Time : 3 Hours Marks : 200

Instructions :

(i) Each question carries *one* mark.

(ii) Choose the correct or most appropriate answer from the given options to the following questions and darken, with blue/black ball point pen the corresponding digit 1, 2, 3 or 4 in the circle pertaining to the question number concerned in the OMR Answer Sheet, separately supplied to you.

MECHANICAL ENGINEERING

1. When you purchase an item with credit card in a shop, the shop-keeper uses a computer system to process the details of your credit card, such as the name of the card holder, its validity period, credit balance in the account, etc.. The type of data processing used in such a case will be the

(1) Sequential file processing (2) Direct-access file processing
(3) Integrated file processing (4) Database processing

---

2. Global agreement in specific control strategies to reduce the release of ozone depleting substance was adopted by

(1) Rio de Janeiro Conference (2) Kyoto protocol
(3) Vienna convention (4) Montreal protocol

---

3. **Assertion (A) :** The computer word is represented by floating point representation.
Reason (R) : Most of the computer arithmetic is performed on complex numbers.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

4. Match the following :

Group A *(Nines complement of)*	**Group B** *(Decimal Equivalent)*
a. 385	i. 743
b. 256	ii. 326
c. 179	iii. 614
d. 673	iv. 820

Select the correct answer from the code given below :

(1) a – iii, b – i, c – iv, d – ii (2) a – iv, b –iii, c – ii, d – i
(3) a – iii, b – iv, c – i, d – ii (4) a – ii, b – iii, c – iv, d – i

---

5. Primary storage, in computer terminology, refers to :

(1) Hard disc drive

(2) Random Access Memory

(3) Read Only Memory

(4) The storage device where the operating system is stored

---

6. Computers perform *division* operations by means of

(1) Addition

(2) Subtraction

(3) Multiplication

(4) Repeated complementary subtraction

---

7. **Assertion (A)** **:** Computer use a number of special memory units called *Registers* which are not considered as part of the main memory.

Reason (R) **:** All these registers have the common ability to receive the information, hold it temporarily, and to pass it on as directed by the control unit.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

8. The characteristics of different types of gates used in computers to perform the necessary arithmetic are given below :

(a) AND gate generates an output signal of 1, only if all the input signals are also 1

(b) OR gate generates an output signal of 1, if any of the input signals are either 0 or 1

(c) NOT gate negates an output signal which is reverse of the original signal

Select the correct answer from the code given below :

(1) (a) and (b) are correct

(2) (b) and (c) are correct

(3) (a) and (c) are correct

(4) (a), (b) and (c) are correct

---

9. A microprocessor unit (MPU) cannot be considered as a complete computer because it lacks the

(1) functions of control unit

(2) functions of arithmetic logic unit

(3) memory and input/output capability

(4) display unit

---

10. **Assertion (A)** : ROMs are used for applications of monitoring a program to control the operation of a washing machine.

Reason (R) : ROMs are used for applications in which it is known that the information never needs to be altered.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

11. The mass of a block is 4 kg and coefficient of friction acting between the surface and block is 0.5. The block is pulled by a force of 10 N. Then find the friction force acting between the surface and block. Take $g = 10\ m/s^2$.

(1) 10 (2) 20

(3) 0 (4) 5

---

12. Some of the drawbacks that arise with today's quality of information are given below.

(a) Printout pollution (b) Refined data

(c) Information overload (d) Memo mania

Select the correct answer from the code given below :

(1) (a), (b), and (c) are correct

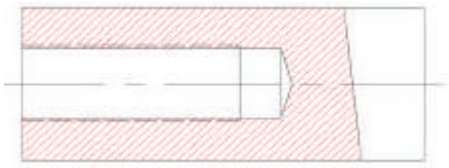
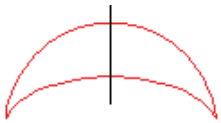
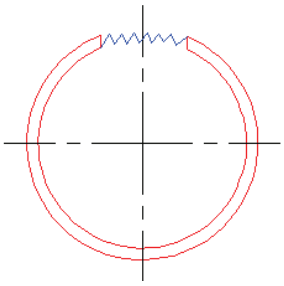
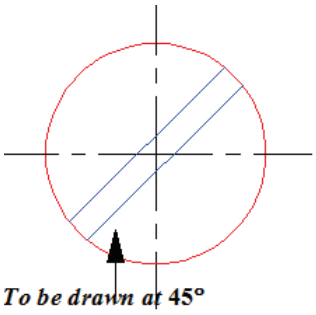
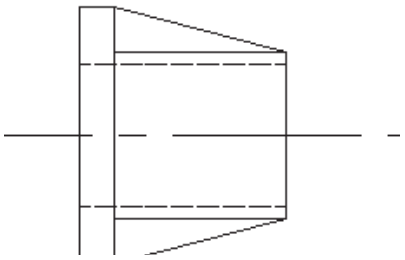
(2) (b), (c), and (d) are correct

(3) (a), (c), and (d) are correct

(4) (a), (b), and (d) are correct

---

13. Match the following Conventional Representation of Machine Parts :

Group A	**Group B**
a. 	i. Slotted head
b. 	ii. Serrated shaft
c. 	iii. Internal threads
d. 	iv. Radial ribs
e. 	v. Leaf spring

Select the correct answer from the code given below :

(1) a – v, b – iii, c – iv, d – ii, e – i (2) a – ii, b – iv, c – v, d – i, e – iii

(3) a – iii, b – iv, c – i, d – ii, e – v (4) a – iii, b – v, c – ii, d – i, e – iv

14. A cycle chain is a combination of several links with turning pairs. It is a

(1) kinematic chain

(2) not a kinematic chain

(3) kinematic chain, if the number of links is small

(4) kinematic chain, if the length of the chain is small

---

15. Match the following :

Group A ***(Characteristics of Data in a Database)***	**Group B** ***(Meaning)***
a. Consistency	i. Data in a database exist permanently
b. Non-redundancy	ii. Data should be correct *w.r.t.* the real world entity that they represent
c. Persistence	iii. Whenever more than one data element in a database represents real-world values, the values should be close to the practical values *w.r.t.* the relationship.
d. Integrity	iv. No two data items in a database should represent the same real-world entity.

Select the correct answer from the code given below :

(1) a – ii, b – iv, c – iii, d – i

(2) a – iv, b – iii, c – ii, d – i

(3) a – iv, b – iii, c – i, d – ii

(4) a – iii, b – iv, c – i, d – ii

---

16. Match the following Rivet heads and their purpose :

Group A	**Group B**
a. Pan heads	i. Used where riveting is done by hand hammering
b. Counter shank heads	ii. Required where very high strength is needed since they have the maximum strength
c. Snap heads	iii. Employed for ship building where flush surfaces are necessary
d. Conical heads	iv. Used mainly for structural work and machine riveting

Select the correct answer from the code given below :

(1) a – iii, b – iv, c – i, d – ii

(2) a – ii, b – iii, c – iv, d – i

(3) a – iv, b – i, c – ii, d – iii

(4) a – ii, b – i, c – iv, d – iii

---

17. Match the following :

Group A *(Database Models)*		**Group B** *(Features)*
a. Relational model	i.	Organizes data elements as tabular rows, one for each instance of an entity
b. Deductive/Inference model	ii.	Represents an entity as a class
c. Hierarchical model	iii.	Uses tables to organize the data elements, each table corresponding to an application entity, and each row representing an instance of that entity
d. Object-oriented model	iv.	Stores as little data as possible, but compensates by maintaining rules that allow new data combinations to be created when needed

Select the correct answer from the code given below :

(1) a – iii, b – iv, c – i, d – ii (2) a – iv, b –iii, c – ii, d – i

(3) a – ii, b – iii, c – iv, d – i (4) a – iv, b –i, c – ii, d – iii

---

18. Which of the following is NOT a level of database services?

(1) Physical level (2) Conceptual level

(3) External level (4) Internal level

---

19. Nature's cleaners are :

(1) Producers (2) Consumers (3) Decomposers (4) Carnivores

---

20. The ratio of (arc of contact/circular pitch) to ensure the contact between a pair of gears before the contact between the preceding pair ends must at least be

(1) 0.5 (2) 1.0 (3) 0.75 (4) 2.0

---

21. Match the following :

Group A *(Welding Technique)*		**Group B** *(Features)*
a. Atomic hydrogen welding	i.	A type of resistance welding where the parts to be joined are normally overlapped
b. Thermit welding	ii.	Welding is done under a mass of fusible granular flux
c. Spot welding	iii.	The welding arc is maintained between a consumable electrode and the workpiece with the filler metal supplied in the form of coiled electrode wire fed by drive rolls
d. Submerged arc welding	iv.	The process utilizes heat of a chemical source
e. MIG welding	v.	The welding arc is maintained between two non-consumable tungsten electrodes

Select the correct answer from the code given below :

(1) a – ii, b – v, c – iv, d – iii, e – i (2) a – v, b – iv, c – i, d – ii, e – iii

(3) a – iii, b – iv, c – v, d – i, e – ii (4) a – iv, b – iii, c – ii, d – v, e – i

---

22. Which of the following factors does NOT influence on the recrystallisation temperature of a metal ?

(1) Grain size before cold working (2) Fracture point
(3) Presence of second phase particles (4) Time

---

23. The spindle speed range in a general purpose lathe is divided into steps which approximately follow

(1) Arithmetic progression (2) Geometric progression
(3) Harmonic progression (4) Logarithmic progression

---

24. The area under which of the following curves gives the information regarding whether the operation/project is within control or not ?

(1) Ogive curve (2) Frequency polygon
(3) Histogram (4) Normal curve

---

25. The main function of the brake fluid is

(1) Lubrication (2) Power transmission
(3) Cooling (4) Scavenging

---

26. Match the following Foundry terms :

Group A	**Group B**
a. Riddle	i. Small brush used for moistening the sand and to paint the pattern
b. Chaplets	ii. Iron rods used for reinforcement of sand in the molding flask
c. Swab	iii. A sieve used for screening the molding sand
d. Sprue	iv. Used to support cores in the mold cavity
e. Gaggers	v. Passage through which the molten metal from the pouring basin reaches the mold cavity

Select the correct answer from the code given below :

(1) a – iii, b – iv, c – i, d – v, e – ii
(2) a – v, b – iv, c – i, d – ii, e – iii
(3) a – iii, b – iv, c – v, d – i, e – ii
(4) a – iii, b – iv, c – v, d – ii, e – i

---

27. Which of the following parameters can be adjusted by modifying the tie-rod attachment length?

(1) Camber (2) Caster (3) Toe (4) Steering gear ratio

---

28. **Assertion (A) :** In foundry practice, the vertical faces of the pattern are always tapered from the parting line, and this provision is termed as the *draft allowance*.

Reason (R) : The draft is always provided as an extra metal over and above the original dimensions of the casting.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

29. The parting sand used in preparing the mold cavity contains

(1) Silica + Clay (2) Silica + Moisture

(3) Clay + Moisture (4) Silica + Clay + Moisture

---

30. Which one of the following moulding processes does not require use of core?

(1) Sand moulding (2) Shell moulding

(3) Centrifugal casting (4) Plaster moulding

---

31. The flow in which the conditions do not change with time at any point, is known as

(1) Streamline flow (2) Uniform flow

(3) Turbulent flow (4) Steady flow

---

32. Which of the following is not a dimensionless parameter?

(1) Reynolds number (2) Friction factor

(3) Kinematic viscosity (4) Pressure coefficient

---

33. A pipe friction test shows that, over the range of speeds used for the test, the non-dimensional friction factor varies inversely with Reynolds number. From this, one can conclude that the

(1) Pipe must be smooth (2) Flow must be laminar

(3) Fluid must be compressible (4) Fluid must be ideal

---

34. **Assertion (A)** : If the adhesive force is more compared to the cohesive force, the liquid spreads and wets the contact surface.

Reason (R) : Adhesion allows a liquid to stick on one surface with the other.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

35. A measure of Rockwell hardness is the

(1) Depth of penetration of indenter (2) Surface area of indentation

(3) Projected area of indentation (4) Height of rebound

---

36. In a stream of glycerine in motion, the mass density of the fluid is 1500 kg/m^3, and the kinematic viscosity of the fluid is 6.30×10^{-4} m^2/s. Its absolute viscosity will be

(1) 0.945 poise (2) 9.45 poise (3) 94.5 poise (4) 0.0945 poise

---

37. **Assertion (A) :** Paint is a non-Newtonian fluid.
Reason (R) : Its viscosity remains constant, and represented by a straight line.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

38. Match the following :

Group A	Group B
a. Newtonian fluid	i. It is not affected by tangential or shear forces.
b. Thixotropic fluid	ii. Volume changes slightly with pressure and temperature.
c. Liquid	iii. The relation between shear stress and rate of shear strain is linear.
d. Ideal fluid	iv. The relation between shear stress and rate of angular deformation is non linear.

Select the correct answer from the code given below :
(1) a – iii, b – iv, c – ii, d – i
(2) a – iv, b – i, c – ii, d – iii
(3) a – ii, b – iv, c – i, d – iii
(4) a – ii, b – iii, c – iv, d – i

---

39. Match the following terms used in thermodynamics :

Group A	Group B
(p = pressure, v = volume, C = constant, $\gamma = \frac{C_p}{C_v}$, h = enthalpy, s = entropy)	
a. Isobaric process	i. $p_1 v_1^{\gamma} = p_2 v_2^{\gamma} = C$
b. Polytropic process	ii. $pv = C$
c. Isentropic process	iii. $ds = C_p \ln\left(\frac{T_2}{T_1}\right)$
d. Throttling process	iv. $p_1 v_1^{n} = p_2 v_2^{n} = C$
e. Hyperbolic process	v. $h_1 = h_2$

Select the correct answer from the code given below :
(1) a – iv, b – i, c – v, d – ii, e – iii
(2) a – ii, b – iv, c – v, d – i, e – iii
(3) a – v, b – ii, c – iv, d – i, e – iii
(4) a – iii, b – iv, c – i, d – v, e – ii

---

40. Which of the following head losses is significant in a pipe flow ?
(1) Loss of head due to gradual contraction
(2) Loss of head due to friction
(3) Loss of head due to sudden enlargement
(4) Loss of head due to sudden contraction

---

41. Match the Lists I and II, using the code given below :

List I *(Quantity to be measured)*	**List II** *(Insrument)*
a. Flow through pipe	i. Piezometer
b. Flow through channel	ii Venturimeter
c. Pressure in a pipe	iii. Pitot tube
d. Velocity of flow	iv Manometer
	v. Orifice plate
	vi. V-notch

Code :

(1) a – ii, v ; b – vi, iv ; c – i ; d – ii, iii
(2) a – v ; b –ii, iv ; c – i, iii ; d – vi
(3) a – ii, v ; b – vi ; c – i, iv ; d – iii
(4) a – i, iii ; b – ii, vi ; c – i, iv ; d – iii, v

---

42. **Assertion (A) :** Components of hard and brittle materials are manufactured by casting or machining.
Reason (R) : Hard and brittle materials cannot be plastically deformed.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

43. Which of the following does not come under the applications of the Database Management System ?
(1) Redundancy management (2) Transaction management
(3) Security management (4) Recovery management

---

44. The critical speed of a rotating shaft depends upon
(1) mass (2) stiffness
(3) mass and stiffness (4) mass, stiffness and eccentricity

---

45. In which of the following machining operations, the shape of the work piece surface, the feed and depth of cut, and the cutting speed are dictated by the tool and not the machine ?
(1) Planing (2) Gear hobbing (3) Gear shaping (4) Broaching

---

46. Some of the advantages of using power hack saw for cutting operation are given below.
(a) The cutting action is continuous, and it requires less time to complete a job.
(b) The cost of hack saw is low, and its maintenance is easy.
(c) The design of machine is simple, and it is easy to change from one job to another.
(d) It does not require supply of cutting fluids during sawing.
Select the correct answer from the code given below :
(1) (a), (b), and (c) (2) (a), (c), and (d)
(3) (a) and (c) (4) (b) and (c)

---

47. A bullet of mass A and velocity B is fired into a block of wood of mass C. If loss of any mass and friction be neglected, what is the end velocity of the system?
(1) AB/(A+C) (2) AC/(B+C) (3) (A+C)/(BC) (4) (A+B)/AC

---

48. In an outside micrometer, the barrel or sleeve is graduated with 0.5 mm steps. The beveled edge of thimble has 50 equal divisions on its circumference, and one complete revolution of the thimble causes the spindle to move by 0.5 mm. If, for a measurement, the reading on the sleeve shows 17 divisions (steps), and the 22nd division on the thimble coincides with the barrel mark, the size measured is equal to
(1) 5.22 mm (2) 8.22 mm (3) 8.72 mm (4) 5.72 mm

---

49. Quenching is not necessary when hardening is done by
(1) case carburizing (2) flame hardening
(3) nitriding (4) induction hardening

---

50. Following are some of the points in the color coding system of patterns :
(a) Surface to be machined – Black
(b) Stop-offs or supports – Black stripes on yellow background
(c) Parting surfaces on a split pattern – No color
(d) Core prints and seats for loose core prints – Yellow
Select the correct answer from the code given below :
(1) (a), (b), and (d) (2) (b), (c), and (d)
(3) (b) and (d) (4) (a), (c), and (d)

---

51. The condition that causes vapour locking in a brake system is
(1) Overheating of the fluid due to frequent brake application
(2) Overcooling of the brakes during high speed driving
(3) Keeping the vehicle without use for an extended period
(4) An excessively high engine speed on a downhill road

---

52. **Assertion (A) :** The intake manifolds of passenger cars have a large cross sectional area to maintain adequate air-fuel mixture velocities throughout their normal operating range.
Reason (R) : Passenger car engines are primarily designed for economy at light load and part throttle operation.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

53. In a CNC machine, the motion of mechanisms along the x, y and z-axes is controlled by individual screws. The control system is of which of the following types ?

(1) Contouring (2) Point-to-Point

(3) Servo (4) Open loop

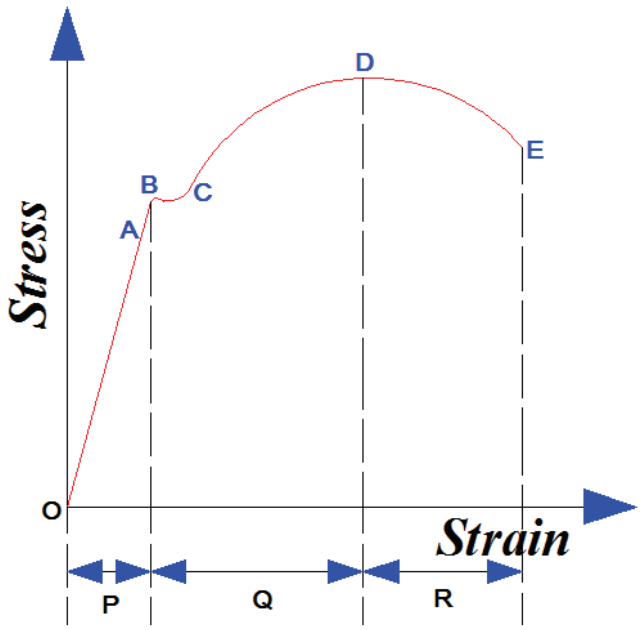
---

54. A cup of 10 cm height and 5 cm diameter is to be made from a sheet metal of 2 mm thickness. The number of reductions will be

(1) One (2) Two (3) Three (4) Four

---

55. The stress-strain diagram for a ductile material is shown in the figure below :



In the above diagram, the regions marked as P, Q, and R corresponding to any one of these listed below :

Uniform Plastic deformation (UPD) ; Elastic deformation (ED) ; Localised Plastic deformation (LPD).

Select the correct answer from the code given below :

(1) P – LPD, Q – ED ; R – UPD (2) P – UPD, Q – ED ; R – LPD

(3) P – ED, Q – LPD ; R – UPD (4) P – ED, Q – UPD ; R – LPD

---

56. The condition that results in large quantities of CO emission is

(1) Insufficient air during combustion (2) Insufficient fuel during combustion

(3) Low temperature combustion (4) High temperature combustion

---

57. In which of the following, the tolerance zone of the hole is entirely below the tolerance zone of the shaft ?

(1) Clearance fit (2) Transition fit

(3) Interference fit (4) Shaft basis system

---

58. The size of a Center Lathe is specified by the 'Swing' and 'Length of the bed'. Here, the 'Swing' is the

(1) Distance between the headstock center and tailstock center
(2) Distance between the headstock center and the top of the bed
(3) Twice the distance between the headstock center and the top of the bed
(4) Maximum angle of swivel of the compound rest.

---

59. Some of the differences between the Davis steering gear and Ackermann steering gear are given below :

(a) Davis steering gear has turning pairs whereas the Ackermann steering gear has sliding gears
(b) Davis steering gear satisfies the condition for correct steering for all positions whereas the Ackermann steering gear satisfies the condition for only three positions
(c) Davis steering gear is bulky whereas the Ackermann steering gear is comparatively lighter
(d) Davis steering gear is more commonly used in automobiles as compared to the Ackermann steering gear

Select the correct answer from the code given below :

(1) (a) and (b) are correct
(2) (b), (c), and (d) are correct
(3) (b) and (c) are correct
(4) (a), (b), and (d) are correct

---

60. What are the main components of an NC machine?

a. Part program
b. Machine Control Unit
c. Servo motor

Select the correct answer using the code given below:

(1) a, b and c
(2) a and b only
(3) b and c only
(4) a and c only

---

61. Match the following :

Group A	**Group B**
a. Sensible heat	i. The quantity of heat required to convert 1 kg of liquid from 0° C to dry saturated vapor at constant pressure
b. Dryness fraction	ii. The heat required to raise the temperature of 1 kg of liquid from 0° C to boiling point
c. Latent heat	iii. The ratio of actual mass of dry saturated steam to the total mass of wet steam containing it
d. Total heat	iv. The quantity of heat required to raise the temperature of 1 kg of liquid at boiling point into dry saturated vapor at the same temperature

Select the correct answer from the code given below :

(1) a – iii, b – i, c – ii, d – iv
(2) a – ii, b – iii, c – iv, d – i
(3) a – iv, b – iii, c – i, d – ii
(4) a – ii, b – i, c – iv, d – iii

---

62. One kilowatt-hour energy is equivalent to

(1) 3600 kW (2) 360 kJ (3) 3600 kJ (4) 3600 kW/sec

---

63. Which of the following is a Water Tube boiler?

(1) Cornish boiler (2) Locomotive boiler

(3) Stirling Bent Tube boiler (4) Lancashire boiler

---

64. Sensible heat is the heat required to

(1) Change vapour into liquid

(2) Change liquid into vapour

(3) Increase the temperature of a liquid or vapour

(4) Convert water into steam and superheat it

---

65. Given below are some of the characteristics of the LaMont boiler.

(a) It is a forced circulation water-tube boiler

(b) It contains no steam separating drum

(c) It generates steam at super-critical temperature (> 221 bar)

(d) The entire process of heating, steam formation, and super-heating is done in a single continuous tube

Select the correct answer from the code given below :

(1) (a) and (c) are correct (2) (a) and (d) are correct

(3) (b) and (c) are correct (4) (a), (c) and (d) are correct

---

66. 100 m of water column is equal to

(1) 1000 kN/m^2 (2) 100 kN/m^2 (3) 10 kN/m^2 (4) 1 kN/m^2

---

67. A Carnot cycle refrigerator operates between 250 K and 300 K. Its coefficient of performance is

(1) 6 (2) 5 (3) 1.2 (4) 0.8

---

68. The basic consideration for studying the performance of a boiler is

(1) The temperature of steam generated (2) The amount of water evaporated

(3) The amount of heat energy consumed (4) The friction losses

---

69. Match the following :

Group A	Group B
a. Curtis turbine	i. Fixed blades serve as guide blades as well as nozzles
b. Impulse turbine	ii. A set of nozzles and rows of moving blades are fixed to shafts, and rows of fixed blades are fixed to the casing
c. Rateau turbine	iii. Pressure drops only in nozzles, and remains constant over the moving blades
d. Reaction turbine	iv. The whole pressure drops from the steam chest pressure to the condenser pressure

Select the correct answer from the code given below :

(1) a – ii, b – iii, c – iv, d – i (2) a – iii, b – ii, c – iv, d – i

(3) a – iii, b – iv, c – i, d – ii (4) a – ii, b – i, c – iv, d – iii

---

70. The greatest problem faced in water conservation is to reduce the amount of

(1) Precipitation (2) Run-off water (3) Groundwater (4) Evaporation

---

71. The ratio of modulus of elasticity to the shear modulus for a Poisson's ratio of 0.4 will be

(1) 5/7 (2) 7/5 (3) 5/20 (4) 14/5

---

72. At a point in a two-dimensional stress system, the normal stresses on two mutually perpendicular planes are σ_x and σ_y, and the shear stress is τ_{xy}. At what value of shear stress, the minimum principal stress will become zero ?

(1) $\sigma_x . \sigma_y$ (2) $(\sigma_x . \sigma_y)^2$ (3) $\sqrt{\sigma_x . \sigma_y}$ (4) $\frac{\sigma_x . \sigma_y}{2}$

---

73. **Assertion (A) :** For brittle materials, the factor of safety is based on maximum Von Mises stress.

Reason (R) : In the case of brittle materials, the yield point is not well defined as for ductile materials.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

74. A brass rod of diameter 20 mm and length 300 mm is subjected to a tensile load of 60 kN. If the extension of the rod under the action of the load is 0.4 mm, the Young's modulus of the material will be equal to (Take $\pi = 3$)

(1) 100 GN/m^2 (2) 75 GN/m^2 (3) 150 GN/m^2 (4) 200 GN/m^2

---

75. A system of forces which meet at a point are termed as
(1) Concurrent forces (2) Coplanar forces
(3) Collinear forces (4) Bi-axial forces

---

76. The change in length due to a tensile or compressive force acting on a body is given by (where P = Tensile or compressive force acting on the body, L = Original length of the body, A = Cross-sectional area of the body, and E = Young's modulus for the material of the body)
(1) PLA/E (2) AE/PL (3) PLE/A (4) PL/AE

---

77. A hydrometer is an instrument that measures
(1) Specific gravity (relative density) of liquids
(2) Relative humidity
(3) Flow of liquids
(4) Density of liquids

---

78. The point on a beam where the bending moment and shear force are both equal to zero, is termed as the
(1) Point of contraflexure (2) Point of Equi-flexure
(3) Point of zero flexure (4) Point of reverse flexure

---

79. The ratio of the inertia force to the viscous force is called
(1) Reynolds's number (2) Froude's number
(3) Weber's number (4) Euler's number

---

80. **Assertion (A) :** The deflection of a beam should not exceed certain limit.
Reason (R) : The stiffness of the beam is inversely proportional to the deflection.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

81. When a body is immersed wholly or partially in a liquid, it is lifted up by a force equal to the weight of liquid displaced by the body. This statement is called
(1) Pascal's law (2) Archimedes principle
(3) Principle of floatation (4) Bernoulli's theorem

---

82. Which of the following tests carried on Engineering materials is a non-destructive test?
(1) Charpy test (2) Fatigue test
(3) Creep test (4) Liquid Penetrant test

---

83. Which welding method is preferable for gray cast iron ?
(1) Submerged arc welding (2) Gas welding
(3) Electric arc welding (4) MIG welding

---

84. In the S – N curve drawn to determine the endurance limit of a material, S and N indicate respectively

(1) Safe stress, Number of cycles before the specimen shows any cracks
(2) Bending stress, Number of cycles before the specimen fails
(3) Compressive stress, Number of predetermined test cycles for the material
(4) Tensile stress, Number of cycles before the specimen gets distorted

---

85. _____ test is conducted to detect the surface cracks on the material.

(1) Liquid Penetrant (2) Magnetic Particle Inspection
(3) Ultrasonic Inspection (4) Radiographic Inspection

---

86. Wet clothes are hung on a clothesline outdoors in sub-zero weather. After a day, the clothes are found to be dry. The process of drying is best explained as

(1) Vaporization (2) Sublimation (3) Melting (4) Condensation

---

87. If the carbon content in a steel is less than 0.83% , it is called

(1) Eutectic steel (2) Eutectoid steel
(3) Hypo-eutectic steel (4) Hypo-eutectoid steel

---

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

List-I *(Variable)*	**List-II** *(Dimensional Expression)*
A. Dynamic Viscosity	1. $M L^2T^{-3}$
B. Moment of momentum	2. $M L^{-1}T^{-2}$
C. Power	3. $M L^{-1}T^{-1}$
D. Volume modulus of elasticity	4. $M L^2T^{-1}$

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

---

89. **Assertion (A) :** Heat treatment is the process of heating and cooling metals or alloys in such a way as to obtain the desired properties.

Reason (R) : The desired mechanical properties can be achieved without addition of other metals by giving proper heat treatment.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

90. In terms of stress and strain at a point, the strain energy density is calculated as $\frac{1}{2}\sigma.\varepsilon$ per unit volume. If σ and ε correspond to yielding, this strain energy is termed as

(1) Yield stress (2) Ultimate stress (3) Proof stress (4) Resilience

---

91. The total energy possessed by a system of moving bodies

(1) is constant at every instant

(2) varies from point to point

(3) is maximum in the start and minimum at the end

(4) is minimum in the start and maximum at the end

---

92. Which of the following is used to measure or check the clearance between two mating parts ?

(1) radius gauge (2) planer gauge (3) feeler gauge (4) wire gauge

---

93. Two shafts A and B are of same material. The diameter of shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to that of shaft B is

(1) 1/8 (2) 1/4 (3) 1/16 (4) 1/2

---

94. **Assertion (A) :** In casting, directional solidification can be achieved by placing chills in those portions of casting which are away from the liquid metal source.

Reason (R) : Chills are made of exothermic materials.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

95. The total number instantaneous centers for a mechanism consisting of 'n' links are

(1) n/2 (2) n (3) (n–1)/2 (4) n(n–1)/2

---

96. The height of mercury barometer column is measured at a place as 757 mm. Then the atmospheric pressure at that place will be (in kN/m^2)

(1) 101 (2) 10.3 (3) 17.95 (4) 55.7

---

97. The main task of a battery in automobiles is to

(1) Supply electricity to the alternator

(2) Act as a reservoir or stabilizer of electricity

(3) Supply electricity to the vehicle's electrical system at all times while the engine is running

(4) Supply a large amount of power to turn the starter motor when the engine is being started

---

98. The main function of cultivator is
(1) To turn the soil
(2) To make furrow in soil
(3) To pulverize the soil
(4) To humidify the soil

---

99. When velocity and forces are being transmitted between two shafts by some gearing device, the point contact occurs in
(1) bevel gears
(2) spiral gears
(3) worm and wheel
(4) helical gears

---

100. **Assertion (A) :** Use of cylinder liners makes the casting of cylinder block simpler.
Reason (R) : No separate enclosed water jacket is needed for the cylinder block.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

101. The shortest distance between two successive rows in a multiple riveted joint is termed as
(1) Marginal pitch (2) Diagonal pitch (3) Straight pitch (4) Back pitch

---

102. Strength of beam is directly proportional to its
(1) Length
(2) Depth
(3) Width
(4) Moment of Inertia

---

103. **Assertion (A) :** Screwed fastenings must always pull down on to the prepared seatings that are flat and at right angles to the axis of the fastening.
Reason (R) : This prevents the screw being bent as it is tightened up.
(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

104. Fibre reinforced plastics are not good candidates for
(1) compressive strength
(2) tensile strength
(3) abrasion resistance
(4) toughness

---

105. A device used for lifting or lowering objects suspended from a hook at the end of retractable chains or cable is called
(1) hoist
(2) jib crane
(3) portable elevator
(4) chain conveyor

---

106. In a four-bar linkage, S denotes the shortest link length, L is the longest link length, P and Q are the lengths of other two links. At least one of the three moving links will rotate by 360° if

(1) $l + s > p + q$ (2) $l + s < p + q$

(3) $l + q < s + q$ (4) $l + p > s + q$

---

107. Assertion (A) : Belts, ropes, chains, and wires are flexible links and transmit tensile forces only.

Reason (R) : A flexible link is one which is partly deformed in a manner not to affect the transmission of motion.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

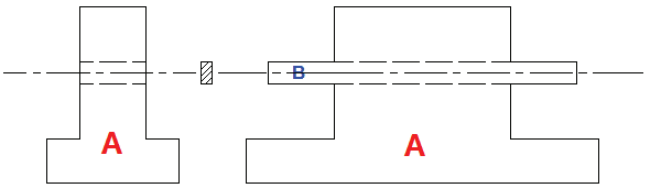
---

108. A good cutting action is indicated by

(1) low chip reduction coefficient (2) smooth surface finish

(3) high cutting ratio (4) low cutting ratio

109.



Assertion (A) : The kinematic pair between the elements **A** and **B**, in the figure shown above, is an incompletely constrained pair.

Reason (R) : The element **B** can only have reciprocating motion w.r.t. **A**.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

110. Mitre gears are employed for

(1) Equal speed (2) Minimum axial thrust

(3) Minimum back-lash (4) Great speed reduction

---

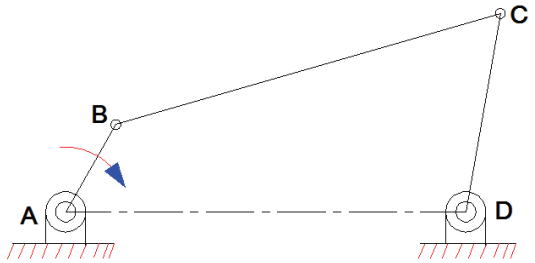
111. Which of the following is used to find the unknown instantaneous centers in a mechanism?

(1) Gruebler's criterion (2) Kennedy's theorem

(3) Kutzback criterion (4) Grashoff's law

---

112. A four-bar chain mechanism is shown in the figure below. If the angular velocity of the link AB is known to be uniform and equal to **ω** rad/s, the velocity of point **C** can be found from the vector equation



(1) $v_c = v_b + v_{cb}$ (2) $v_c = v_b + v_{bc}$ (3) $v_c = v_b + v_{ba}$ (4) $v_c = v_b + v_{ab}$

---

113. Leaf springs are subjected to

(1) Bending stress (2) Compressive stress

(3) Tensile stress (4) Shear stress

---

114. The Tchebicheff approximate straight line motion mechanism is made up of

(1) four-bar chain

(2) crossed four-bar chain

(3) inversion of a single-slider crank chain

(4) inversion of a double-slider crank chain

---

115. Assertion (A) : The Davis steering gear mechanism is generally preferred to the Ackermann steering gear mechanism in automobiles.

Reason (R) : The Davis steering gear mechanism exactly satisfies the condition for correct steering for all positions of turning of the automobile.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

116. For high speed engines, the cam follower should move with

(1) Uniform velocity (2) Simple harmonic motion

(3) Uniform acceleration and retardation (4) Cycloidal motion

---

117. Assertion (A) : Flat pulleys were made with a slightly convex or "crowned" surface to allow the belt to self-center as it runs.

Reason (R) : Such belts running over cylindrical pulleys quickly wear off due to high speeds of transmission.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

118. In a coupling rod of a locomotive, each of the four pairs is a _____ pair.

(1) Sliding (2) Turning (3) Rolling (4) Screw

---

119. The contact ratio is given by

(1) Length of path of approach/circular pitch

(2) Length of path of recess/circular pitch

(3) Length of arc of contact/circular pitch

(4) Length of arc of contact/cos

---

120. Match the following terms used in vibrations :

(f_n = Natural frequency of vibration)

Group A	**Group B**
a. f_n of free transverse vibration of a shaft subjected to a number of Point loads	i. Logarithmic decrement
b. Damped free vibrations	ii. Magnification factor
c. f_n of Free longitudinal vibrations	iii. Amplitude of vibration tends to infinity
d. Under-damped Forced vibrations	iv. Dunkerley's method
e. Whirling speed	v. Equilibrium method

Select the correct answer from the code given below :

(1) a – iv, b – i, c – v, d – ii, e – iii (2) a – ii, b – iv, c – v, d – i, e – iii

(3) a – v, b – ii, c – iv, d – i, e – iii (4) a – iii, b – v, c – ii, d – i, e – iv

---

121. A thermodynamic system together with its surroundings is called a

(1) Thermodynamic entity
(2) Universe
(3) Environment
(4) Thermodynamic atmosphere

---

122. Which one of the following is NOT a mass production method of gears ?

(1) Cutting by hob
(2) Cutting by milling cutter
(3) Cutting by pinion cutter
(4) Cutting by rack cutter

---

123. The Whitworth quick return motion mechanism is formed in a slider crank chain when the

(1) coupler link is fixed
(2) longest link is a fixed link
(3) slider is a fixed link
(4) smallest link is a fixed link

---

124. Assertion (A) : In actual practice, for complete combustion of a fuel, an excess quantity of air is required.

Reason (R) : This is to compensate for the possible low quality of oxygen in the air supplied.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

125. Assertion (A) : More uniform turning moment is obtained in four-stroke engine as compared to that in two-stroke engine, hence lighter flywheel is needed.

Reason (R) : In four-stroke engine, one power stroke is obtained for every two revolutions of the crankshaft.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)
(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) (A) is false but (R) is true

---

126. Why is the Watt governor not suitable for high speed engines ?

(1) It becomes unstable
(2) It acts as an isochronous governor
(3) The governor starts hunting
(4) The movement of the sleeve becomes very small

---

127. Greater proportion of heat in a cutting operation is produced in the region of

(1) shearing plane of the chip
(2) tool-chip interface
(3) tool and workpiece contact
(4) the body of workpiece

---

128. **Assertion (A) :** Work Study employs the techniques of Method Study and Time Study in all the steps involved in an operation.

Reason (R) : The implementation of Work Study in an organization improves the morale of the workers and thereby results in increase of productivity of the organization.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

129. A soap bubble has a spherical shape because

(1) the pressure inside the bubble is uniform

(2) a spherical shape will have maximum energy

(3) a sphere will have minimum surface area for a given volume

(4) a sphere will have minimum volume for a given surface energy

---

130. Given below are some of the basic principles of motion economy.

(a) Principles related to the design of the product

(b) Principles related to the use of 'Human body'

(c) Principles related to the design of tools and equipment

(d) Principles related to the 'Work place layout'

Select the correct answer from the code given below :

(1) (b), (c), and (d) are correct

(2) (a), (b), and (d) are correct

(3) (a), (c), and (d) are correct

(4) (b), and (d) are correct

---

131. A gas in a closed thermodynamic system of mass m undergoes a process over a very small change of temperature (dT), and a very small work (dW) is performed. If $dW = -C_v.m.dT$, then the process is

(1) adiabatic compression

(2) constant volume compression

(3) constant volume expansion

(4) adiabatic expansion

---

132. Given below are some methods used for Time Study :

(a) Time-recording machine

(b) Alarm clock method

(c) Stop watch method

(d) Motion picture camera

Select the correct answer from the code given below :

(1) (a), (b), and (c) are correct

(2) (a), (c), and (d) are correct

(3) (b), (c), and (d) are correct

(4) (a), and (c) are correct

---

133. Addition of Vanadium to Steel results in improvement of

(1) fatigue strength

(2) heat treatability by quenching

(3) resistance to oxidation at elevated temperature

(4) hardenability

---

134. When a worker is attending more than one machine, one or more machines may remain idle while the worker is occupied with the work on the other machine(s). The allowance provided to compensate for this idleness is termed as the

(1) Interference allowance (2) Process allowance

(3) Extra busy period allowance (4) Contingency allowance

---

135. Given below are some of the methods for calculating the depreciation of machinery / equipment :

(a) Annuity charging method (b) Straight line method

(c) Sinking fund method (d) Machining quality method

Select the correct answer from the code given below :

(1) (b), (c), and (d) are correct (2) (a), (c), and (d) are correct

(3) (a), (b), and (d) are correct (4) (a), (b), and (c) are correct

---

136. Assertion (A) : Ground specimens have higher fatigue strength as compared to fine-turned specimens of the same material.

Reason (R) : Grinding introduces residual tensile stresses on the surface.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

137. The acceleration of a body sliding down an inclined surface having inclination angle θ with the horizontal is

(1) $g \sin \theta$ (2) $g \cos \theta$ (3) $g \tan \theta$ (4) g

---

138. Given below are some of the parameters of Acceptance Sampling Plan :

(a) Lot size (b) Acceptance number

(c) Number of defectives per lot (d) Sample size

Select the correct answer from the code given below :

(1) (a), (c), and (d) are correct (2) (b), (c), and (d) are correct

(3) (a), (b), and (d) are correct (4) (a), (b), and (c) are correct

---

139. Military type of organisation is known as

(1) line organization
(2) functional organization
(3) line and staff organization
(4) line, staff and functional organization

---

140. Among the parameters given below, which of them is NOT a constituent of the Estimation of the value of a product before it is actually manufactured?

(a) Design and arrangement of special items
(b) Time allowance
(c) Time of Method Study
(d) Transportation bottlenecks

Select the correct answer from the code given below :

(1) (a) and (d)
(2) (a) only
(3) (a) and (c)
(4) (d) only

---

141. Tool life can NOT be defined as the

(1) number of minutes after which the tool failed
(2) machining time in minutes for which the tool performed satisfactorily
(3) average length of cut per cutting edge
(4) average volume of material removed per cutting edge

---

142. In which of the following joints all the rivets are in double shear ?

(1) double riveted lap joint
(2) double riveted single cover butt joint
(3) double riveted double cover of unequal width butt joint
(4) double riveted double cover of equal width butt joint

---

143. In a cam and follower pair, the follower is moving with SHM. The maximum jerk occurs

(1) in the middle of the outstroke
(2) in the middle of the return stroke
(3) coinciding with abrupt change in acceleration
(4) in the middle of the dwell period after outstroke

---

144. An operation process chart represents graphically the

(1) operation, transport, and delay
(2) points at which the materials enter the process, operation, inspection, and the time required for operation
(3) operation, transporation, and inspection
(4) operation, inspection, and the time required for operation

---

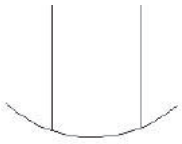
145. Bin Cards are used in

(1) Machine coding (2) Fixing targets

(3) Quality Control (4) Stores

---

146. Match the following Welding Symbols :

Group A		**Group B**
a.		i. Spot welding
b.		ii. Edge welding
c.		iii. Square Butt weld
d.		iv. Single Bevel Butt welding
e.		v. Fillet welding

Select the correct answer from the code given below :

(1) a – v, b – iii, c – iv, d – ii, e – i (2) a – ii, b – iv, c – v, d – i, e – iii

(3) a – v, b – ii, c – iv, d – i, e – iii (4) a – iii, b – v, c – ii, d – i, e – iv

---

147. Assertion (A) : In hot riveting, when it is required, additional operation like caulking is done.

Reason (R) : This operation relieves the residual thermal stresses.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

148. The only angle on which the strength of the tool depends, is

(1) Lip angle (2) Clearance angle (3) Rake angle (4) Cutting angle

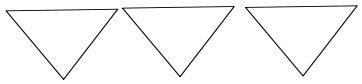
---

149. Which one of the following is trapezoidal thread?

(1) Acme thread (2) Square thread (3) Buttress thread (4) Metric thread

---

150. A symbol for surface roughness value **(R_a)** in **µm** is shown in the figure below :



Identify the correct value from the following list.

(1) 0.2 to 0.8 mm (2) 12.5 to 50 mm (3) 0.025 to 0.1 mm (4) 1.6 to 6.3 mm

---

151. Assertion (A) : In a mechanical voltage regulator, the air gaps between the coil core and armature are critical for correct regulator operation, and must be within specifications.

Reason (R) : The effectiveness of a magnet increases as the square of the distance through which it must act.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

152. The entropy of a mixture of ideal gases is the sum of the entropies of constituents evaluated at

(1) Temperature and pressure of the mixture

(2) Temperature of the mixture and partial pressure of the constituents

(3) Temperature and volume of the mixture

(4) Pressure and volume of the mixture

---

153. Given below are some of the characteristics of condensers employed in the automobile ignition system :

(a) The capacity of the condenser does not depend on the plate size

(b) The condenser is installed across the breaker points in the ignition system

(c) When the circuit breaker points are closed, the primary current is interrupted causing the coil magnetic field to start to collapse

(d) The condenser provides a place for the electrons in the primary current to go during initial circuit breaker point opening

Select the correct answer from the code given below :

(1) (a) and (d) are correct (2) (b) and (d) are correct

(3) (a), (b) and (c) are correct (4) (b), (c) and (d) are correct

---

154. Machining centre is

(1) a group of automatic machine tools

(2) an NC machine tool

(3) the next logical step beyond NC machine tool

(4) an automatic tool changing unit

---

155. The specified operating temperature range for automobile spark plug is

(1) 330 K to 976 K (2) 440 K to 1012 K

(3) 616 K to 1189 K (4) 830 K to 1247 K

---

156. Choose incorrectly matched:

(1) Green revolution – agricultural crops (2) White revolution – milk production

(3) Grey revolution – oil seeds (4) Golden revolution – horticulture

---

157. **Assertion (A) :** General purpose tractors have high ground clearance.

Reason (R) : The high ground clearance saves damage of crops during cultivation.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

158. Given below are some of the criteria for the selection of tractors :

(a) Under a single cropping pattern, one tractor of 20 – 25 hp is suitable for about 40 hectares farm

(b) For higher altitude climates, air cooled engines are preferred

(c) A tractor with less wheel base and higher ground clearance works successfully in black cotton soil

Select the correct answer from the code given below :

(1) (a) and (b) are correct (2) (b) and (c) are correct

(3) (a), and (c) are correct (4) Only (b) is correct

---

159. The main function of intake manifold in an I.C. engine is that it

(1) promotes the mixture of air and fuel

(2) reduces intake noise

(3) cools the intake air to a suitable temperature

(4) distributes intake air equally to the cylinders

---

160. Assertion (A) : In Power tillers, V-belt is usually used to transmit power from the engine to the main clutch.

Reason (R) : V-belt has very high efficiency and it works as a shock absorber also.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

161. The torque available at the contact between driving wheels and road is known as

(1) tractive effort (2) clutch effort (3) brake effort (4) turning effort

---

162. Match the following terms used in Farm Machinery :

Group A	**Group B**
a. Reaper	i. A machine to cut herbage crops
b. Swath	ii. An assembly comprising of fingers, knife guides on wearing plates and shoes
c. Cutter bar	iii. A type of connecting rod which is pinned to the crankshaft with the help of a pin
d. Pitman	iv. A machine to cut grain crops
e. Mower	v. The material as left by the harvesting machine

Select the correct answer from the code given below :

(1) a – iv, b – i, c – ii, d – iii, e – v

(2) a – iv, b – v, c – ii, d – iii, e – i

(3) a – v, b – iv, c – i, d – ii, e – iii

(4) a – iii, b – v, c – i, d – ii, e – iv

---

163. Assertion (A) : Tractor drawn semi-mounted or mounted type mowers are operated by Power Take Off (P.T.O.) shaft.

Reason (R) : In this case, the cutting mechanism is driven independently of the forward speed of the mower.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

164. The aluminium alloy is used in cylinder blocks because

(1) material cost is low

(2) it is lighter and have good heat dissipation characteristics

(3) it does not require any cylinder liners

(4) the piston is also made of aluminium alloy

---

165. A machine to separate grains from the harvested crop and provide clean grain without much loss and damage is called

(1) Swath (2) Reaper (3) Thresher (4) Windrower

---

166. **Assertion (A) :** Treading a layer of 15 to 20 cm thick harvested crop by a team of animals is an age-old traditional method followed by farmers.

Reason (R) : This yields a total grain loss not more than 5 per cent, in which broken grain will be less than 2 per cent.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

167. Strain hardening in a ductile material occurs

(1) from the beginning of loading to yielding (2) from yielding to necking

(3) from yielding to fracture (4) from necking to fracture

---

168. Match the following different type of threshers used in Farm Machinery :

Group A	**Group B**
a. Axial flow type	i. The cylinder consists of a flywheel with corrugation on its periphery and sides, which rotates inside a closed casing and concave
b. Raspbar type	ii. It consists of beaters mounted on a shaft which rotates inside a closed casing and concave
c. Drummy type	iii. It consists of spike tooth cylinder, woven-wire mesh concave and upper casing provided with helical louvers
d. Hammer mill type	iv. Corrugated bars are mounted axially on the periphery of the cylinder
e. Syndicator type	v. It is provided with aspirator type blower and sieve shaker

Select the correct answer from the code given below :

(1) a – iii, b – iv, c – ii, d – v, e – i (2) a – iv, b – v, c – ii, d – iii, e – i

(3) a – v, b – iv, c – i, d – ii, e – iii (4) a – ii, b – v, c – iii, d – i, e – iv

---

169. Given below are some of the types of Production drawings :

(a) Component or Part drawings (b) Assembly drawings

(c) Disassembly drawings (d) Sub-assembly drawings

Select the correct answer from the code given below :

(1) (a), (b) and (c) are correct (2) (b), (c) and (d) are correct

(3) (a), (b) and (d) are correct (4) (a), (c) and (d) are correct

---

170. Match the following Automotive Air Conditioning Fault Symptoms and the Possible faults :

Group A *(Symptom)*	**Group B** *(Possible fault)*
a. Discharge pressure low	i. Clogged or kinked pipes
b. Refrigerant loss	ii. Fault with the compressor, if bubbles are seen, low refrigerant
c. Suction pressure too high	iii. Frozen evaporator
d. Discharge temperature is lower than normal	iv. Oily marks (from the lubricant in the refrigerant) near joints or seals
e. Suction and discharge pressure too low	v. High pressure valve fault, excessive refrigerant or the expansion valve open too long

Select the correct answer from the code given below :

(1) a – iii, b – iv, c – i, d – v, e – ii
(2) a – iv, b – v, c – ii, d – iii, e – i
(3) a – v, b – iv, c – i, d – ii, e – iii
(4) a – ii, b – iv, c – v, d – iii, e – i

---

171. In riveted joints, the minimum margin shall be equal to _____ times the nominal diameter of the rivet.

(1) 2.5 (2) 2.0 (3) 1.5 (4) 1.0

---

172. Given below are some of the main components of an automobile Air Bag system :

(a) Passenger seat switches
(b) Igniter
(c) Pyrotechnic inflater
(d) Passenger seat belts

Select the correct answer from the code given below :

(1) (a), (b), and (c) are correct
(2) (b) and (c) are correct
(3) (b), (c), and (d) are correct
(4) (a), (c), and (d) are correct

---

173. A thermostatic expansion valve in refrigeration system

(1) maintains different temperatures in the evaporator proportional to load
(2) is suitable only in constant load system
(3) reduces the load on the evaporator
(4) ensures the evaporator is completely filled with refrigerant when the load increases

---

174. Given below are some of the features / characteristics of various sensors used in automobiles

(a) The operation of most ABS sensors is different from that of a crank angle sensor
(b) The inductive distributor pick-up sensor normally has four connections
(c) Most of the coolant temperature sensors are NTC thermistors
(d) The two main advantages of Hall Effect sensors are that measurement of lower (or even zero) speed is possible, and that the voltage output of the sensor is independent of speed

Select the correct answer from the code given below :

(1) (a), and (c) are correct
(2) (a), (b) and (c) are correct
(3) (b), (c), and (d) are correct
(4) (c), and (d) are correct

---

175. Assertion (A) : Recent evidence shows that fine particulates may be the most serious threat to human life in urban areas.

Reason (R) : Diesel engines have higher emissions of Nitrogen Oxides and significant emissions of fine particulates.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

176. Hooke's Law holds good upto

(1) Yield point

(2) Limit of Proportionality

(3) Breaking Point

(4) Elastic Limit

---

177. Objects that are symmetric can be shown effectively using

(1) Quarter section

(2) Full section

(3) Half section

(4) Symmetric section

---

178. Assertion (A) : Those executives who were smart enough to leave lots of time for Q & A got better grades than those who lectured. And those managers who encouraged a dialogue with the team came out on top.

Reason (R) : People usually give the best scores to leaders who trust you and to leaders who listen.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

179. The refrigerant in a refrigeration system will be at its highest temperature

(1) between the compressor and condenser

(2) between the evaporator and compressor

(3) at the condenser

(4) at the evaporator

---

180. What is the concept that is most fundamental to the leadership role?

(1) Leading by example

(2) Staying calm in crisis situation

(3) Convincing ability

(4) Serving the organization or group and the people within it

---

181. Efficiency of a Carnot engine is 75%. If the cycle direction is reversed, COP of the reversed Carnot cycle is

(1) 1.33 (2) 0.75 (3) 0.33 (4) 1.75

---

182. The ignition system in a petrol engine has to transform the normal battery voltage (of 6 – 8V) to

(1) 230 V (2) 420 V (3) 8000 V (4) 4000 V

---

183. The gear train usually employed in clocks is a

(1) simple gear train (2) reverted gear train

(3) sun and planet gear (4) differential gear

---

184. Which of the following is conducted to determine the indicated power of a multi-cylinder engine?

(1) Morse test (2) Heat Balance

(3) Rating of fuels (4) Drawing of performance curves

---

185. Assertion (A) : The blades in an axial flow compressor are made of aerofoil section.

Reason (R) : This is to reduce the loss caused by turbulence and boundary separation.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

186. Cr is added as an alloying element into steel to increase

(1) Hot hardness temperature (2) Wear resistance

(3) Corrosion resistance (4) Machinability

---

187. Given below are some of the properties required of an ideal refrigerant :

(a) It must have a low specific heat and high latent heat

(b) It must have low thermal conductivity

(c) It must have high boiling point and low freezing point

(d) It must have high critical pressure and temperature

Select the correct answer from the code given below :

(1) (a), (b), and (c) are correct (2) (a), (c), and (d) are correct

(3) (b) and (c) are correct (4) (a) and (d) are correct

---

188. If a beam is subjected to a constant bending moment along its length, then the shear force will

(1) also have a constant value everywhere along its length

(2) be zero at all sections along the beam

(3) be maximum at the center and zero at the ends

(4) be zero at the center and maximum at the ends

---

189. **Assertion (A) :** For any lifting machine, the law of machine is generally a straight line which does not pass through the origin.

Reason (R) : In practice, it is difficult to get an ideal machine.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

190. Stiffness of a spring is independent of

(1) Diameter of wire

(2) Diameter of coil

(3) Number of coils

(4) Material strength

---

191. In a Weston differential pulley block, let the diameter of the larger pulley of the top block be **D**, the diameter of the smaller pulley of the top block be **d**, **W** be the load lifted, and **P** the effort applied. The Mechanical Advantage of the machine will be equal to

(1) $\frac{W(D-d)}{P}$

(2) $\frac{2D}{(D-d)}$

(3) $\frac{2WD}{P(D-d)}$

(4) $\frac{2W(D-d)}{P}$

---

192. In a wheel and axle, the diameter of the wheel is 490 mm, and that of the axle is 180 mm. The thickness of the cord on the wheel is 10 mm, and that on the axle is 20 mm. The velocity ratio of the machine will be equal to

(1) 2.50

(2) 2.30

(3) 2.33

(4) 2.53

---

193. A spring stretches by 1 mm under a force of 0.9 N. If an unknown mass is attached at its free end, and the number of oscillations in free vibration recorded in one minute is 600, the unknown mass is equal to (Take $\pi = 3$)

(1) 0.5 kg (2) 0.8 kg (3) 0.25 kg (4) 1 kg

---

194. Given below are some of the main circuits run by a modern automobile system :

(a) Generating circuit (b) Ignition circuit

(c) Starting circuit (d) Lubrication circuit

Select the correct answer from the code given below :

(1) (a), (c), and (d) are correct (2) (a), (b), and (d) are correct

(3) (a), (b) and (c) are correct (4) (b), (c) and (d) are correct

---

195. Assertion (A) : The lead-acid type battery is used as the primary source of automobile electricity.

Reason (R) : It serves as the reserve source of electricity to operate the whole of electrical equipment.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

196. Scab is a

(1) Sand casting defect (2) Machining defect

(3) Welding defect (4) Forging defect

---

197. Assertion (A) : Temperature compensating devices are used in some voltage regulators to raise the charging voltage when the system is cold.

Reason (R) : Low temperature slows the chemical reaction and high temperature speeds up the reaction.

(1) Both (A) and (R) are individually true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are individually true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

---

198. The process of supercharging in I.C. engines is meant for

(1) increasing the density of intake air

(2) raising the exhaust pressure

(3) increasing the quantity of fuel going into the cylinder

(4) providing more air for cooling

---

199. The electrical power available from an automobile battery is expressed in

(1) Watts (2) Volts

(3) Ampere-hours (4) Voltage-hours

---

200. In thermal power plants, coal is transferred from bunker to the other places by

(1) Hoists (2) Conveyors (3) Cranes (4) Lifts
