angles and each key withstands torsion in one direction only
(a) sunk key
(b) flat saddle key
(c) hollow saddle key
(d) tangent key
Ans: (d)

31. Spot the odd one out
(a) feather key
(b) saddle key
(c) woodruff key
(d) gib head key
Ans: (b)

32. The width and thickness of a rectangular sunk key are respectively
(a) $\frac{d}{4} and \frac{d}{6}$
(b) $\frac{d}{2} and \frac{d}{4}$
(c) $\frac{d}{4} and \frac{d}{8}$
(d) $\frac{d}{3} and \frac{d}{5}$
Ans: (a)

33. The shearing area of a key of length l, breadth b and depth h is equal to
(a) $b \times h$
(b) $l \times h$
(c) $l \times b$
(d) $l \times h/2$
Ans: (c)

34. Consider a key with width equal to one-fourth of the shaft diameter d. Design considerations stipulate that for key to be as strong in shear as shaft in torsion, the length of key should be approximately equal to
(a) 1.0 d (b) 1.5 d
(c) 1.85 d (d) 2.25 d
Ans: (b)

35. The key that transmits power through frictional resistance only is
(a) Saddle key
(b) Sunk key
(c) Woodruff key
(d) Tangent key
Ans: (a)

36. Which key is used for light duty work?
(a) Saddle key
(b) Sunk key
(c) Feather key
(d) Woodruff key
Ans: (a)

37. Suggest the key to be used for rough and heavy service applications
(a) Saddle key
(b) Woodruff key
(c) Kennedy key
(d) Gib head key
Ans: (c)

38. Key are generally made of
(a) Mild steel
(b) High carbon steel
(c) Cast iron
(d) Wrought iron
Ans: (a)

39. Which one of the following keys fit partly in the key way of the hub and partly in the key seat of shaft?
(a) Saddle key
(b) Sunk key
(c) Tangent key
(d) Round key

Ans: (b)

40. The key way for a sunk key is provided
   (a) In shaft only
   (b) In hub only
   (c) Partly in hub and partly in shaft
   (d) Neither in shaft nor in hub

Ans: (c)