MECHANICAL ENGINEERING

PAPER-II

1. What is the additional time available for the performance of an activity in PERT and CPM calculated on the basis that all activities will start at their earliest start time, called?
   a. Slack
   b. Total float
   c. Free float
   d. independent float
2. In the basic EOQ model, if demand is 60 per month, ordering cost is Rs. 12 per order, holding cost is Rs. 10 per unit per month. what is the EOQ?
   a. 12
   b. 144
   c. 24
   d. 28
3. Which one of the following is correct? In tile basic EOQ model, if lead time increases from 5 to 10 days, the EOQ will
   a. double
   b. decrease by a factor of two
   c. remain the same
   d. The data is insufficient to find EOQ
4. Which one of the following statements is not correct
   a. Work sampling is a technique of work measurement
   b. Method study is a technique aimed at evolving improved methods.
   c. Synthetic data is not a technique covered under pre-determined motion time systems
   d. 'Select' is the first step of method study
5. A time standard for a data entry clerk is to be set A job is rated at l20 percent, it takes 30 seconds to enter each record and the allowances are 15%. What is the normal time?
   a. 25 seconds
   b. 30 seconds
   c. 36 seconds
   d. 40 seconds
6. Which one of the following statements is not correct?
   a. The operating characteristic curve of an acceptance sampling plan shows the ability of the plan to distinguish between good and bad lots.
   b. No sampling plan can give complete protection against the acceptance of defective products.
   c. C chart has straight line limits and U chart has zig-zag limits.
   d. Double sampling results in more inspection than single sampling if the incoming quality is very bad
7. Which one of the following statements is not correct?
   a. A linear programming problem with 2 variables and 3 constraints can be solved by Graphical Method.
   b. In big-M method if the artificial variable can not be driven out it depicts an optimal solution.
   c. Dual of a dual is the primal problem.
   d. For mixed constraints either big-M method or two phase method can be employed.
8. In Order for a transportation matrix which has six rows and four columns not to degenerate, what is the number of occupied celled in the matrix?
   a. 6
   b. 9
   c. 15
   d. 24
9. In a single server queuing system with arrival rate of 'λ' and mean service time of 'μ' the expected number of customers in the system is $\frac{\lambda}{(\mu-\lambda)}$.
   What is the expected waiting time per customer in the system?
   a. $\frac{\lambda^2}{(\mu-\lambda)}$
   b. $\mu-\lambda$
   c. $\frac{1}{\mu-\lambda}$
   d. $\frac{(\mu-\lambda)}{\lambda}$
10. Match List-I with List-II and -select the correct answer using the code given below the lists:
    List-I
    (Components)
    A. Control unit
    B. Arithmetic unit
    C. Memory
    D. Output device
    List-II
    (Functions)

1. Logical checks and calculations
2. Stores instructions and data
3. Converts results and presents to the user
4. Converts instructions to codes
5. Receives instructions and per forms operations

Code:

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

11. The Central Processing Unit of a mini computers uses which of the following blocks:
    1. Memory Unit
    2. Control Unit
    3. Arithmetic Unit
    4. Output Unit

    Select the correct answer using the code given below:
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1 and 4
12. Which one of the following statements about FORTRAN is not correct?
    a. GO TO 999
    b. CONTINUE 999
    c. PRINT 999
    d. DIMENSION A (999)
13. Bottom gating system is sometimes preferred in casting because
    a. it enables rapid filling of mould cavity
    b. it is easier to provide in the mould
    c. it provides cleaner metal
    d. it reduces splashing and turbulence
14. The pattern adopted for those castings where there are some portions which' are structurally weak and are likely to break by the force of ramming are called:
    a. Loose piece pattern
    b. Follow board pattern
    c. Skelton pattern
    d. Single piece pattern
15. Which of the following casting processes does not/do not require central core for producing pipe?
    1. Sand casting process
    2. Die casting process
    3. Centrifugal casting process

    Select the correct answer using the code given below:
    a. 1 and 2
    b. 2 only
    c. 2 and 3
    d. 3 only
16. If critical path of a project is 20 months with a standard derivative 4 months, What is the probability that the project will be completed in 24moths?
    a. 15.85 %
    b. 68.3 %
    c. 84.2 %
    d. 95.50%
17. Common contact ratio of a pair of spur pinion and gear is
    a. Less than 1.0
    b. equal to 1
    c. between 2 and 3
    d. greater than 3
18. In case of am p disc clutch, if n_1 is the nurnberofdiscicni1hedriving-shaft and n_2 is the number of discs on the driven shaft, then what is the number of pairs of contact surfaces?
    a. $n_1 + n_2$
    b. $n_1 + n_2 - 1$
    c. $n_1 + n_2 + 1$
    d. $n_1 + 2n_2$
19. For roller chain drive with sprocket having 10 teeth, the velocity of the driven shaft with respect to that of drive will be approximately
    a. same
    b. 5% above to 5% below
    c. 5% above
    d. below
20. Which of the following in-line engines working on four-stroke cycle is completely balanced inherently?
    a. 2 cylinder engine
    b. 3 cylinder engine
    c. 4 cylinder engine
    d. 6 cylinder engine

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

    List-I
    (Key/spline)
    B. Gib head key
    C. Woodruff key
    D. Parallel key
    E. Spline

    List-II
    (Application)
    1. Self aligning
    2. Facilitates removal
    3. Mostly used
    4. Axial movement possible

    Code:

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

21. Eight bolts are to be selected for fixing the cover plate of a cylinder subjected to a maximum load of 980 175 kN. If the design stress for the bolt material is 315 N/mm2, what is the diameter of each bolt?

a. 10 mm
b. 22 mm
c. 30 mm
d. 36 mm

22. Consider the following statements:
1. The amount of interference needed to create a tight joint varies with diameter of the shaft.
2. An interference fit creates no stress state in the shaft.
3. The stress state in the hub is similar to a thick-walled cylinder with internal pressure.

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

23. Consider the following statements:
A nomenclature ϕ50 H8/p8 denotes that
1. hole diameter is 50 mm.
2. it is a shaft base system.
3. 8 indicates fundamental deviation.

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

24. Consider the following:
V-belts are specified by their
1. nominal inside length in mm
2. nominal pitch length
3. belt cross section symbol
4. weight/unit length of the belt

Which of the above are correct?
a. 1, 2, 3 and 4
b. 1 and 2 only
c. 1 and 3 only
d. 3 and 4 only

25. Consider the following statements:
Maximum shear stress induced in a power transmitting shaft is
1. directly proportional to torque being transmitted.
2. inversely proportional to the cube of its diameter.
3. directly proportional to its polar moment of inertia.

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

26. Maximum shear stress in a Mohr's Circle
a. is equal to radius of Mohr's circle
b. is greater than radius of Mohr's circle
c. is less than radius of Mohr's circle
d. could be any of the above

27. Maximum deflection of a cantilever beam of length l carrying uniformly distributed load w per unit length will be:
a. $Wl^4/(EI)$
b. $Wl^4/(4\,EI)$
c. $Wl^4/(8\,EI)$
d. $Wl^4/(384\,EI)$

[Where E = modulus of elasticity of beam material and I moment of inertia of beam cross-section]

28. In I-section of a beam subjected to transverse shear force, the maximum shear stress is developed
a. at the centre of the web
b. at the top edge of the top flange
c. at the bottom edge of the top flange
d. None of the above

29. In case of a beam of circular cross-section subjected to transverse loading, the maximum shear stress developed in the beam is greater than the average shear stress by
a. 50%
b. 33%
c. 25%
d. 10%

30. A structural member subjected to an axial compressive force is called
a. beam
b. column
c. frame
d. strut

31. Structure of a polymer is:
a. Long chain
b. Rhombic
c. Cubic
d. Closed pack hexagonal

32. Consider the following statements:
1. Metal forming decreases harmful effects of impurities and improves mechanical strength.
2. Metal working process is a plastic deformation process.
3. Very intricate shapes can be produced by forging process as compared to casting process.

Which of the statements given above are correct?
a. 1, 2 and 3
b. 1 and 2 on1y
c. 2 and 3 only
d. 1 and 3 only

33. Match List-I with List-II and select the correct answer using the code given below the lists
List-I
(Forging Technique)
A. Smith Forging
B. Drop Forging
C. Press Forging
D. Machine Forging

List-II
(Process)

1. Material is only upset to get the desired shape
2. Carried out manually in open dies
3. Done in closed impression dies by hammers in blows
4. Done in closed impression dies by continuous squeezing force

Code:

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

34. A cylindrical vessel with flat bottom can be deep drawn by
a. shallow drawing
b. single action deep drawing
c. double action deep drawing
d. triple action deep drawing

35. Which one of the following methods is used for the manufacture of collapsible toothpaste tubes?
a. Impact extrusion
b. Direct extrusion
c. Deep drawing
d. Piercing

36. Small amount of carbonaceous material sprinkled on the inner surface of mould cavity is called
a. Backing sand
b. Facing sand
c. Green sand
d. Dry sand

37. In automobiles, Hook's joint is used between which of the following?
a. Clutch and gear box
b. Gear box and differential
c. Differential and wheels
d. Flywheel and clutch

38. In a flat belt drive the belt can be subjected to a maximum tension T and centrifugal tension T_C. What is the condition for transmission of maximum power?
a. $T = T_C$
b. $T = \sqrt{3}\, T_C$
c. $T = 2T_C$
d. $T = 3\, T_C$

39. A shaft is subjected to combined twisting moment T and bending moment M. What is the equivalent bending moment?
a. $\frac{1}{2}\left\{\sqrt{M^2+T^2}\right\}$
b. $\sqrt{M^2+T^2}$
c. $\frac{1}{2}\left\{M+\sqrt{M^2+T^2}\right\}$
d. $M+\sqrt{M^2+T^2}$

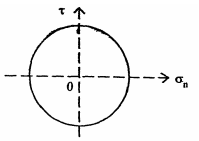
40. The ratio of torque carrying capacity of a solid shaft to that of a hollow shaft is given by:
a. $(1-K^4)$
b. $(1-K^4)^{-1}$
c. K^4
d. $1/K^4$

Where $K = \frac{D_i}{D_0}$

D_i = Inside diameter of hollow shaft
D_0 = Outside diameter of hollow shaft Shaft materials are the same.

41. The principal stresses at a point in two-dimensional stress system are σ_1 and σ_2 and corresponding principal strains are ε_1 and ε_2. If E and V denote Young's modulus and Poisson's ratio, respectively, then which one of the following is correct?
a. $\sigma_1 = E\,\varepsilon_1$
b. $\sigma_1 = \frac{E}{1-V^2}\left[\varepsilon_1 + V\varepsilon_2\right]$
c. $\sigma_1 = \frac{E}{1-V^2}\left[\varepsilon_1 - V\varepsilon_2\right]$
d. $\sigma_1 = E\,(\varepsilon_1 - V\varepsilon_2)$

42. A point in a two dimensional state of strain is subjected to pure shearing strain of magnitude y radians. Which one of the following is the maximum principal strain?
a. γ_{xy}
b. $\gamma_{xy}/\sqrt{2}$
c. $\gamma_{xy}/2$
d. $2\gamma_{xy}$

43. 

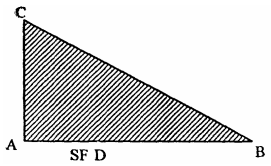
Consider the Mohr's circle shown above:
What is the state of stress represented by this circle?
a. $\sigma_x = \sigma_y \neq 0,\ \tau_{xy} = 0$
b. $\sigma_x = \sigma_y = 0,\ \tau_{xy} \neq 0$
c. $\sigma_x = 0,\ \sigma_y = \tau_{xy} \neq 0$
d. $\sigma_x \neq 0,\ \sigma_y = \tau_{xy} = 0$

44. What is the relationship between the linear elastic properties Young's modulus (E), rigidity modulus (G) and bulk modulus (K)?
a. $\frac{1}{E} = \frac{9}{K} + \frac{3}{G}$
b. $\frac{3}{E} = \frac{9}{K} + \frac{1}{G}$
c. $\frac{9}{E} = \frac{3}{K} + \frac{1}{G}$

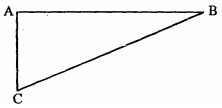
d. $\frac{9}{E}=\frac{1}{K}+\frac{3}{G}$

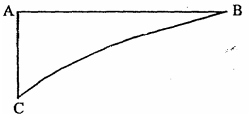
45. A 100 mm x 5 mm x 5 mm steel bar fee to expand is heated from 15^0C to 40^0C. What shall be developed?
a. Tensile stress
b. Compressive stress
c. Shear stress
d. No stress

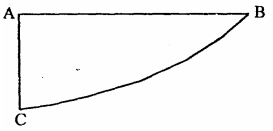
46.

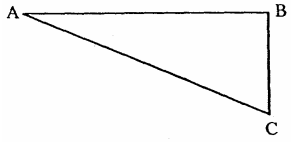


The shearing force diagram for a beam is shown in the above figure. The bending moment diagram is represented by which one of the following?

a.


b.


c.


d.


47. Match List-I with List-II and select the correct answer using the code given below the lists
List-I
(Formula/theorem/method)
A. Clapeyron's theorem
B. Maculay's method
C. Perry's formula
List-II
(Deals with topic)
1. Deflection of beam
2. Eccentrically loaded column
3. Rivetted joints
4. Continuous beam
Code:

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

48. What is the shape of the shearing stress distribution across a rectangular cross- section beam?
a. Triangular
b. Parabolic only
c. Rectangular only
d. A combination of rectangular and parabolic shape

49. A solid shaft transmits a torque T. The allowable shearing stress is τ. What is the diameter of the shaft?
a. $\sqrt[3]{\frac{16T}{\pi\tau}}$
b. $\sqrt[3]{\frac{32T}{\pi\tau}}$
c. $\sqrt[3]{\frac{16T}{\tau}}$
d. $\sqrt[3]{\frac{T}{\tau}}$

50. Which one of the following expresses the stress factor K used for design of closed coiled helical spring?
a. $\frac{4C-4}{4C-1}$
b. $\frac{4C-1}{4C-4}+\frac{0.615}{C}$
c. $\frac{4C-4}{4C-1}+\frac{0.615}{C}$
d. $\frac{4C-1}{4C-4}$
Where C = spring index

51. A helical coil spring with wire diameter 'd' and coil diameter 'D' is subjected to external load. A constant ratio of d and D has to be maintained, such that the extension of spring is independent of d and D. What is this ratio?
a. D^3/d^4
b. d^3/D^4
c. $\frac{D^{4/3}}{d^3}$
d. $\frac{d^{3-4}}{D^3}$

52. A closed coil helical spring of mean coil diameter 'D' and made from a wire of diameter 'd' is subjected to a torque 'T' about the axis of the spring. What is the maximum stress developed in the spring wire?
a. $\frac{8T}{\pi d^3}$

b. $\frac{16T}{\pi d^3}$

c. $\frac{32T}{\pi d^3}$

d. $\frac{64T}{\pi d^3}$

53. Where does the maximum hoop stress in a thick cylinder under external pressure occur?
a. At the outer surface
b. At the inner surface
c. At the mid-thickness
d. At the 2/3rd outer radius

54. If one end of a hinged column is made fixed and the other free, how much is the critical load compared to the original value?
a. 1/4
b. 1/2
c. Twice
d. Four times

55. Who postulated the maximum distortion energy theory?
a. Tresca
b. Rankine
c. St. Venant
d. Mises-Henky

56. In the atomic hard-sphere model of the ciysta1stureofCopper,whaiisibeede length of unit cell?
a. 2 x Atomic radius
b. $\left(4/\sqrt{3}\right)$ x Atomic radius
c. $\left(2\sqrt{2}\right)$ x Atomic radius
d. $\sqrt{2}$ x Atomic radius

57. Which one of the following is correct?
When "devitrification" of inorganic glasses is done,
a. glass transforms from crystalline to non-crystanine state
b. glass transforms into a fully transparent material
c. glass transforms from non-crystalline state to poly-crystalline state
d. glass is relieved of internal stresses

58. What is a surface imperfection, which separates crystals of different orientations in a poly-crystalline aggregate, called?
a. Edge dislocation
b. Stacking fault
c. Grain boundary
d. Screw dislocation

59. Which one of the following statements is correct in the case of screw dislocations?
($\vec{b}$ = Burgers Vector, $\vec{t}$ = Imaginary Vector)
a. $\vec{b}$ is perpendicular to $\vec{t}$
b. $\vec{b}$ is parallel to $\vec{t}$
c. $\vec{b}$ is inclined to $\vec{t}$
d. $\vec{b}$ and $\vec{t}$ are non-coplanar and non intersecting

60. Which one of the following is correct?
Malleability is the property by which a metal or alloy can be plastically deformed by applying
a. tensile stress
b. bending stress
c. shear stress
d. compressive stress

61. Which of the following elements given below determine (s) the maximum attainable hardness in steel?
1. Chromium
2. Manganese
3. Carbon
4. Molybdenum
Select the correct answer using the code given below:
a. 1 only
b. 1 and 2
c. 3 only
d. 2 and 4

62. Coefficient of Expansion is practically nil in a particular alloy. What is this alloy?
a. Hadfield Manganese Steel
b. Invar
c. Vitallium
d. Stellite

63. Consider the following statements relating to mechanical properties of ceramics:
1. Tensile strength is theoretically high but in practice quite low.
2. Compressive strength is many times lower than tensile strength.
3. Shear strength is high.
4. Transverse strength is easy to ascertain.
Which of the statements given above are correct?
a. 1 and 3
b. 1 and 4
c. 2 and 3
d. 2 and 4

64. Maximum angular velocity of the connecting rod with a crank to connecting rod ratio 1:5 for a crank speed of 3000 rpm is around:
a. 300 rad/s
b. 60 rad/s
c. 30 rad/s
d. 3000 rad/s

65. In three ball bearings identified as SKF 2015, 3115 and 4215
a. bore is common but width is increasing
b. outer diameter is common but bore is increasing
c. width is common but outer diameter is decreasing

d. bore is common but outer diameter is decreasing

66. Which one of the following statements regarding computers is not correct?
   a. Databases contain fields and records
   b. The organized set of instructions given to the computer to solve a problem is called a program
   c. Collection of 8 bits is called a byte
   d. Spreadsheet is a term used in FORTRAN language

67. Which one of the following is not a command in DBase III?
   a. Create
   b. List
   c. Sort
   d. Remove

68. Consider the following statements about antifriction bearings:
   1. Their location influences the lateral critical speed of a rotor.
   2. Roller bearings are antifriction bearings.

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

69. Consider the following statements:
   1. One way of improving vibration isolation is to decrease the mass of the vibrating object.
   2. For effective isolation, the natural frequency of the system should be far less thank the exciting frequency.

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

70. Consider the following statements in respect of austenitic stainless steels:
   1. Austenitic stainless steels are hardened and strengthened by cold working.
   2. Austenitic stainless steels cannot be quenched and tempered.

   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

Directions:-
Each of the next Twelve (12) items consists of two statements, one labelled as the 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:
(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 is false
(d) A is false but R is true

71. **Assertion (A):** Value Engineering is concerned with increasing the quality of the product even at enhanced Cost to fulfill the customer requirements.
Reason (R): Customer requirements are changing very rapidly and survival of a manufacturing industry is linked with fulfilling the customers requirements.

72. **Assertion (A):** Lever Rule can be applied to determine relative amounts of phases present at any temperature.
Reason (R): Lever Rule is restricted to estimate relative phases, only if they are solid phases.

73. **Assertion (A):** In case of Control Chart for fraction rejected (p-chart), binomial distribution is used.
Reason (R): In binomial distribution probability of the event varies with each draw.

74. **Assertion (A):** In case of Control Charts for variables, the averages of sub-groups of readings are plotted instead of plotting individual readings.
Reason (R): It has been proved through experiments that averages will form normal distribution curve.

75. **Assertion (A):** In centralized inspection, material handling is less.
Reason (R): Less number of gauges and instruments are required as inspection is carried out in one location.

76. **Assertion (A):** Submerged are welding is not recommended for high carbon steels, tool steels, aluminium, magnesium etc.
Reason (R): This is because of unavailability of suitable fluxes, reactivity at high temperatures and low sublimation temperatures.

77. **Assertion (A):** The Lewis equation for design of gear tooth predicts the static load capacity of a cantilever beam of uniform strength.
Reason (R): According to law of gears interchangeability is possible only when gears have same pressure angle and same module.

78. **Assertion (A):** Elements are classified into metals and non-metals on the basis of their atomic weights.
Reason (R): The valence electron structures contribute to the primary bonding between the atoms to form aggregates.

79. **Assertion (A):** In design of double fillet welding of unsymmetrical sections with plates subjected to axial loads lengths of parallel welds are made unequal.
Reason (R): The lengths of parallel welds in fillet welding of an unsymmetrical section with a plate are so proportioned that the sum of the resisting moments of welds about the centre of gravity axis is zero.

80. **Assertion (A):** A cotter joint is used to rigidly connect two coaxial rods carrying tensile load.
Reason (R): Taper in the cotter is provided to facilitate its removal when it fails due to shear.

81. **Assertion (A):** Two pulleys connected by a crossed belt rotate in opposite directions.
Reason (R): The length of the crossed belt remains constant.

82. **Assertion (A):** In steady rotating condition the journal inside a hydrodynamic journal bearing remains floating on the oil film.
Reason (R): The hydrodynamic pressure developed in steady rotating conditions in journal bearings balances the load on the journal.

83. Which one of the following statements is not correct?
a. PERT is activity oriented and CPM is event oriented
b. In PERT, three time estimates are made, whereas in CPM only one time estimate is made
c. in PERT slack is calculated whereas in CPM floats are calculated
d. Both PERT and CPM are used for project situations

84. A PERT activity has an optimistic time estimate of 3 days, a pessimistic time estimate of 8 days, and a most likely time estimate of 10 days. What is the expected time of this activity?
a. 5.0 days
b. 7.5 days
c. 8.0 days
d. 8.5 days

85. Consider the following steps in production, planning and control:
1. Capacity planning
2. Material requirement planning
3. Purchasing
4. Design decisions
Which one of the following is the correct sequence of the above steps in operations management?
a. 2-3-4-1
b. 2-4-3-1
c. 4-1-2-3
d. 1-2-4-3

86. Which one of the following is correct?
Production, planning and control functions are extremely complex in
a. job-production shop producing small number of pieces only once
b. job-production shop producing small number of pieces intermittently
c. batch production shop producing a batch only once
d. batch production shop producing a batch at irregular intervals

87. Which one of the following statements is not correct?
a. Schedule chart shows the processing of a job on various work centres against time
b. Load chart shows the processing of various jobs on a work centre against time
c. Dispatching is the activity related with dispatching of goods to the customers
d. Routing is the activity related with the operations and their sequence to be performed on the job

88. What term is used to designate the direction of the predominant surface pattern produced by machining operation?
a. Roughness
b. Lay
c. Waviness
d. Cut off

89. What symbol is used to indicate surface roughness?
a. =
b. $\sqrt{\ }$
c. $0.1\sqrt{\ }$
d. Δ

90. Match List-I with List-II and select the correct answer using the code given below the lists
List-I
(Unconventional machining process)
A. Electro polishing.
B. Electrochemical machining
C. Abrasive jet machining
D. Electrical discharge machining
List-II
(Basic process)
1. Thermal Mechanical
2. Mechanical
3. Electro-chemical
4. Chemical
Code:

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

91. In Taylor's tool life equation is VP^n= constant. What is the value of n for ceramic tools?
a. 0.15 to 0.25
b. 0.4 to 0.55
c. 0.6 to 0.75

d. 0.8 to 0.9

92. What are the reasons for reduction of tool life in a machining operation?
1. Temperature rise of cutting edge
2. Chipping of tool edge due to mechanical impact
3. Gradual wear at tool point
4. Increase in feed of cut at constant cutting force

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

93. Which machining processes are used for gear manufacture?
1. Form milling
2. Broaching
3. Roll forming
4. Hobbing

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

94. Consider the following statements:
In an orthogonal cutting the cutting ratio is found to be 075. The cutting speed is 60 m/mm and depth of cut 24 mm.
Which of the following are correct?
1. Chip velocity will be 45 m/min.
2. Chip velocity will be 80 m/min.
3. Chip thickness will be 18 mm.
4. Chip thickness will be 32 mm.

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

95. Cold forging results in improved quality due to which of the following?
1. Better mechanical properties of the process.
2. Unbroken grain flow.
3. Smoother finishes.
4. High pressure.

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

96. Which one of the following is correct? Babbitts are used for
a. gears
b. bearings
c. bolts
d. clutch liners

97. What is the process by which two or more chemically different monomers are polymerised to form a cross link polymer together with a by-product such as water or ammonia, known as?
a. Addition polymerization
b. Co-polymerisation
c. Linear polymerisation
d. Condensation polymerization

98. Match List-I with List-II and select the correct answer using the code given below the lists:
List-I
(Principal/Method)
A. Klein's construction
B. Kenaedy's theorem
C. D'Alembert's principle
D. Grubler's rule
List-II
(Corresponding Application)
1. Instantaneous centers in linkages
2. Relative acceleration of linkages
3. Mobility of linkages
4. Dynamic forces in linkages

Code:

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

99. Which mechanism produces intermitted rotary motion from continuous rotary motion?
a. Whitworth mechanism
b. Scotch Yoke mechanism
c. Geneva mechanism
d. Elliptical trammel

100. A journal bearing with hydrodynamic lubrication is running steadily with a certain amount of minimum film thickness. When the load and speed are doubled, how does the minimum film thickness vary?
a. Remains unchanged
b. Gets doubled
c. Gets reduced to one-fourth of original value
d. Gets reduced to half of original value

101. Interference between an involute gear and a pinion can be reduced by which of the following?
1. Increasing the pressure angle of the teeth in the pair, the number of teeth remaining the same.
2. Decreasing the addendum of the gear teeth and increasing the same for the pinion teeth by the corresponding amount.

Select the correct answer using the code given below:
a. 1 only

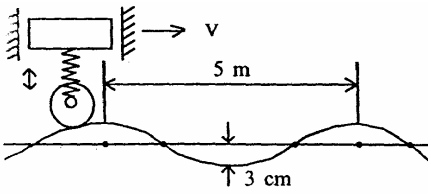
b. 2 only
c. Both 1 and 2
d. Neither 1 nor 2

102. Which one of the following is correct?
When two teeth profiles of gears are conjugate, the sliding velocity between them
a. is always zero, all through the path of contact
b. is zero, at certain points along the path of contact
c. is never zero anywhere on the path of contact
d. can be made zero by proper selection of profiles

103. For a speed ratio of 100 smallest gear box is obtained by using which of the following?
a. A pair of spur gears
b. A pair of bevel and a pair of spur gears in compound gear train
c. A pair of helical and a pair of spur gears in compound gear train
d. A pair of helical and a pair of worm gears in compound gear train

104. Among the following four designs of a flywheel with given mass M(kg) and external diameter D(m), which is the one with the highest energy storage capacity?
a. Plain circular disc of uniform thickness
b. Double conical disc thicker at the centre and thinner at the periphery
c. Double conical disc thinner at the centre and thicker at the periphery
d. Circular ring with spokes

105.

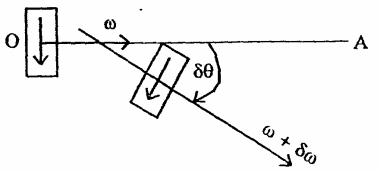


The figure above shows the schematic of an automobile having a mass of 900 kg and the suspension spring constant of 81×10^4 N/m. If it travels at a speed of 72 km/hr on a rough road with periodic waviness as shown, what is the forcing frequency of the road on the wheel?
a. 10 Hz
b. 4 Hz
c. 1.5 Hz
d. 20 Hz

106. Which one of the following mechanisms represents an inversion of the single slider-crank chain?
a. Elliptical trammel
b. Oldham's coupling
c. Whitworth quick return mechanism
d. Pantograph mechanism

107. Which one of the following is correct?
A hydrodynamic slider bearing develops load bearing capacity mainly because of
a. slider velocity
b. wedge shaped oil film
c. oil compressibility
d. oil viscosity

108.



At a given instant, a disc is spinning with angular velocity ω plane at right angles to the paper, (see the figure) and after a short interval of time δt, it is spinning with angular velocity ω+ωδ and the axis of spin has changed direction by the amount δθ.
In this situation what is the component of acceleration parallel to OA?
a. dθ/dt
b. ω(dθ/dt)
c. dω/dt
d. dθ/dω

109. Which one of the following is correct?
When a nut is tightened by placing a washer below it, the bolt will be subjected to
a. compression only
b. tension
c. shear only
d. compression and shear

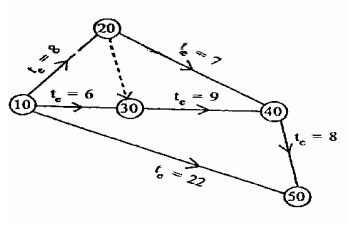
110. Which material is used for bushes in the bushed-pin type of flexible coupling?
a. Gun metal
b. Plastic
c. Rubber
d. Aluminium

111. The balls of the ball bearings are manufactured from steel rods. The operations involved are:
1. Ground
2. Hot forged on hammers
3. Heat treated
4. Polished
What is the correct sequence of the above operations from start?
a. 3-2-4-1
b. 3-2-1-4
c. 2-3-1-4
d. 2-3-4-1

112. Weekly production requirements of a product are 1000 items. The cycle time of producing one product on a machine is 10 minutes. The factory works on two shift basis in which total available time is 16 hours. Out of the available lime about 25% is expected to be wasted on break downs, material unavailability and quality related problems. The factory works

for 5 days in a week. How many machines are required to fulfill the production requirements?

a. 2
b. 3
c. 4
d. 6

113. 

Consider the above network. Activity times are given in number of days. The earliest expected occurrence time (TE) for event 50 is:

a. 22
b. 23
c. 24
d. 25

114. Which one of the following is not a technique of Long Range Forecasting?

a. Market Research and Market Survey
b. Delphi
c. Collective Opinion
d. Correlation and Regression

115. Using the exponential smoothing method of forecasting, what will be the forecast for the fourth week if the actual and forecasted demand for the third week is 480 and 500 respectively and $\alpha = 0.2$

a. 400
b. 496
c. 500
d. 504

116. Consider the following characteristics of assembly line balancing:

1. apportionment of sequential work activities into work stations
2. high utilization of equipment
3. minimization of idle time

Which of the statements given above are correct?

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

117. In the production of a product the fixed costs are Rs. 6,000/- and the variable cost is Rs. 0/- per product. if the sale price of the product is Rs. 12/-, the break even volume of products to be made will be:

a. 2000
b. 3000
c. 4000
d. 6000

118. The inter-arrival times at a tool crib are exponential with an average time of 10 minutes and the length of the service time is assumed to be exponential with mean 6 minutes. The probability that a person arriving at the booth will have to wait is equal to:

a. 0.15
b. 0.40
c. 0.42
d. 0.6

119. If A is greater than B then it is expressed in FORTRAN as:

a. A > B
b. AGTB
c. A.GT.B
d. AGT.B