MECHANICAL ENGINEERING

PAPER-II

1. The process of removing the burrs or flash from a forged component in. drop forging is called:
   a. Swaging
   b. Perforating
   c. Trimming
   d. Fettling

2. Which of the following materials is used in the manufacture of extrusion nozzles?
   a. Grey cast iron
   b. Malleable cast iron
   c. White cast iron
   d. Nodular cast iron

3. Match List I (Alloy) with List II (Major Constituent) and select the correct answer using the code given below the List:

   List I

   A. Babbitt
   B. Invar
   C. Gun Metal
   D. Duralumin

   List II

   1. Nickel
   2. Tin and lead
   3. Aluminum
   4. Copper

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

4. Consider the following statements about medium carbon steel:
   1. It can be quench-hardened but not case-hardened.
   2. It cannot be quench-hardened but casehardening can be done.
   3. It exhibits distinct yield point under tension test

   Which of the following statements given above are correct?
   a. 1 and 2
   b. 2 and 3
   c. 1 and 3
   d. 1, 2 and 3

5. The eutectoid of carbon in Iron, above lower critical temperature, when cooled, results in:
   a. Ferrite and austenite
   b. Ferrite and Cementite
   c. Cementite and austenite
   d. Ferrite, Cementite and austenite

6. Consider the following statements about FCC and HCP crystal structure:
   1. Both have same coordination number and atomic packing fraction.
   2. Both represent closely packed crystal structure.
   3. Both structures are generated by staking of close packed planes on top of one another, but only the stacking sequence is different.

   Which of the statements given above are correct?
   a. 1 and 2
   b. 2 and 3
   c. 1,2 and 3
   d. 1 and 3

7. Thermoplastic materials cannot be produced by:
   a. Injection modeling process
   b. Extrusion process
   c. Blow molding process
   d. Both (a) and (b) above

8. increases of ferrite phase in steel increases:
   a. Strength
   b. Hardness
   c. Ductility
   d. Brittleness

9. Match List I (Steel) with List II (Application) and select the correct answer using the code given below the lists:

List I

A. Mild steel

B. Tool steel

C. High carbon steel

D. Medium carbon steel

List II

1. Ball bearing
2. Cold chisels
3. Shaft and axles
4. Rolled steel sections

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

10. Austempering is employed to obtain:

a. 100% martens tic structure

b. 100% bainitic structure

c. 50% martens tic and 50% bainitic structure

d. 100% pearlitic structure

11. In an assignment problem having n facilities and n jobs, what is the number of possible ways of making assignments?

a. n^1

b. n^2

c. 2n

d. 2^n

12. A 60 C-plain carbon steel has, approximately:

a. 75% of pear and 25% of ferrite

b. 25% of pearlite and 75% of ferrite

c. 75% of Cementite and 25% of ferrite

d. 75% of pearlite and 25% of Cementite

13. Match List I (Alloying Element) with List II (Effect on steel) and select the correct answer using the code given below the Lists:

List I

A. Vanadium

B. Molybdenum

C. Silicon

D. Chromium

List II

1. Increases endurance strength
2. Improves creep properties
3. Increases hardness
4. Increases resistance to high temperature oxidation

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

14. The B.C.C. and H.C.P. metals undergo plastic deformation by:

a. Slip

b. Twinning

c. Edge dislocation

d. Twinning in combination with slip.

15. If σ_c and E denote the crushing stress and Young's modulus for the material of a column, then the Euler formula can be applied for determination of cropping load of a column made of this material only, if its slenderness ratio is:

a. More than $\pi\sqrt{E/\sigma_c}$

b. Less than $\pi\sqrt{E/\sigma_c}$

c. More than $\pi^2\left(\frac{E}{\sigma_c}\right)$

d. Less than $\pi^2\left(\frac{E}{\sigma_c}\right)$

16. Beam A is simply supported at its ends and carries udl of intensity *w* over its entire length. It is made of steel having Young's modulus E. Beam B is cantilever and carries a udl of intensity w/4 over its entire length. It is made of brass having Young's modulus E/2. The two beams are of same length and have same cross-sectional area. If σ_A and σ_B denote the maximum bending stresses developed in beams A and B, respectively, then which one of the following is 'correct?

a. $\sigma_A/\sigma_B = 0$

b. $\sigma_A/\sigma_B < 1.0$

c. $\sigma_A/\sigma_B > 1.0$

d. σ_A / σ_B depends on the shape of cross-section

17. Consider the following statements:

1. Coriolis acceleration in a slotted bar mechanism is always perpendicular to the direction of the slotted bar.
2. In a 4-link mechanism, the instantaneous centre of rotation of the input link and output link always lies on a straight line along the coupler.

Which of the statements given above is/are correct?

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

18. Which of the following types of stresses is/are 'involved in the wire-drawing operation?

a. Tensile only
b. Compressive only
c. A combination of tensile and compressive stresses
d. A combination of tensile, compressive and shear stresses

19. Match List I (Type of Forging) with List II (Operation) and select the correct answer using the code given below the Lists:

List I

A. Drop Forging
B. Press Forging
C. Upset Forging
D. Roll Forging

List II

1. Metal is gripped in the dies and pressure is applied on the heated end.
2. Squeezing action
3. Metal is placed between rollers and pushed
4. Repeated hammer blows

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

20. The complete phase recrystallisation and fine grain structure is obtained in casting, forging and rolled parts by:

a. Recrystallisation annealing
b. Normalizing
c. Spheroidising
d. Austenising

21. Match List I with List II and select the. correct answer using the code given below the Lists:

List I

A. Transportation Problem
B. Assignment Problem
C. Dynamic Problem
D. PERT

List II

1. Critical Path
2. Stage Coach
3. Vogel's Approximate Method
4. Hungarian Method

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

22. A tie for leaving variables in simple procedure implies:

a. Optimality
b. Cycling
c. No solution
d. Degeneracy

23. A control chart is established with limits o ± 2 standard errors for use in monitoring samples of size n = 20. Assume the process to be in control. What. is the likelihood of a sample mean falling outside the control limits?

a. 97.7%
b. 95.5%
c. 4.5%
d. 2.3%

24. Which of the following are needed as the input data for materials requirement planning?

1. Weekly production schedule
2. Bill of material
3. Supplier lead time

4. Market forecast

Select the correct answer using the code given below:

a. 1,2 and 3
b. 2,3 and 4
c. 1 and 4
d. 1,2,3 and 4

25. In ABC analysis, A item require:

a. No safety stock
b. Low safety stock
c. Moderate safety stock
d. High safety stock

26. The critical path of a network is the path that:

a. Takes the shortest time
b. Takes the longest time
c. Has the minimum variance
d. Has the maximum variance

27. In a small engineering project, for an activity the optimistic time is 2 minutes, the most likely time is 5 minutes and the pessimistic time is 8 minutes. What is the expected time of the activity?

a. 1 minutes
b. 5 minutes
c. 8 minutes
d. 18 minutes

28. What are the key functions of a master schedule?

1. To generate material and capacity requirements
2. To maintain valid priorities
3. An effective capacity utilization
4. Planning the quantity and timing of output over the intermediate time horizons

Select the correct answer using the code given below:

a. 1,2 and 3
b. 2,3 and 4
c. 1,3 and 4
d. 1,2 and 4

29. Match List I (An Element of Jigs and Fixtures) with List II (Associating system) and select the correct answer using the code given below the Lists:

List I

A. Bush
B. Setting block
C. Diamond pin
D. V-block

List II

1. Milling fixture
2. Turning fixture
3. Radial location
4. Cylindrical location
5. Drill jigs

	A	B	C	D
a.	5	4	3	1
b.	3	1	2	4
c.	5	1	3	4
d.	3	4	2	1

30. Which one of the following forecasting techniques is most suitable for making long range forecasts?

a. Time series analysis
b. Regression analysis
c. Exponential smoothing
d. Market Surveys

31. The rating life of a group of apparently identical ball bearings is defined as the number of revolutions or exceeded before the first evidence of fatigue crack by:

a. 100% of the bearings of the group
b. 95% of the bearings of the group
c. 90% of the bearings of the group
d. 66.66% of the bearings of the group

32.

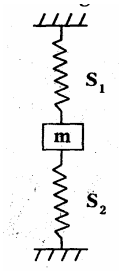
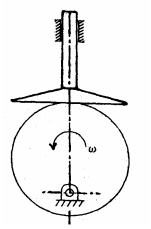


Figure given above shows a spring-mass system where the mass m is fixed in between two springs of stiff nesses S_1 and S_2. What is the equivalent spring stiffness?

a. $S_1 - S_2$
b. $S_1 + S_2$
c. $\frac{S_1 + S_2}{S_1 S_2}$

d. $\frac{S_1 - S_2}{S_1 S_2}$

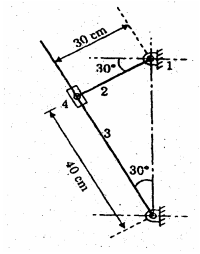
33.



The above figure shows a cam with a circular profile, rotating with a uniform angular velocity of ω rad/s. What is the nature of displacement of the follower?

a. Uniform
b. Parabolic
c. Simple harmonic
d. Cycloidal

34.



In the figure given above, the link 2 rotates at an angular velocity of 2 rad/s. What is the magnitude of Coriolis acceleration experienced by the link 4?

a. 0
b. 0.8 m/s^2
c. 0.24 m/s^2
d. 0.32 m/s^2

35. Which one of the following governors is used to drive a gramophone?

a. Watt governor
b. Porter governor
c. Pickering governor
d. Hartnell governor

36. A Hooks's Joint is used to connect two:

a. Coplanar and non-parallel shafts
b. Non-coplanar and non-parallel shafts
c. Coplanar and parallel shafts
d. Non-coplanar and parallel shafts

37. A circular section rod ABC is fixed at ends A and C. It is subjected to torque T at B. AB = BC = L and the polar moment of inertia of portions AB and BC are 2 J and J respectively. If G is the modulus of rigidity, what is the angle of twist at point B?

a. $\frac{TL}{3GJ}$
b. $\frac{TL}{2GJ}$
c. $\frac{TL}{GJ}$
d. $\frac{2TL}{GJ}$

38. Consider the following statements:

1. The degree of freedom for lower kinematic pairs is always equal to one.
2. A ball-and-socket joint has 3 degrees of freedom and is a higher kinematic pair
3. Oldham's coupling mechanism has two prismatic pairs and two revolute pairs.

Which of the statements given above is/are correct?

a. 1, 2 and 3
b. 1 only
c. 2 and 3
d. 3 only

39. Consider the following statements:

1. The effect of gyroscopic couple on a car while negotiating a curve is that its outer wheels tend to get lifted from the ground.
2. If spin vector is rotated about the precession vector axis in a direction opposite to that of precession through 90°, the new position of the spin vector indicates the direction of the torque vector.

Which of the following statements given above is/are correct?

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

40. In a Kinematic chain, a quaternary joint is equivalent to:

a. One binary joint
b. Two binary joints

c. Three binary joints

d. Four binary joints

41. A single cylinder, four-stroke I.C. engine rotating at 900 rpm has a crank length of 50 mm and a connecting rod length of 200 mm. if the effective reciprocating mass of the engine is 1.2 kg, what is the approximate magnitude of the maximum 'shaking force' created by the engine?

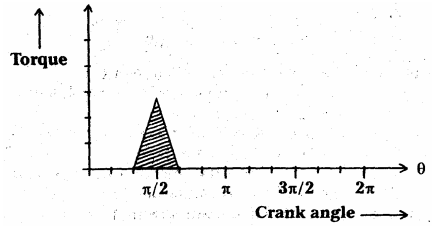
a. 533 N

b. 666 N

c. 133 N

d. None of the above

42.



The crank of a slider-crank punching press has a mass moment of inertia of 1 kgm2. The above figure shows the torque demand per revolution for a punching operation. If the speed of the crank is found to drop from 30 rad/s to 20 rad/s during punching what is the maximum torque demand during the punching operation?

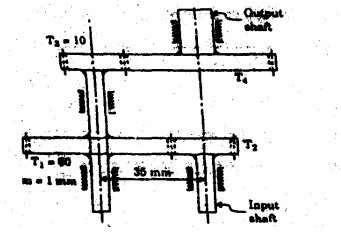
a. 95.4 Nm

b. 104.7 Nm

c. 477.2 Nm

d. 523.8 Nm

43.



In the figure shown above, if the speed of the input shaft of the spur gear train is 2400 rpm and the speed of the output shaft is 100 rpm, what is the module of the gear 4?

a. 1.2

b. 1.4

c. 2

d. 2.5

44. Spiral gears are used to connect:

a. Two parallel shafts

b. Two intersecting shafts

c. Two non-parallel and non-intersecting shafts

d. None of the above

45. consider the following statements for a 4-cylinder inline engine whose cranks are arranged at regular intervals of 90°:

1. There are 8 possible firing orders fort the engine.
2. Primary force will remain unbalanced for some firing orders.

Which of the statements given above is/are correct?

a. 1 only

b. 2 only

c. Both 1 and 2

d. Neither 1 nor 2

46. Consider the following statements concerning centrifugal governors:

1. The slope of the controlling force curve should be less than that of the straight line representing the centripetal force at the speed considered for the stability of a centrifugal governor.
2. Isochronisms for a centrifugal governor can be achieved only at the expense of stability.
3. When sleeve of a centrifugal governor reaches its topmost position, the engine should develop maximum power.

Which of the statements given above is/are correct?

a. 1 and 2

b. 2 and 3

c. 2 only

d. 3 only

47. Which of the following are Included in the finishing operations for porous bearing?

1. Infiltration
2. Sizing
3. Heat treatment
4. Coining

Select the correct answer using the code given below:

a. 1 and 2

b. 2 and 3

c. 2 and 4
d. 1 and 4

48. In gating system design, which one of the following is the correct sequence in which choke area, pouring time, pouring basin and sprue sizes are calculated?
a. Choke area - Pouring time - Pouring basin - Sprue
b. Pouring basin - Sprue - Choke area - Pouring time
c. Choke area - Sprue - Pouring basin - Pouring time
d. Pouring basin - Pouring time - Choke area - Sprue

49. Consider the following statements:
1. In gas welding, the torch should be held at an angle of 30° to 450 from the horizontal plane.
2. In gas welding, the size of the, torch depends upon the thickness of metal to be formed.
3. Drag in gas cutting is the time difference between heating of the plate and starting the oxygen gas for cutting.

Which of the statements given above are correct?
a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and S

50. Which of the following are the major characteristics of submerged are welding?
1. High welding speeds.
2. High deposition rates.
3. Low penetration.
4. Low cleanliness.

Select the correct answer using the code given below:
a. 2 and 3
b. 1, 2 and 3
c. 3 and 4
d. 1 and 2

51. In atomic hydrogen welding, hydrogen acts as
a. A heating agent
b. One of the gases to generate the flame
c. An effective shielding gas protecting the weld
d. A lubricant to increase the flow characteristics of weld metal

52. Hot cracks occur in the weld and fusion zone' as the metal solidifies. Which of the following are the causes for hot cracks?
1. Presence of sulphur and phosphorus in the base metal
2. High carbon or alloy content of the base metal
3. Moisture in the joint or electrode
4. Joint restraint

Select the correct answer using the code given below:
a. 1, 2 and 4
b. 1, 2 and 3
c. 3 and 4
d. 1, 2 3 and 4

53. Which one of the following statements is correct?

In up-milling operation, the unperformed chip thickness,
a. Is zero at the start of the cut and increases to a maximum value just before the tooth disengages the work piece.
b. Increases to the maximum value at the centre of the travel and decreases towards the end of tooth engagement.
c. Has a maximum value just after the cut is started and drops to zero at the end of the cut.
d. Remains uncharged.

54. Consider the following statements in respect of grinding?
1. The pitch of the grit cutting edges is larger than the pitch of the milling cutter.
2. The cutting angles of the grits have a random geometry.
3. The size of the chip cuts is very small for grinding.

Which, of the statements given above are correct?
a. 1 and 2
b. 2 and 3
c. 1 and 3
d. 1, 2 and 3

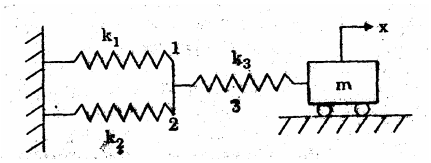
55. Consider the ‘following statements : An increase In the. cobalt content in the straight carbide grades of carbide tools

1. Increases the hardness.
2. Decreases the hardness.
3. Increases the transverse rupture strength
4. Lowers the transverse rupture strength

Which of the statements given above are correct?

a. 1 and 3
b. 2 and 4
c. 1 and 4
d. 2 and 3

56.



Which one of the following is the correct value of the natural frequency (ω_n) of the system given above?

a. $\left[\dfrac{1}{\left\{\dfrac{1}{(k_1+k_2)}+\dfrac{1}{k_3}\right\}}\right]^{1/2}$

b. $\left(\dfrac{3k}{m}\right)^{1/2}$

c. $\left(\dfrac{k}{3m}\right)^{1/2}$

d. $\left[\dfrac{k_3+\left(\dfrac{1}{\dfrac{1}{k_1}+\dfrac{1}{k_2}}\right)}{m}\right]^{1/2}$

57. If the surface of a component is heavily stressed while the stresses in the core are of comparative small magnitude, which one of the following heat treatment method is employed?

a. Annealing
b. Tempering
c. Quenching
d. Case hardening

58. The tolerance specified by the designer for the diameter of a shaft is 20.00 ±0.025 mm. The shafts produced by three different of 19.99 mm, 20.00 mm and 20.01 mm respectively, with same standard deviation. What will be the percentage rejection for the shafts produced by machines A, B and C?

a. Same for the machines A, B and C since the standard deviation is same for the three machines
b. Least for machine A
c. Least for machine B
d. Least for machine C

59. Consider the following statements:

1. Cast Iron has poor ability, to damp vibrations.
2. Cast Iron has higher compressive strength compared to that of steel.
3. Cast Iron parts are suitable where permanent deformation is preferred over fracture.

Which of the statements given above is/are correct?

a. 1, 2 and 3
b. 1 and 3
c. 3 only
d. 2 only

60. The initial contents of an array A are:

A= [2 7 8 6 15 14 0 50 3]

What would be the contents of the array A after executing the following segment of the FORTRAN code?

```
DO 35 J = 1, T,1
TEMP = A(J)
A(J) = A(J+2)
A(J+1) = TEMP
35 CONTINUE
```

a. A= [7 2 8 6 14 15 50 0 3]
b. A= [8 6 2 7 0 50 15 14 3]
c. A = [8 6 15 14 0 50 3 7 2]
d. A= [0 2 3 6 7 8 14 15 50]

61. Match List I (Illegal Statement) with List II (Reason) and select the correct answer using the code given below:

List I

A. READ*,(A(I),I=(0,5)
B. READ*,(A(I,J), I=1,10),J= 1,8)
C. IF (2.GE. B) THEN B=0
D. IF (A+B)GN.(C+D) THEN TOT= 100

List II

1. Mismatched parenthesis
2. Invalid operator
3. Illegal subscript
4. Mismatched data types

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

62. # include <stdio.h>
Main ( ) {
Int I = 4, j = 6, k =6;
{
Int I = 4;
Print f ("% d% d% d", I, j^{++}, $^{--}$k);
}
I^{++}; j^{++}; k^{++};
Print f ("% d% d% d/n", I, j, k);
What would be the printed output after the program given above is executed?
a. 475686
b. 465686
c. 466686
d. 575686

63. Consider the following piece of codes defining function
XYZ:
Int XYZ (int x)
{
If (x>=0)
Else
Return XYZ (-x);
}
Which one of the following statements is correct?
a. The function XYZ is syntactically incorrect.
b. The function .XYZ runs forever for some values of its parameter x.
c. The function XYZ computes the absolute value of x.
d. The function XYZ counts the number of binary digits in the number.

64. Consider the following segment of a program:
Int j = 1, x = 4
While (++j<=10)
X^{++};
What is the final value of x?
a. 11
b. 12
c. 13
d. 14

65. **Assertion (A):** Carburizing is done on non-ferrous alloys to increase the surface hardness.
Reason (R): Precipitation hardening of non-ferrous alloys involves solution heat treatment followed by precipitation heat treatment.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

66. **Assertion (A):** In attribute control of quality by sampling, the sample size has to be larger than variable control.
Reason (R): Variables are generally continuous, and attributes have few discrete levels.
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

67. **Assertion (A):** Value analysis is superior to other conventional cost reduction techniques.
Reason (R): in conventional cost reduction techniques bands
a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

68. **Assertion (A):** Hole basis system is generally preferred to shaft basis system in tolerance design for getting the required fits.

Reason (R): hole has to be given a larger tolerance band than the mating shaft.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

69. **Assertion (A):** selective control manges time more efficiency.

Reason (R): ABC analysis is based on Pareto distribution.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

70. **Assertion (A):** carbide tips are generally given negative rake angle.

Reason (R): carbide tips are made form very hard materials.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

71. **Assertion (A):** The critical speed of an elastic shaft calculated by the Rayleight's method is higher than the actual critical speed.

Reason (R): The higher critical speed is due to higher damping ratio

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

72. **Assertion (A):** Tapered roller bearings must be used in heavy duty worm gear speed reducers.

Reason (R): Tapered roller bearings are suitable for large radial as well as axial loads.

a. Both A and R are individually true and R is the correct explanation of A
b. Both A and R are individually true but R is not the correct explanation of A
c. A is true but R is false
d. A is false but R is true

73. Which one of the following can completely balance several masses revolving in different planes on a shaft?

a. A single mass in one of the planes of the revolving masses
b. A single mass in any one plane
c. Two masses in any two planes
d. Two equal masses in any two planes

74. Which one of the following expresses the sensitiveness of a governor?

a. $\frac{N_1 + N_2}{2N_1N_2}$

b. $\frac{N_1 - N_2}{2N_1N_2}$

c. $\frac{2(N_1 + N_2)}{2N_1 - N_2}$

d. $\frac{2(N_1 - N_2)}{2N_1 + N_2}$

(Where N_1 = Maximum equilibrium speed N_2 = Minimum equilibrium speed)

75. If the total radial interference between two cylinders forming a compound cylinder. Is δ and Young's modulus of the materials of the cylinders is E, then the interface pressure developed a the interface between two cylinders of the same material and same length is:

a. Directly proportional of E/δ
b. Inversely proportional of E/δ
c. Directly proportional of E/δ
d. Inversely proportional of E/δ

76. Power screws are used to produce uniform,, slow and powerful motion such as required in presses, jacks and other machinery .'V' threads are usually not used for this application due to low efficiency. This is because:

a. Profile angle is zero

b. Profile angle is moderate

c. Profile angle is large.

d. There is difficulty in manufacturing the profile

77. Consider the following statements pertaining to the basic Lewis- equation for the strength. design of spur gear teeth

1. Single pair of teeth participates in power transmission at any instant.
2. The tooth is considered -as a cantilever beam of uniform strength:
3. Loading on the teeth is static in nature.
4. Lewis equation takes into account the inaccuracies of the tooth profile.
5. Lewis equation takes into account the inaccuracies of the tooth profile.

Which of the statements given above are correct?

a. 1, 3, 4 and 5

b. 1, 2, 3 and 4

c. 1, 2 and 3

d. 2, 4 and 5

78. Match List I (Type of Gear? Gear Train) with List II (Different Usage and Drive) and select the correct answer using the code given below the Lists:

List I

A. Epicyclic gear train

B. Bevel Gear

C. Worm-worm Gear

D. Herringbone Gear

List II

1. Reduces end thrust
2. Low gear ratio
3. Drives non-parallel nonintersecting shafts
4. Drives non-parallel intersecting shafts
5. High gear ratio

	A	B	C	D
a.	5	4	3	1
b.	2	3	4	5
c.	5	3	4	1
d.	2	4	3	5

79. What is the main advantage of hydrodynamic bearing over roller bearing?

a. Easy to assemble

b. Relatively low price

c. Superior load carrying capacity at higher speeds

d. Less frictional resistance

80. If the load on a ball bearing is halved, its life:

a. Remains unchanged

b. Increases two times

c. Increases four times

d. Increases eight times

81. A square key of side d/4 is to be fitted on a shaft of diameter d and in the hub of a pulley, if the material of the key and shaft is same and the two are to be equally strong in shear, what is the length of the key?

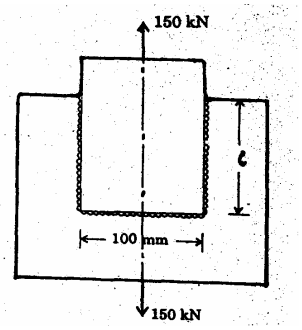
a. $\frac{\pi d}{2}$

b. $\frac{2\pi d}{3}$

c. $\frac{3\pi d}{4}$

d. $\frac{4\pi d}{5}$

82.



Two plates are joined together by means of single transverse and double parallel fillet welds as shown in figure given above. If the size of fillet is 5 mm and allowable shear load per mm is 300 N, what is the approximate length of each parallel fillet?

a. 150 mm

b. 200 mm

c. 250 mm

d. 300 mm

83. What is the safe static tensile load for a M36 × 4C bolt of mild steel having yield stress of 280 MPa and a factor of safety 1.5?

a. 285 kN

b. 1.90 kN
c. 142.5 kN
d. 95 kN

84. Autofrettage is a method of:
a. Joining thick cylinders
b. Relieving stresses from thick cylinders
c. Pre-stressing thick cylinders
d. Increasing, the life of thick cylinders

85. Consider the following statements in respect of worm gears:
1. They are used for very high speed reductions.
2. The velocity ratio does not depend on the helix angle of the worm.
3. The axes of worm and gear are generally perpendicular and non-intersecting.

Which of the statements given above are correct?
a. 1 and 2
b. 1 and 3
c. 2 and 3
d. 1, 2 and 3

86. A hollow shaft of the same cross-section area and material as that of a solid shaft, transmits:
a. Same torque
b. Lesser torque
c. More torque
d. Cannot be predicted without more data

87. In sliding contact bearings, a positive pressure can be built up and a load supported by a fluid only by the use of a:
a. Diverging film
b. Converging-diverging film
c. Converging film
d. Flat film

88. If E, G and K denote Young's modulus, Modulus of rigidity and Bulk Modulus, respectively for an elastic material, then which one of the following can be possibly true?
a. $G = 2K$
b. $G = E$
c. $K = E$
d. $G = K = E$

89. At a point in two-dimensional stress system $\sigma_x = 100$ N/mm^2, $\sigma_y = \tau_{xy} = 40$ N/mm^2. What is the radius of the Mohr circle for stress drawn with a scale of:
1 cm = 10 N/mm^2 ?
a. 3 cm
b. 4 cm
c. 5 cm
d. 6 cm

90. The point of contraflexure is a point where:
a. Shear force changes sign
b. Bending moment changes sign
c. Shear force is maximum
d. Bending moment is maximum

91. Consider the following statements:
1. Forging reduces the grain size of the metal, which results in a decrease in strength and toughness.
2. Forged components can be provided with thin sections, without reducing the strength.

Which of the statements given 'above is/are correct?
a. Only 1
b. Only 2
c. Both 1 and 2
d. Neither 1 nor 2

92. Consider the following statements:
1. Strength of steel increases with carbon content.
2. Young's Modulus of steel increases with carbon content.
3. Young's Modulus of steel remains unchanged with variation of carbon content.

Which of the statements given above is/are correct?
a. 1 only
b. 2 only
c. 1 and 2
d. 1 and 3

93. A hollow pressure vessel is subject to internal pressure.
Consider the following statements:
1. Radial stress at inner radius is always zero.

2. Radial stress at outer radius is always zero.
3. The tangential stress is always higher than other stresses.
4. The tangential stress is always lower than other stresses.

Which of the statements given above are correct?

a. 1 and 3
b. 1 and 4
c. 2 and 3
d. 2 and 4

94. Which of the following pairs correctly matched?

(Designation of Steel/Cast iron) (Description)

1. Fe E 250 : Minimum tensile strength of 250 N/mm^2
2. 40 C 8 : Percentage of Manganese is 0.7% — 0.9%
3. FG 200 : Grey cast iron with ultimate tensile strength of 200 N/mm^2

Select the correct answer using the code given below:

a. 1 and 2
b. 2 and 3
c. 1 and 3
d. 1, 2 and 3

95. Consider the following statements:

1. Endurance strength of a component is not affected by its surface finish and notch sensitivity of the material.
2. For ferrous materials like steel S-N curve becomes asymptotic at 10^6 cycles.

Which of the statements given above Is/are correct?

a. 1 only
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

96. At a section of a beam, shear force is F with zero BM. The cross-section is square with side a. Point A lies on neutral axis and point B is mid way between neutral axis and top edge, i.e. at distance a/4 above the neutral axis. If τ_A and τ_{AB} denote shear stresses at points A and B, then what is the value of τ_A / τ_B ?

a. 0
b. 3/4
c. 4/3
d. None of above

97. If the area of cross-section of a circular section beam is made four times, keeping the loads, length, support conditions and material of the beam unchanged, then the qualities (List I) will change through different factors (List II). Match the List I with the List II and select the correct answer using the code given below the Lists:

List I

A. Maximum BM
B. Deflection
C. Bending Stress
D. Section Modulus

List II

1. 8
2. 1
3. 1/8
4. 1/16

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

98. Normal stresses of equal magnitude p, but of opposite signs, act at a point of a strained material in perpendicular direction. What is the magnitude of the resultant normal stress on a plane inclined at 45° to the applied stresses?

a. 2p
b. p/2
c. p/4
d. Zero

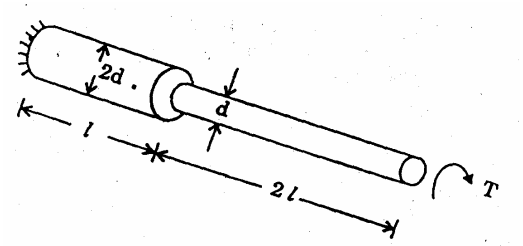
99. A solid uniform metal bar of diameter D and length L is hanging vertically from its upper end The elongation of the bar due to self weight is:

a. Proportional to L and inversely proportional to D^2
b. Proportional to L^2 and inversely proportional to D2

c. Proportional of L but independent of D

d. Proportional of L^2 but independent of D

100.



What is the total angle of twist of the stepped shaft subject to torque T shown In figure given above?

a. $\frac{16T_l}{\pi Gd^4}$

b. $\frac{38T_l}{\pi Gd^4}$

c. $\frac{64T_l}{\pi Gd^4}$

d. $\frac{66T_l}{\pi Gd^4}$

101. For a power transmission shaft transmitting power P at N rpm, its diameter is proportional to:

a. $\left(\frac{P}{N}\right)^{1/3}$

b. $\left(\frac{P}{N}\right)^{1/2}$

c. $\left(\frac{P}{N}\right)^{2/3}$

d. $\left(\frac{P}{N}\right)$

102. Match List I (Type of Bearings) with List II (Type of Load) and select the correct answer using the code given below the Lists :

List I

A. Deep groove bearing

B. Tapered roller bearing

C. Self aligning being

D. Thrust bearing

List II

1. Radial load
2. Radial and axial load
3. Mainly radial load with shaft misalignment
4. Mainly axial load

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

103. In single server queuing model if arrival rate is λ and service rate is μ, then what is the probability of the system being idle?

a. λ/μ

b. μ/λ

c. 1–λ/μ

d. $\left(\frac{1-\lambda}{\mu}\right)$

104. Which of the following are correct in respect of graphically solved linear programming problems?

1. The region of feasible solution has concavity property.
2. The boundaries of the region are lines or planes.
3. There are corners or extreme points on the boundary

Select the correct answer using the code given below:

a. 1 and 2

b. 2 and 3

c. 1 and 3

d. 1, 2 and 3

105. Match List I (Production Control Function) with List II (Explanation) and select the correct answer using the code given below the Lists:

List I

A. Bill of Materials (BOM)

B. Capacity Resource Planning (CRP)

C. Material Requirement Planning (MRP)

D. Master Production Schedule (MPS)

List II

1. A technique for determining the quantity and timing of dependent demand items
2. A technique for determining personnel and equipment capacities needed to meet the production objective

3. Specifies what end items are to be produced and when
4. The part numbers & quantity required per assembly

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

106. If the arrivals are completely random, then what is the probability distribution of number of arrivals In a given time?
   a. Negative exponential
   b. Binomial
   c. Normal
   d. Poisson

107. Match List I (Activity) with List II (Technique) and select the correct answer using the code given below the Lists:

List I

A. Line Balancing
B. Product Development
C. Forecasting
D. Quality Control

List II

1. Value analysis
2. Exponential smoothing
3. Control chart
4. Selective control
5. Rank position matrix

	A	B	C	D
a.	2	1	4	3
b.	5	3	2	1
c.	2	3	4	1
d.	5	1	2	3

108. For a product, the forecast for the month of January was 500 units. The actual demand turned out to be 450 units What is the forecast for the month of February using exponential smoothing method with a smoothing coefficient = 0.1?
   a. 455
   b. 495
   c. 500
   d. 545

109. Which one of the following methods can be used for forecasting when a demand pattern is consistently increasing or decreasing?
   a. Regression analysis
   b. Moving average
   c. Variance analysis
   d. Weighted moving average

110. Match List I (Matching Process) with List II (Application) and select the correct answer using the code given below the Lists:

List I

A. EDM
B. LBM
C. USM
D. ECM

List II

1. Holes & cavities In hard & brittle materials
2. Micro-drilling & micro-welding of materials
3. Shaping of hard metals or reshaping of cemented cabide tools
4. Shaping of cemented carbine dies and punches

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

111. In helical milling, the ratio of the circumference of the gear blank to the lead of the heliz determines the:
   a. Proper speed to use
   b. Proper feed and depth of cut required
   c. Angle setting of the machine table
   d. Gear ratio for table screw and dividing head

112. Which one of the following processes produces a casting when pressure forces the molten metal into the mould cavity?
   a. Shell moulding
   b. Investment casting
   c. Die casting
   d. Continuous casting

113. Consider the following statements:
   1. In arc welding, 65% to 75% heat is generated at the anode.

2. Duty cycle in case of arc welding is the cycle of complete welding of work piece from the beginning.
3. Arc blow is more common with DC welding.

Which of the statements given above are correct?

a. 1, 2 and 3
b. 1 and 2
c. 2 and 3
d. 1 and 3

114. Magnetic forming is an example of:

a. Cold forming
b. Hot forming
c. High energy rate forming
d. Roll forming

115. Which one of the following is the correct expression for the Merchant's mach inability constant?

a. $2\phi + \gamma - \alpha$
b. $2\phi - \gamma + \alpha$
c. $2\phi - \gamma - \alpha$
d. $\phi + \gamma - \alpha$

(where ϕ = shear angle, γ = friction angle & α = rake angle)

116. Match List I (Tool) with List II (Element of Tool) and select the correct answer using. the code given below the Lists:

List I

A. Broach
B. Reamer
C. Drill
D. Carbine insert face mill

List II

1. Tang
2. Pilot
3. Front taper
4. Bond
5. Sweeper tooth

	A	B	C	D
a.	2	5	1	3
b.	1	3	4	5
c.	2	3	1	5
d.	1	5	4	3

117. The gating ratio 2 : 8 : 1 for copper in gating system design refers to the ratio of areas of:

a. Sprue : Runner : Ingate
b. Runner : Ingate : Sprue
c. Runner : Sprue : Ingate
d. Ingate : Runner : Sprue

118. In shell moulding, how can the shell thickness be accurately maintained?

a. By controlling the time during which the pattern is in contact with mould
b. By controlling the time during which the pattern is heated
c. By maintaining the temperature of the pattern in the range of 175°C–380°C
d. By the type of binder used

119. Which one of the following is the most significant property to be considered in the selection of material for the manufacture of locating pins and drill jig buses used in jigs and fixtures?

a. Wear resistance
b. Elasticity
c. Shear strength
d. Tensile strength

120. Which of the following is/are used as low wearing tool material(s) in electric discharge machining?

a. Copper and brass
b. Aluminium and graphite
c. Silver tungsten and copper tungsten
d. Cast iron