Tatyasaheb kore Institute of Engineering and technology
Department of Mechanical Engineering
MCQ Question Bank of
MACHINE DESIGN-II(Third Year Sem-VI)

1. Line joining S_{yt} (yield strength of the material) on mean stress axis and S_e (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.

2. Notch sensitivity (q) is given by the equation _____

where K_f = fatigue stress concentration factor and K_t = theoretical stress concentration factor.

a. $(K_f + 1) / (K_t - 1)$

b. $(K_f - 1) / (K_t - 1)$

c. $(K_f + 1) / (K_t + 1)$

d. $(K_f - 1) / (K_t + 1)$

3. Which of the following equations is correct for Soderberg Criteria?

a. $(\sigma_m / S_{ut}) + (\sigma_a / S_e) = (1 / N_f)$
b.($\sigma_m / S_{ut}) - (\sigma_a / S_e) = (1 / N_f)$
c.($\sigma_m / S_{yt}) + (\sigma_a / S_e) = (1 / N_f)$
b.($\sigma_m / S_{ut}) - (\sigma_a / S_e) = (1 / N_f)$

4. 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

5. 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

6. 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

7. 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 is80N/mm².

a)8mm

b)9mm

c)10mm

d) 12mm

8. Which one of the following types of bearings is employed in shafts of gearboxes of automobiles?

(a) Hydrodynamic journal bearings

(b) Multi-lobed journal bearings

(c) Antifriction bearings

(d) Hybrid journal bearings

9. Deep groove ball bearings are used for.

(a) Heavy thrust load only

(b) Small angular displacement of shafts

(c) Radial load at high speed

(d) Combined thrust and radial loads at high speed

10) What is the load stress factor for cast iron gear pair if BHN = 300?

a. 1.89N/mm^2

b. 1.62N/mm^2

c. 1.44N/mm^2

d. 1.413 N/mm^2

11)Which of the following gear tooth failures is/are induced when maximum Hertz contact stress on gear tooth surface exceeds surface endurance strength of tooth?

a. Abrasivestrength
b. Corrosivewear
c. Destructivepitting
d. Galling.

12.The gears are used to connect two parallel shafts except

a. Spur gear
b. Helical gear
c. Double helical gears
d. Bevel gears

13.The gears used to connect non-parallel and non-intersecting shafts is

a. Straight bevel gears
b. Spiral bevel gears
c. Spiral gears
d. Double helical gears

14.To connect two intersecting shafts we use

a. Spur gear
b. Helical gear
c. Worm and wheel
d. Bevel gears

15.The gear used to convert rotary motion into translating motion is

a. Worm and wheel
b. Crown gear
c. Rack and pinion
d. Spiral Bevel gear

16.The point of contact of two pitch circles of mating gears is called

a. Pressure point
b. Pitch point
c. Module
d. Contact point

17.The circular pitch of a gear is given by

a. Πd/t
b. Πd/2t
c. 2Πd/t
d. Πd/3t

Where d=diameter of pitch circle
t=number of teeth

18.The module of a gear is given by

a. d/t
b. 2d/t
c. d/2t
d. d/3t

Where d=diameter of pitch circle
t=number of teeth

19. In single started worm, for one rotation, the wheel will rotate equal to

a. p/2
b. p
c. 2p
d. p/3

Where, p= pitch of wheel

20. In worm and wheel, the shaft axes are at

a. 90 degrees
b. 45 degrees
c. 180 degrees
d. 270 degrees

21.A ball bearing is to be used for a shaft whose speed is 400 rpm. The loads on the bearing are 4 kN radial and 4 kN thrust. The bearing is to have a life of 5000 hrs at a reliability of 94%. Determine the specific dynamic capacity (kN). Taking X = 0.56 and Y = 1

a. 35.82kN
b. 40 kN
c. 18 kN
d. 10 kN

22.SKF 6207 bearing is to operate on the following work cycle. F_r = 6000 N at 200 rpm for 40% of life, F_r = 10000 N at 400 rpm for 60% of life. The inner ring rotates, the loads are steady find the expected nominal life of the bearing (hrs) if dynamic capacity is equal to 20 kN.

a. 518.23Hrs
b. 400Hrs
c. 180 Hrs
d. 108Hrs

23.A full journal bearing having clearance to radius ratio of $\frac{1}{100}$, using a lubricant with $\mu = 28 \times 10^{-3}$ Pa-S, supports the shaft journal running at N = 2400 rpm. If bearing pressure is 1.4 MPa the Somerfield number is

A) 8×10^{-3}
B) 0.48×10^{-2}
C) 8×10^{-5}
D) 32×10^{-3}

24. A sliding contact bearing is operating under stable condition. The pressure developed in oil film is p when the journal rotates at N rpm. The dynamic viscosity of lubricant is μ and effective coefficient of friction between and journal of diameter D is f which one of the following statements is correct for the bearing.

A) f is directly proportional to μ and p
B) f is directly proportional to μ and N
C) f is inversely proportional μ and D
D) f is directly proportional to μ and inversely proportional to N

25. Match List I (bearings) with List II (Applications) and select the correct answer using the codes given below the lists:

List I	List II
A. Cylindrical Roller Bearing	1. Radial Loads
B. Ball- Bearing	2. m/c needs frequent dismounting and assembling
C. Taper Roller Bearing	3. Radial Loads with lesser thrust
D. Angular Contact Bearing	4. Shock Loads
	5. Axial Expansion of shaft dur to rise in temperature

A) A-1, B-3, C-2, D-5
B) A-5, B-2, C-4, D-1
C) A-2, B-3, C-5, D-1
D) A-3, B-5, C-1, D-4

26) It is necessary to use pump in bearing of
A) Hydrodynamic type
B) Radial
C) Hydrostatic type
D) Thrust type

27. A ball bearing is characterized by basic static capacity of 11000 N and dynamic capacity of 18000 N. This bearing is subjected to equivalent static load = 5500 N. The bearing loading ratio and life in million respectively are

A) 3.27 and 52
B) 2 and 10.1
C) 3.27 and 35.0
D) 1.6 and 4.1

28. For satisfactory performance the clearance ratio in sliding contact bearing should be between

A) 0.001 to 0.002
B) 0.0005 to 0.0008
C) 0.005 to 0.01
D) 0.01 to 0.02

29) In hydrodynamic bearing the fluid film is formed due to

A) Pressure developed by pump
B) Rotation of journal
C) Friction between shaft and bearing
D) None of the above

30. A journal bearing of diameter 25 cm and length 40 cm carries a load of 150 kN. The average bearing pressure (kN/cm^2) is

A) 0.01
B) 0.047
C) 0.5
D) 0.35

31. In a journal bearing, p = average bearing pressure, Z = absolute viscosity of the lubricant, N = rotational speed of the journal. The bearing characteristic is given by

A) $\frac{ZN}{p}$
B) $\frac{Z}{pN}$
C) $\frac{p}{ZN}$
D) $\frac{N}{Zp}$

32. Which one of the following is the lubricant regime during normal operation of a rolling element bearing?

A) Elastohydradynamic lubrication
B) Boundary lubrication
C) Hydrodynamic lubrication
D) Hydrostatic lubrication

33. Match List - I (Bearings) with List - II (Applications) and select the correct answer using the codes given below the lists:

List I	List II
A. Journal Bearing	1. Electric Motors
B. Thrust Bearing	2. Watches
C. Conical Pivot Bearing	3. Marine Engines
D. Ball Bearing	4. Swivelling Chairs

A) A-3, B-4, C-1, D-2
B) A-3, B-4, C-2, D-1
C) A-4, B-2, C-1, D-3
D) A-4, B-2, C-3, D-1

34. To carry large axial load in a flat collar bearing, a number of collars is provided to
A) Decrease intensity of pressure
B) Reduce frictional torque
C) Increase intensity of pressure
D) Increase frictional torque

35. The frictional torque transmitted in a flat pivot bearing assuming uniform wear is
A) $\frac{3}{4}\mu WR$
B) $\frac{2}{3}\mu WR$
C) μWR
D) $\frac{\mu WR}{2}$

36. Which bearing is preferred for oscillating conditions?
A) Taper roller bearing
B) Angular contact single row ball bearing
C) Needle roller bearing
D) Double row roller bearing

37. Ball bearing are provided with a cage

A) To prevent the lubricant from flowing out
B) To maintain the balls at a fixed distance apart
C) To reduce friction
D) To facilitate slipping of balls

38. Babbit lining is used on brass/bronze/bearing to

A) Increase bearing resistance
B) Increase wear resistance
C) Provide antifriction properties
D) Increase compressive strength

.39. Which one of the following types of bearings is employed in shafts of gearboxes of automobiles?

A) Hydrodynamic journal bearing
B) Multi-lobed journal bearings
C) Antifriction bearings
D) Hybrid journal bearings

40. The life of a ball bearing at a load 10 kN is 8000 hrs. Its life in hours, if the load is increased to 20 kN, keeping all other conditions same is.

A) 4000
B) 1000
C) 2000
D) 500

41. Tapered roller bearings can take

A) Axial load only

B) Radial load only

C) Both radial and axial loads and the ratio of these being less than unity

D) Both radial and axial loads and the ratio of these being greater than unity

42. In a journal bearing, the radius of the friction circle increases with the increase in

A) Radius of the journal

B) Speed of the journal

C) Load

D) Viscosity of the lubricant

43. The life of a ball-bearing is inversely proportional to

A) $(\text{Load})^{1/3}$

B) $(\text{Load})^{3.3}$

C) $(\text{Load})^{3}$

D) $(\text{Load})^{2}$

44. Type of failure which occurs in ball bearings is

A) Bending

B) Crushing

C) Fatigue

D) Shear

45. Load rating of 620 bearing is 22.5 kN, the life of the bearing should be 27 × 10^6 cycles, the equivalent load (kN) on the bearing must be.

A) 17.5 kN

B) 27.5 kN

C) 7.5 kN

D) 37.5 kN

46. The bearing pressure is limited to 80 N/cm^2 in a footstep bearing. The area of contact surface is 160 cm^2. The bearing can carry a maximum load (in kN) of

A) 10.5 kN

B) 23.5 kN

C) 12.80 kN

D) 32.5 kN

47. Friction is lower at starting condition and moderate at speed in the case of

A) Radial bearings

B) Angular bearings

C) Ball bearings

D) Journal bearings

48. The bearings which can support steady loads without any relative motion between the journal and the bearing is called

A) Thin film bearing

B) Zero film bearing

C) Externally pressurized lubricated bearing

D) Hydrodynamic bearing

49. Starting friction is low in

A) Hydrostatic lubrication

B) Hydrodynamic lubrication

C) Mixed (or semi fluid) lubrication

D) Boundary lubrication

50. Virtual number of teeth on pinion of bevel gear is calculated using the formula _____(where z_p = number of teeth on pinion, γ_p & γ_g = pitch cone angle)

a. $z_p / \cos \gamma_p$

b. $z_p / \cos \gamma_g$

c. $z_p / \cos^2 \gamma_p$

d. $z_p / \cos^3 \gamma_p$

51. A bevel gear consists of steel pinion and cast iron gear having pitch line velocity of 10 m/s. The maximum tangential force acting on the gear is 1500 N and face width is 40 mm. What is the dynamic load acting on this single stage bevel gear box if sum of errors on meshing teeth is 10 x 10^{-3} N/mm? (Use Buckingham's equation)

a. 4000.12 N

b. 4064.58 N

c. 2500.23 N

d. 2000.10 N

52. A bevel gear has pitch circle diameters of pinion and gear as 20 mm and 40 mm respectively. What is the face width of bevel gear?
(m =module)

a. 17.5 m

b. 10 m

c. 7.45 m

d. 3.16 m

53. What is the pitch line velocity if pinion has pitch circle diameter of 35 mm and rotates at 1000 r.p.m transmitting power of 250 kW to the gear?

a. 1.832 m/s

b. 2.5 m/s

c. 3.662 m/s

d. none of the above

54. A straight bevel gear is manufactured by cutting process and maximum tangential force of 12000 N acts on it. What is the effective load acting between meshing teeth if pitch line velocity is 130 m/s?

a. 92.30 kN
b. 272 kN
c. 2000 N
d. 500 N

55. Which of the gears has the highest contact ratio?
a) Helical
b) Spur
c) Bevel
d) Worm

56. 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

57. The gears used to connect non-parallel and non-intersecting shafts is

a. Straight bevel gears
b. Spiral bevel gears
c. Spiral gears
d. Double helical gears

58. What is the effect of large diametric quotient on worm and worm wheel?
a. Strength and rigidity of worm shaft is high
b. Efficiency of worm shaft increases
c. Worm shaft becomes weaker
d. All of the above

59. A standard worm gear pair is designated as 4/40/10/8, what does number 10 in it indicate?
a. Number of starts on worm
b. Diametral quotient
c. Centre distance
d. Module

60. A worm gear pair is designated as 1/30/10/8. What is the face width of the worm gear?

a. 30 mm

b. 53.07 mm

c. 58.4 mm

d. 62.3 mm

61. A worm gear pair has 2 starts on worm thread, 11.2 as diametral quotient, 2 as module and 38 numbers of teeth on worm gear. How is the gear pair designated with these specifications?

a. 2/11.2/38/2*

b. 11.2/2/38/2

c. 2/38/2/11.2

d. 2/38/11.2/2

62. If pressure angle is 22^o and coefficient of friction is 0.05. What is the axial force acting on the worm gear designated as 1/40/10/5, if tangential force of 1200 N acts on it?

a. 1241.2 N

b. 2618.4 N

c. 7755.1 N

d. 7847.4 N

63. A gear box having surface area of 0.30 m^2 has overall heat transfer coefficient of 23 $W/m^2\ ^oC$,when a fan is mounted on worm shaft to circulate air on fins. What is the power transmitting capacity of a gear box based on thermal considerations, if temperature rise of lubricating oil is 50 ^oC? (Assume $\lambda = 6^o$, $\Phi_n = 22^o$ & $\mu = 0.05$)

a. 1.023 kW

b. 1.006 kW

c. 1.227 kW

d. 2.000 kW

64.The shortest distance between worm gear and axes of the worm is given as _____

a. m ($z_w + z_g$) / q

b. m ($z_w + z_g$) / 2

c. m (q + z_g) / 2

d. √m (q + z_g) / 2

65. Which of the following relations is true?(where n_w = worm speed, n_g = worm gear speed, z_g = number of teeth on worm gear, z_w = number of starts on worm).

a. n_w α (1/z_g)

b. n_w / n_g = z_g /z_w

c. n_w / n_g = z_w /z_p

d. n_w z_g = n_g z_w

66. When large gear reductions are needed _____ gears are used.

a) Helical

b) Spur

c) Worm

d) Bevel

67. Which is of these is an advantage of worm gear?

a) It is expensive

b) Has high power losses and low transmission efficiency

c) Produce a lot of heat

d) Used for reducing speed and increasing torque

68. Find the helix angle of the worm if the pitch of the worm gear is 12 mm and the pitch diameter is 50 mm.

a) 8.687°

b) 11.231°

c) 9.212°

d) 10.319°

69. Find the speed of the gear if the worm is a three start worm rotating at 500 rpm. The gear has 20 teeth.

a) 125 rpm

b) 100 rpm

c) 75 rpm

d) 50 rpm

70. for a two start worm gear having a pitch of 20 mm and a lead angle 12°, find the centre distance if the larger gear has 25 teeth.

a) 148.22 mm

b) 124.93 mm

c) 121.19 mm

d) 109.53 mm

.71. Calculate the lead angle of the worm gear for maximum efficiency if θ = 90° and the coefficient of friction is 0.05.

a) 48.21°

b) 42.23°

c) 43.57°

d) 46.43°

72. Find the maximum efficiency if the lead angle is given to be 10° and the coefficient of friction is 0.07.

a) 79.82%

b) 72.23%

c) 76.29%

d) 70.72%

73. Calculate the maximum efficiency of the worm gears which have a friction angle of 0.06.

a) 88.71%

b) 83.23%

c) 89.91%

d) 86.49%

74. The angle at which the teeth are inclined to the normal of the axis of rotation is called _____

a) pitch angle

b) lead angle

c) normal angle

d) joint angle

75. 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

76. 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

77. A pair of worm gear is written as 2/40/12/6. Calculate the speed reduction.

a) 2

b) 20

c) 15

d) 6

78. If worm helix angle is 30º, then worm should have at least ___ threads.

a) 5

b) 6

c) 7

d) 8

79. The worm helix angle is the _____ of the worm lead angle.

a) Complement

b) Half

c) Double

d)Supplement

80. Match the following Group 1 items with Group 2 items and select the correct option

1. Helical gears ----------A. Intersecting shafts
2. Bevel gears ----------B. Rotary motion into reciprocating motion
3. Spiral gears ---------- C. Non-parallel nor intersecting
4. Rack and pinion ---------- D. Parallel shafts

a. 1 – A, 2 – C, 3 – D, 4 – B
b. 1 – D, 2 – A, 3 – C, 4 – B
c. 1 – B, 2 – D, 3 – C, 4 – A
d. 1 – C, 2 – A, 3 – B, 4 – D

81. Herring-bone gears are also known as
a. Hypoid gears
b. Helical gears
c. Spiral gears
d. None of the above

82. What is meant by interference?

a. Mating of conjugate profiles of a tooth

b. Mating of involute profiles of a tooth

c. Mating of non-involute profiles of a tooth

d. All of the above.

83. A pair of helical gears consists 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

84. 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=25^{o}.

a) 443.5N

b) 1125.6N

c) 7971.9N

d) 1014.2N

85. 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/mm^2, then calculate the beam strength.

a) 15000N

b) 12000N

c) 8000N

d) 10000N

86. Calculate the shaft angle for same hand of helix if helix angle of two gears are 20^o and 17^o.

a) 17^o

b) 20^o

c) 37^o

d) 3^o

87. 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=25^o. 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

88. Which of the following formulae of velocity factor (K) is considered if helical gears of medium accuracy are manufactured by hobbing process followed by shaving?

a. 5.6 / (5.6 + √V)
b. √5.6 / (5.6+ √V)
c. 6 / (6+V)
d. 0.85

89. What is the axial pitch for helical gears if helix angle is 25^o and normal module is 7?

a. 50.55 mm
b. 52.03 mm
c. 32.15 mm
d. 11.31 mm

90. The shortest distance measured along the normal to the helix between corresponding points on the adjacent teeth is called _____

a) gear pitch

b) helical pitch

c) circular pitch

d) normal circular pitch

91. A_____ bearing supports the load acting along the axis of the shaft.

a) Thrust

b) Radial

c) Longitudinal

d) Transversal

92. Which of the following bearings carry thrust load in one direction?

a. Spherical roller thrust bearings

b. Taper roller bearings

c. Both a. and b.

d. None of the above

93. A deep groove ball bearing rotating at 1200 r.p.m. is subjected to radial and an axial force of 2000 N and 1500 N respectively. What will be the basic dynamic capacity of bearing if 20,000 hours is the rating life?(Consider radial factor = 0.55, Thrust factor = 2 & application factor = 1.5?

a. 69.448 kN

b. 54.498 kN

c. 50.236 kN

d. 12.726 kN

94. Which of the following is a Stribeck's equation to determine basic static capacity of ball bearings?(where d = roller diameter, L = roller length)

a. KdLZ / 5

b. $Kd^2Z / 5$

c. $K^2dL / 5Z$

d. 5 Kd / Z

95. The type of bearing used in crankshaft is

a. Plain bearing
b. Roller bearing
c. Ball bearing
d. Magnetic bearing

96. Which of the following design eliminate the oil whirl completely?

a. Tilting pad
b. Pressure dam
c. Stabilizing force
d. All of the above

97. Oil whirl in journal bearing can be prevented by

a. Providing an obstacle to whirling fluid
b. Providing stabilizing load to minimize whirl
c. Both ‘a’ and ‘b’
d. None of the above

98. The location of journal is measured by

a. Attitude angle
b. Pressure angle
c. Wedge angle
d. None of the above

99. Hydrostatic bearing usually use ____ as lubricant

a. Oil
b. Grease
c. Nothing
d. Any of the above

100. When the load of bearing is carried by direct surface to surface contact is called

a. Full film condition
b. Boundary condition
c. Dry condition
d. None of the above