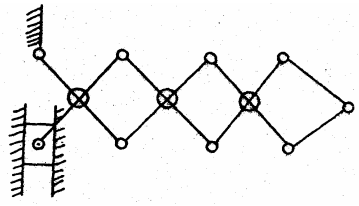
MECHANICAL ENGINEERING

PAPER–II

1. Euler's formula can be used for obtaining crippling load for a M.S. column with hinged ends. Which one of the following conditions for the slenderness ratio 1/k is to be satisfied?
   a. $5 < 1/k < 8$
   b. $9 < 1/k < 18$
   c. $19 < 1/k < 40$
   d. $1/k \leq 80$

2. 

   The kinematic chain shown in the above figure is a
   a. structure
   b. mechanism with one degree of freedom
   c. mechanism with two degrees of freedom
   d. mechanism with more than two degrees of freedom

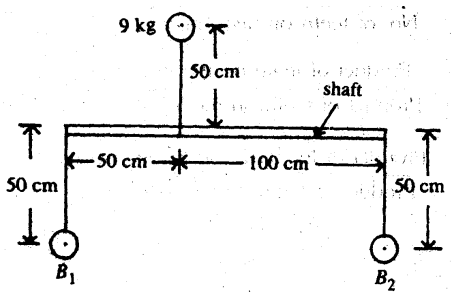
3. A point on a link connecting a double slider crank will trace a
   a. straight line
   b. circle
   c. parabola
   d. ellipse

4. A wheel is rolling on a straight level track with a uniform velocity 'v'. The instantaneous velocity of a point on the wheel lying at the mid-point of a radius
   a. varies between $3\frac{v}{2}$ and $-\frac{v}{2}$
   b. varies between v/2 and - v/2
   c. vanes between $3\frac{v}{2}$ and $\frac{v}{2}$
   d. does not vary is equal to v

5. A four-bar chain has
   a. all turning pairs
   b. one turning pair and the others are sliding pairs
   c. one sliding, pair and the others are turning pairs
   d. all sliding pairs

6. Which one of the following pairs is correctly matched?
   a. Beauchamp tower : First experiments on journal bearings
   b. Osborne Reynolds : Antifriction bearings
   c. Somonerfeld number: Pivot and Coller bearings
   d. Ball bearings : Hydrodynamic lubrication

7. Sensitiveness of a governor is defined as
   a. $\frac{\text{Range of speed}}{2 \times \text{Mean speed}}$
   b. $\frac{2 \times \text{Mean speed}}{\text{Range of speed}}$
   c. Mean speed × Range of speed.
   d. $\frac{\text{Range of speed}}{\text{Mean speed}}$

8. 

   Masses B_1, B_2 and 9 kg are attached to a shaft in parallel planes as shown in the above figure. If the shaft is rotating at 100 rpm, the mass B_2 is
   a. 3 kg
   b. 6 kg
   c. 9 kg
   d. 27 kg

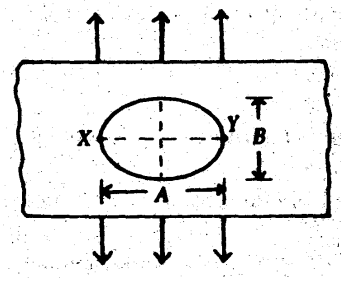
9. The equation of motion bra damped viscous vibration is $3\ddot{x} + 9x + 27x = 0$

   The damping factor is
   a. 0.25
   b. 0.50
   c. 0.75

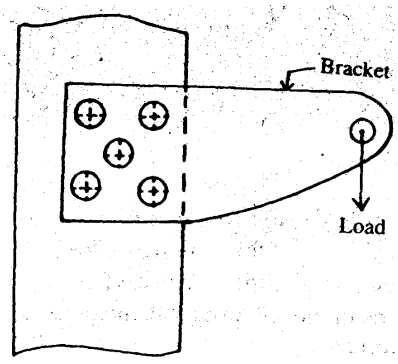
d. 1.00

10. A mass is suspended at the bottom of two springs in series having stiffness 10 N/mm and 5N/mm. The equivalent spring stiffness of the two spring is nearly
    a. 0.3 N/ mm
    b. 3.3 N/mm
    c. 5 N/mm
    d. 15 N/mm

11. The velocity ratio in the case of compound train of wheel is equal to
    a. $\frac{\text{No. of teeth on first driver}}{\text{No of teeth on last follower}}$
    b. $\frac{\text{No. of teeth on last follower}}{\text{No of teeth on first driver}}$
    c. $\frac{\text{Product of teeth on the drivers}}{\text{Product of teeth on the followers}}$
    d. $\frac{\text{Product of teeth on the followers}}{\text{Product of teeth on the drivers}}$

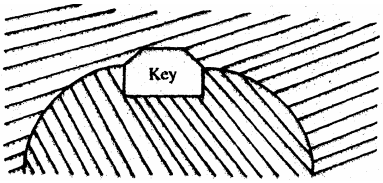
12. 

A loaded semi-infinite flate plate is having an elliptical hole (A/B = 2) in the middle as shown in the above figure. The stress concentration factors at point either X or Y is
    a. 1
    b. 3
    c. 5
    d. 7

13. 

For the bracket bolted as shown in the above figure, the bolts will develop
    a. Primary tensile stresses and secondary shear stresses
    b. Primary shear stresses and secondary shear stresses
    c. Primary shear stresses and secondary tensile stresse
    d. Primary tensile stresses and secondary compressive stresses

14. A screw thread specified by M 20 × 2.5 C as per BIS thread system means
    a. Metric thread of 20 mm nominal diameter and 2.5 mm pitch having coarse tolerance
    b. Metric thread of 20 mm root diameter and 2.5 pitch having coarse tolerance
    c. Metric thread of fine class having 20 mm root diameter and 2.5 mm pitch
    d. Metric thread of 20 mm shank diameter and 2.5 mm thread depth with coarse tolerance

15. 

The key shown in the above figure is a
    a. Barth key
    b. Kennedy key
    c. Lewis key
    d. Woodruff key

16. Which one of the following statements with regard to belt drives is NOT correct?
    a. Increase in the angle of wrap of the belt enables more power transmission
    b. Maximum power is transmitted when the centrifugal tension is three times the tight side tension
    c. Wide and thin belt is preferable for better life than a thick and narrow one
    d. Crown is provided on the pulley to make the belt run centrally on the pulley

17. Angle of twist of a shaft of a diameter ‘d’ is inversely proportional to
    a. d
    b. d^2
    c. d^3
    d. d^4

18. Which one of the following sets of parameters should be monitored for

determining safe operation of journal bearing?

a. Oil pressure, bearing metal temperature and bearing vibration
b. Bearing vibration, oil pressure and speed of shaft
c. Bearing metal temperature and oil pressure
d. Oil pressure and bearing vibration

19. Consider the following pairs of parts:
1. Pair of gear in mesh
2. Belt and pulley
3. Cylinder and piston
4. Cam and follower

Among these, the higher pairs are
a. 1 and 4
b. 2 and 4
c. 1, 2 and 3
d. 1, 2 and 4

20. Which one of the following sets of accelerations is involved in the motion of the piston inside the cylinder of a uniformly rotating cylinder mechanism?
a. Coriolis and radial acceleration
b. Radial and tangential acceleration
c. Coriolis and gyroscopic acceleration
d. Gyroscopic and tangential acceleration

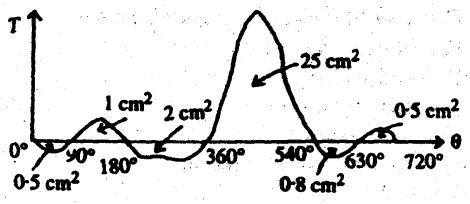
21. Consider the following statements:
1. Round bar in a round hole forms a turning pair.
2. A square bar in a square hole forms a sliding pair.
3. A vertical shaft in a foot-step bearing forms a successful constraint.

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

22. Consider the following pairs of types of bearings and applications:
1. Partial Journal bearing : Rail wagon axles
2. Full Journal bearing : Diesel engine crankshaft
3. Radial bearing Combined radial and axial Loads

Which of these pairs /are conectly matched?
a. 1 alone
b. 1 and 2
c. 2 and 3
d. 1, 2 and 3

23.



Consider the following statements regarding the turning moment diagram of a reciprocating engine shown in the above figure
(Scale 1 cm^2 = 100 N.m)
1. It is a four stroke IC engine
2. The compression stroke is 0° to 180°
3. mean turning moment $T_m = 580/\pi$ N.m
4. It is a multi-cylinder engine

Which of these statements are correct?
a. 1, 2 and 3
b. 1, 2 and 4
c. 2, 3 and 4
d. 1, 3 and 4

24. The pitching of a ship in the ocean is an oscillatory periodic motion. A ship is pitching 6° above and 6° below, with a period of 20s from its horizontal plane. Consider the following statements iii this regard:
1. The mdtion has a frequency of oscillation (i.e. pitching) of 3 cycles / minute.
2. The motion has an angular frequency of 3.14 rad/s.
3. The angular velocity of precession of ships rotor is $\pi^2/300$ rad/s
4. The amplitude of pitching is $\pi/30$ rad

Which of these statements are correct?
a. 1 and 2
b. 1, 2 and 4
c. 2, 3 and 4
d. 1, 3 and 4

25. The critical speed of' a shaft is affected by the,
a. diameter and the eccentricity of the shaft
b. span and the eccentricity of the shaft
c. diameter and the span of the shaft
d. span of the shaft

26. Match list I (Applications) with list II (Joints) and select the correct answer :

List I
A. Roof girder
B. Cylinder head of an IC engine
C. Piston rod and cross head
D. Solid shaft and a plate

List II
1. Hook's joint
2. Screwed joint
3. Cotter joint
4. Welded joint
5. Riveted joint

Codes;

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

27. The following parameters are to be calculated while designing a screw jack:
1. Core diameter of screw
2. Torque required to rotate the screw
3. Principal stresses
4. Height of the nut

The correct sequence of the calculation of these parameters is
a. 1, 2, 4, 3
b. 1, 2, 3, 4
c. 2, 1, 3, 4
d. 2, 1, 4, 3

28. Consider the following types of stresses in respect, of a hoisting tope during acceleration of load:
1. Direct stress due to weigth hoisted and weight of the rope
2. Bending stresses due to bending of rope over the sheave
3. Stresses due to Initial tightening
4. Acceleration stresses

Which of these are the correct types of stresses induced in a hoisting rope during acceleration of load?
a. 1, 2 and
b. 2, 3 and 4
c. 1, 2 and 4
d. 1, 3 and 4

29. Consider the following statements regarding a centrifugal clutch:
1. It need riot be unloaded before engagement
2. It enables the prime mover to start up under no-load conditions
3. it picks up the load gradually with the increase in speed
4. It will not slip to the point of destruction
5. it is very useful when the power unit has jaw starting torque

Which of these are the advantages of a centrifugal clutch?
a. 1, 2 and 4
b. 1, 3 and 5
c. 2, 3 and 5
d. 1, 3, 4 and 5

30. Match List I with List II and select the correct answer:

List I
A. Compound train
B. Quick return mechanism
C. Exact straight line motion
D. Approximate straight line motion

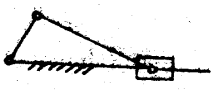
List II
1. Hart mechanism
2. Coriolis force
3. Transmission of motion around bends and comets
4. Waft mechanism

Codes;

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

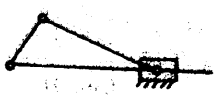
31. Match List I (kinematic inversions) with List II (applications) and select the correct answer:

List I

A. 

B. 

C. 

D. 

List II
1. Hand pump

2. Compressor
3. Whitworth quick return mechanism
4. Oscillating Cylinder Engine

Codes;

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

32. Match List I (Applications) with List II (Features of vibration) and select the correct answers:

List I

A. Vibration tamper
B. Shock absorber
C. Frahm tachometer
D. Oscillator

List II

1. Frequency of free vibration
2. Forced vibration
3. Damping of vibration
4. Transverse vibration
5. Absorption of vibration

Codes;

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

33. Match list I (Keys) with List II (Characteristics) and select the correct answer:

List I

A. Saddle key
B. Woodruff key
C. Tangent key
D. Kennedy key

List II

1. Strong, in shear and crushing
2. Withstands tension in one direction
3. Transmission of power through frictional resistance
4. Semicircular in shape

Codes;

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

34. Match List I (Application) with List II (Drive element) and select the correct answer:

List I

A. Automobile differential
B. Bicycle
C. Planing machine
D. Radiator fan of automobile

List II

1. Flat belt
2. V-belt
3. Chain drive
4. Gear drive

Codes;

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

35. Match List I with list II and select the correct answer:

List I

A. Unwin's formula
B. Wahl factor
C. Reynolds equation
D. Lewis form factor

List II

1. Bearings
2. Rivets
3. Gears
4. Springs

Codes;

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

36. In an orthogonal cutting test, the cutting force and thrust force were observed to be 1000 N and 500 N respectively. If the rake angle of tool is zero, the coefficient of friction in chip-tool interface will be

a. 1/2
b. 2
c. $1/\sqrt{2}$
d. $\sqrt{2}$

37. The magnitude of the cutting speed for maximum profit rate must be

a. in between the speeds for minimum cost and maximum production rate

b. higher than the speed for maximum production rate
c. below the speed. for minimum cost
d. equal to the Speed for minimum cost

38. The sequence of markings “S 14K 14 S” on a grinding wheel represents respectively
a. bond type, structure, grade’, grain size and abrasive type
b. abrasive type, grain size, grade, structure and bond type
c. bond type, grade, structure, grain size and abrasive type
d. abrasive type, structure, grade. grain size and bond type

39. In a tool life test, doubling the cutting speed reduces the tool life to 1/8 th of the original. The Taylor’s tool life index is
a. 1/2
b. 1/3
c. 1/4
d. 1/8

40. Match List I (Types of casting) with list II (Working principles) and select the correct answer:
A. Die casting
B. Centrifugal casting
C. Centrifuging
D. Continuous casting
List II
1. Molten metal is forced into the die under pressure
2. Axis of rotation does not coincide with axis of mould
3. Metal solidifies when mould is rotating
4. Continuously pouring molten metal into mould
Codes;

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

41. Consider the following statements:
In electrochemical grinding,
1. a rubber bonded alumina grinding wheel acts as the cathode and the workpiece as the anode
2. a copper bonded alumina grinding wheel acts as the cathode and the workpiece as the anode
3. metal removal takes place due to the pressure applied by the grinding wheel
4. metal removal takes place due to electrolysis
Which of these statements are correct?
a. 1 and 3
b. 2 and 4
c. 2 and 3
d. 1 and 4

42. In the rolling process, roll separating force can be decreased by
a. reducing the roll diameter
b. increasing the roll diameter
c. providing back-up rolls
d. increasing the friction between the rolls’ and the metal

43. Consider the following statements:
In forward extrusion process
1. the ram and the extruded product travel in the same direction
2. the ram and the extruded product travel in the opposite direction
3. the speed of travel qf the extruded product is same as that of the ram
4. the speed of travel of the extruded product is greater than that of the ram
Which of these statements are correct?
a. 1 and 3
b. 2 and 3
c. 1 and 4
d. 2 and 4

44. Which one of the following lubricants is most suitable for drawing mild steel wires?
a. Sodium stearate
b. Water
c. Lime-water
d. Kerosene

45. Which one of the following statements is correct?
a. No flux is used in gas welding of mild steel
b. Borax is the commonly used flux coating on welding electrodes
c. Laser beam welding employs a vacuum chamber and thus avoids use of a shielding method
d. AC can be used for GTAW process

46. Best position of crank for blanking operation in a mechanical press is
a. top dead centre
b. 20 degrees below top dead centre

c. 20 degrees before bottom dead centre
d. Bottom dead centre

47. Match List I (process) with List II (products/materials) and select the correct answer:

List I

A. Die casting
B. Shell molding
C. CO_2 molding
D. Centrifugal casting

List II

1. Phenol formaldehyde
2. C.I. pipes
3. Non-ferrous alloys
4. Sodium silicate

Codes;

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

48. Which one of the following sets of tools or tools and processes are normally employed for making large diameter holes?
a. Boring tool
b. BTA tool (Boring and trepanning association) and gun drill
c. Gun drill and boring tool
d. Boring toll and trepanning

49. Which one of the following processes of gear manufacture results in best accuracy of the involutes gear tooth profile?
a. Milling
b. Hobbing
c. Rotary gear shape
d. Rack type gear shaper

50. One of the index plates of a milling machine dividing head has the following hole circles:

15 : 16 : 17 : 18 : 19 : 20

A gear wheel of 34 teeth has to be milled by simple indexing method. To machine each tooth. The index crank has to be rotated through
a. 17 holes in the 20- hole circle
b. 18 holes in the 20-holes circle
c. 1 revolution and 3 holes in 17-hole circle
d. 1 revolution and 2 holes in 18-hole circle

51. Which one of the following tolerances set on inner diameter and outer diameter respectively of headed dig bush for press fit is correct?
a. G 7 h6
b. F 7 n6
c. H 7 h6
d. F 7 j6

52. Match List I (Components of a table fan) with List II (Manufacturing processes) and select the correct answer:

List I

A. Base with stand
B. Blade
C. Armature coil wire
D. Armature shaft

List II

1. Stamping and pressing
2. Wire drawing
3. Turning
4. Casting

Codes;

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

53. Crater wear starts at some distance from the tool tip because
a. Cutting fluid cannot penetrate that region
b. Stress on rake face is maximum at the region
c. Tool strength s minimum at that region
d. Tool temperature is maximum at that region

54. Consider the following tool materials:
1. HSS
2. Cemented carbide
3. Ceramics
4. Diamond

The correct sequence of these materials in decreasing order of their cutting speed is
a. 4, 3, 1, 2
b. 4, 3, 2, 1
c. 3, 4, 2, 1
d. 3, 4, 1, 2

55. Consider the following processes:
1. Gas welding
2. Thermit welding

3. Arc welding
4. Resistance welding

The correct sequence of these processes in increasing order of their welding temperature is

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

56. Match List I with List II and select the correct answer:

List I

A. Quick return mechanism
B. Apron mechanism
C. Indexing mechanism
D. Regulating wheel

List II

1. Lathe
2. Milling machine
3. Shaper
4. Centre less grinding

Codes;

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

57. Consider the following characteristics of a robot:

1. The tip of the robot arm moves from one point to another with it's in between path not being defined.
2. it can be used for drilling holes at different points in a work piece.
3. It can be used for V butt joint welding between two points.
4. The memory capacity required for its control unit is low. Which of these are the characteristics associated with a point to point robot?

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

58. Match List I (Components used in jigs and fixtures) with List II (Their functions) and select the correct answer

List I

A. Jack pin
B. V-locator
C. Bushes
D. Ejectors

List II

1. To guide the drill bit during machining
2. For casy removal of the work piece from the jig or fixture after the machining operation is over
3. To locate the crcu1ar or semicircular objects in a jig or fixture
4. To locate work pieces whose dimensions are subject to variations

Codes;

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

59. Match List I (Scientist) with List II (Research work) and select the correct answer:

List I

A. Schewart
B. Taguchi
C. Erlang

List II

1. Less function in quality
2. Queuing model
3. Zero defect
4. Control charts

Codes;

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

60. The management is interested to know the percentage of idle time of equipment. The trial study showed that percentage of idle time would be 20%. The number of random observations necessary for 95% level of confidence and ± 5% accuracy Is

a. 6400
b. 1600
c. 640
d. 160

61. Which one of the following is NOT a technique of PMTS?

1. Synthetic data
2. Stop-watch time study
3. Work factor

4. MTM

62. Rowan incentive plan is given by (R Hourly rate, T Actual time taken for job, T_a = Standard time for job T_s = Standard time for job and E = Earnings)

$$E = R \times T_a + \frac{(T_s - T_a)}{T_s} \times T_s \times R$$

The shape of the curves between bonus earned and percentage time saved is a

a. Straight line
b. Parabola
c. Horizontal line
d. Vertical line

63. Last year, a manufacturer produced 15000 products while were sold Rs. 300 each. At that volume, the fixed costs were Rs. 15.2 lacs and total variable costs were Rs.21 lacs. The break even quantity of product would be

a. 4000
b. 7800
c. 8400
d. 9500

64. Consider the following statements regarding plant location and plant layout:

1. Qualitative factor analysis is a method of evaluating a potential location without applying quantitative values to the decision criteria.
2. The three determinants of the type of layout are type of product, type of process and the volume of production.
3. An appliance manufacturing plant where products are made on assembly lines would be classified as job shop type of layout.

Which of these statements is/are correct?

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

65. Routing in production planning and control refers to the

a. Balancing of load on machines
b. Authorization of word to be performed
c. Progress of work performed
d. Sequence of operations to be performed

66. Match List I with List II and select the correct answers:

List I

A. Control charts for variables
B. Control chart for number of non-conformities
C. Control chart for fraction rejected
D. Activity time distribution in PERT

Codes;

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

67. Which one of the following statements is NOT correct?

a. Assignment model is a special case of a linear programming problem
b. In queuing models, Poisson arrivals and exponential services are assumed
c. In transportation problems, the non-square matrix is made square by adding a dummy row or a dummy column
d. In linear programming problems, dual of a dual is a primal

68. Consider the following statements:

1. A linear programming problem with three variables and two constraints can be solved by graphical method.
2. For solutions of a linear programming problem with mixed constraints, Big-M-method can be employed,
3. In the solution process of a linear programming problem using Big-M-method, when an artificial variable leaves the basis, the column of the artificial variable can be removed from all subsequent tables.

Which of theses statements are correct?

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

69. Arrivals at a telephone booth are considered be Poisson with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with a mean of 3 minutes. The probability that a person arriving at the booth will have to wait, is

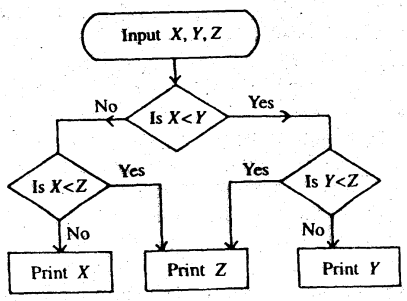
a. 0.043
b. 0.300

c. 0.429
d. 0.700

70. Dummy activities are used in a network to
a. Facilitate computation of slacks
b. Satisfy precedence requirements
c. Determine project completion time
d. Avoid use of resources

71. If earliest starting time for an activity is 8 weeks, the latest finish time is 37 weeks and the duration time of the activity is 11 weeks, then the total float is equal to
a. 18 weeks
b. 14 weeks
c. 56 weeks
d. 40 weeks

72. Consider the following flow chat:



The printed value among X, Y and Z by the computer will be
a. The highest
b. The middle
c. The lowest
d. None of the above

73. match List I with List II and select the correct answer:
List I
A. RAM
B. ROM
C. DOS
D. LAN
List II
1. Network of computers
2. Software which makes the computer work
3. Memory used for processing
4. Memory in which user cannot write anything
Codes;

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

74. A production system has a product type of layout in which there are four machines laid in series. Each machine does a separate operation. Every product needs all the four operations to be carried out. The designed capacity of each of the four machines is 200, 175, 160 and 210 products per day. The system capacity would be
a. 210 products per day
b. 200 products per day
c. 175 products per day
d. 160 products per day

75. Match List I (End conditions of columns) with List II (Equivalent length in terms of length of hinged-hinged column) and select the correct answer:
List I
A. Both ends hinged
B. One end fixed and other end free
C. One end fixed and the other pin-jointed
D. Both ends fixed
List II
1. L
2. 2 L
3. L / 2
4. 2 L
Codes;

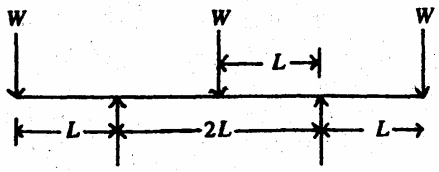
	A	B	C	D
a.	1	3	4	2
b.	1	3	2	4
c.	3	1	2	4
d.	3	1	4	2

76. Match List I with List II and select the correct answer:
List I
A. Bending moment is constant
B. Bending moment is maximum or minimum
C. Bending moment is zero
D. Loading is constant
List II
1. Point of contraflexure
2. Shear force changes sing
3. slope of shear force diagram is zero over the portion of the beam
4. shear force is zero over the portion of the beam
Codes;

	A	B	C	D

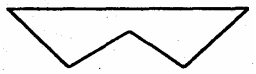
a.	4	1	2	3
b.	3	2	1	4
c.	4	2	1	3
d.	3	1	2	4

77.

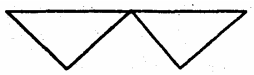


A loaded beam is shown in the above figure. The bending moment diagram of the beam is best represented as

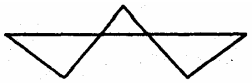
a.



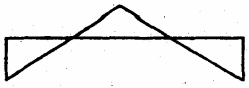
b.



c.



d.



78. At a certain section at a distance 'x' from one of the supports of a simply supported beam, the intensity of loading, bending moment and shear force are W_x, M_x, and V_x respectively, if the intensity of loading is varying continuously along the length of the beam, the invalid relation is

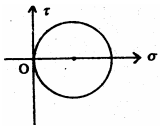
a. Slope $Q_x = M_x / V_x$
b. $V_x = d M_x / dx$
c. $W_x = d^2M_x / dx^2$
d. $W_x = dV_x / dx$

79. Plane stress at a point in a body is defined by principal stresses 3σ andσ. The ration of the normal stress to the maximum shear stress of the plane of maximum shear stress is

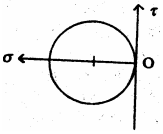
a. 1
b. 2
c. 3
d. 4

80. Which one of the following Mohr's circles represents the state of pure shear?

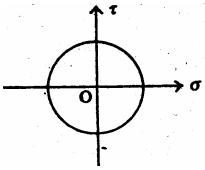
a.



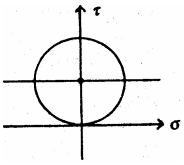
b.



c.



d.



81. The state of plane stress in a plate of 100 mm thickness is given as

$\sigma_{xx} = 100N / mm^2, \sigma_{yy} = 200N / mm^2$

Young's modules = 300 N/mm^2

Poisson's ration = 0.3

The stress developed in the direction of thickness is

a. Zero
b. 90 N/mm^2
c. 100 N/mm^2
d. 200 N/mm^2

82. Consider the following tools:

1. High carbon steel tools
2. High speed steel tools
3. Ceramic tools
4. Carbide tools

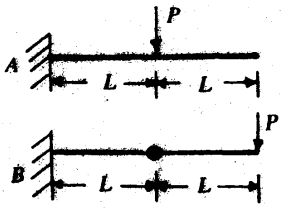
Which of these tools are provided with negative rake angle?

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

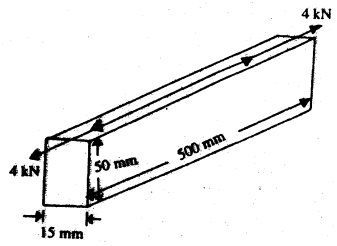
83. A rod of material with E = 200 × 10^3 MPa and α = 10^{-3} mm/mm°C is fixed at both the ends. It is uniformly heated such that the increase in temperature is 30°C. The stress developed in the rod is

a. 6000 N/mm^2 (tensile)
b. 6000 N/mm^2 (compressive)
c. 2000 N/mm^2 (tensile)
d. 2000 N/mm^2 (compressive)

84. A circular solid shaft is subjected to a bending moment of 400 kN.m and a twisting moment of 300 kN.m. On the basis of the maximum principal, stress theory, the direct stress is σ and according to the maximum shear stress theory, the shear stress is τ. The ratio σ/τ alt is
   a. 1/5
   b. 3/9
   c. 9/5
   d. 11/6

85. 

The two cantilevers A and B shown in the above figure have the same uniform cross-section and: the same material. Free end deflection of cantilever 'A' is δ. The value of mid-span deflection of the cantilever 'B' is

86. 

A link is under a pull which lies, on one of the faces as shown in the above figure. The magnitude of maximum compressive stress in the line would be
   a. 21.3 N/mm^2
   b. 16.0 N/mm^2
   c. 10.7 N/mm^2
   d. zero

87. Two coiled springs, each having stiffness K, are placed in parallel. The stiffness of the combination will be
   a. 4K
   b. 2K
   c. K/2
   d. K/4

88. A long slender bar having uniform rectangular cross- section 'B × H' is acted upon by an axial compressive force. The slides B and H are parallel to x- and y-axes respectively. The ends of the bar are fixed such that they behave s pin-jointed when the bar buckles in a plane normal to x-axis, and they behave as built-in when the bar buckles in a plane normal to y-axis. If load capacity in either mode of buckling is same, the value of H/B will be
   a. 2
   b. 4
   c. 8
   d. 16

89. The property by which an amount of energy is absorbed by a material without plastic deformation, is called
   a. toughness
   b. impact strength
   c. ductility
   d. resilience

90. When a weight of 100 N falls on a spring of stiffness 1 kN/m from a height of 2m, the deflection caused in the first fall is
   a. equal to 0.lm
   b. between 0.1 to 0.2 m
   c. equal to 0.2 m
   d. more than 0.2 m

91. Which one of the following features improves the fatigue strength of a metallic material?
   a. Increasing the temperature
   b. Scratching the surface
   c. Overstressing
   d. Under stressing

92. Cermets are
   a. metals for high temperature use with ceramic like properties
   b. ceramics with metallic strength and luster
   c. Coated tool. materials
   d. metal-ceramic composites

93. Percentages of various alloying elements present in different steel materials are given below:
   1. 18% W; 4% Cr; 1% V; 5% Co; 0.7% C
   2. 8% Mo; 4% Cr; 2% V; 6% W; 0.7% C
   3. 27% Cr; 3% Ni; 5% Mo; 0.25% C
   4. 18% Cr; 8% Ni; 0.15% C

   Which of these relate to that of high speed steel?
   a. 1 and 3
   b. 1 and 2
   c. 2 and 3
   d. 2 and 4

94. A thin cylinder contains fluid at a pressure of 500 N/m^2, the internal diameter of the shell is 0.6 m and the tensile stress in the material is to be limited to 9000 N/m^2. The shell must have a minimum wall thickness of nearly
    a. 9 mm
    b. 11 mm
    c. 17 mm
    d. 21 mm

95. From a tension test, the yield strength of steel is found to be 200 N/mm^2. Using a factor of safety of 2 and applying maximum principal stress theory of failure, the permissible stress in the steel shaft subjected to torque will be
    a. 50 N/mm^2
    b. 57.7 N/mm^2
    c. 86.6 N/mm^2
    d. 100 N/mm^2

96. Which one of the following properties is more sensitive to increase in strain rate?
    a. Yield strength
    b. Proportional limit
    c. Elastic limit
    d. Tensile strength

97. Pearlite consists of
    a. 6.67% C and 93.33% ferrite
    b. 13% Fe and 87% cementite
    c. 13% C and 87% ferrite
    d. 13% cementite and 87% ferrite

98. Addition of vanadium to steel results in improvement of
    a. heat1reatthihty by quenching
    b. harden ability
    c. fatigue strength
    d. resistance to oxidation at elevated temperature

99. Atomic packing factor (APF) in the case of copper crystal is
    a. 0.52
    b. 0.68
    c. 0.74
    d. 1.633

100. During paratactic solidification, one liquid
    a. combines with one solid to form a second new solid
    b. solidifies into two different solids
    c. forms one solid
    d. form one solid and another liquid

101. Consider the following advantages:
    1. Rapid process
    2. Work with keyways can be ground
    3. No work holding device is required.

    Which of these are the advantages of centre less grinding?
    a. 1, 2 and 3
    b. 1 and 2
    c. 2 and 3
    d. 1 and 3

102. 102. Assertion (A): Poisson's ratio of a material is a measure of change in dimension in one direction due to loading in the perpendicular direction.

    Reason (R): The nature of lateral strain in a uniaxially loaded member is opposite to that of linear strain.
    a. Both A and Rare true and R is the correct explanation of A
    b. Both A and R are 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

103. Assertion (A): Addition polymerization is a primary summation of individual molecules into long chains.

    Reason (R): In addition polymerization the reaction produces a small molecule as by-product.
    a. Both A and Rare true and R is the correct explanation of A
    b. Both A and R are 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

104. Assertion (A) Normalized steel will Knee lower hardness than annealed steel.

    Reason (R): The pearlier of normalized steel is finer and has lower intermolecular space.
    a. Both A and Rare true and R is the correct explanation of A
    b. Both A and R are 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

105. When a composite unit consisting of a steel rod surrounded by a cast iron tube is subjected to an axial load.

    Assertion (A): The ratio of normal stresses induced in both the materials is equal to

the ratio of Young's moduli of respective materials.

Reason (R): The composite unit of these two materials is firmly fastened together at the ends to ensure equal deformation in both the materials.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

106. Assertion (A) Cam of a specified contour is preferred to a cam with a specified follower motion.

Reason (R): Cam of a specified contour has superior performance.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

107. Assertion (A): In designing the size of the flywheel, the weight of the arms and the boss are neglected.

Reason (R): The flywheel absorbs energy during those periods when the turning moment is greater than the resisting moment.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

108. Assertion (A): For a radial engine containing four or more cylinders, the secondary forces are in complete balance.

Reason (R): The secondary direct and reverse cranks form a balanced system in the radial engines.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

109. Assertion (A): In pre-loaded bolted joints, there is a tendency for failure to occur in the gross plate section rather than through holes.

Reason (R): The effect of pre-loading is to create sufficient friction between the assembled parts so that no slippage occurs.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

110. Assertion (A) : Helical gears are used for transmitting motion and power between intersecting shafts, where was straight bevel gears are used for transmitting motion and power between two shafts intersecting each other at 900:

Reason (R): In helical gears teeth are inclined to the axis of the shaft and are in the form of a helix, whereas in bevel gears, teeth are tapered both in thickness and height from one end to the-other.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

111. Assertion (A): To obtain large deformations by cold working intermediate annealing is not required.

Reason (R): Cold working is performed below the recrystallisation temperature of the work material.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

112. Assertion (A): Oil as cutting fluid results in a lower coefficient of friction.

Reason (R): Oil forms a thin liquid film between the tool face and chip, and it provided 'hydrocyanic lubrication'.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

113. Assertion (A): In metal cutting, the normal laws of sliding friction are not applicable.

Reason (R): Very high temperature is produced at the tool-chip interface.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

114. Assertion (A): The ratio of cutting force to thrust force is very high in grinding process as compared to other machining processes.

Reason (R): Random orientation and effective negative rake angles of abrasive grains increase the cutting force and adversely affect the cutting action and promote rubbing action.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

115. Assertion (A): The axis of an NC drilling machine spindle is denoted as z - axis.

Reason (R): In NC machine tool, the axis perpendicular to both x- and y - axes is designated as z - axis.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

116. Assertion (A): Double sampling is preferred over single sampling when the quality of incoming lots is expected to be either very good or very bad.

Reason (R): With double sampling, the amount of inspection required will be lesser than in the case of single sampling

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

117. Assertion (A): Vogel's approximation method yields the, best initial basic feasible solution of a transportation problem.

Reason (R): Vogel's method gives allocations to the lowest cost elements of the whole matrix.

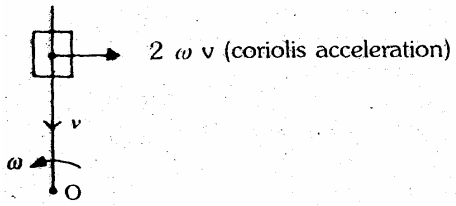
a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are true but R is NOT the correct explanation of A
c. A is true but R is false
d. A is false but R is true

118. Assertion (A): Master production schedule drives the whole of production and inventory control system in a manufacturing organization.

Reason (R): Master production schedule is a list of daily and weekly work released by PPC to production.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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

119. Assertion (A): The direction of Carioles acceleration shown in the given figure is correct.



Reason (R): The direction of Carioles acceleration is such that it will rotate at a velocity v about its origin in the direction opposite to ω

120. Assertion (A): While plotting control charts for variables, averages of sub - groups of readings are used rather than the individual readings,

Reason (R): If control charts, are plotted with the individual readings, the labour of plotting the chart will increase.

a. Both A and Rare true and R is the correct explanation of A
b. Both A and R are 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