

JEE MAIN-2024-25 (Part Test-3)

(Physics, Chemistry and Mathematics)

SYLLABUS

Physics :- Mechanical, Properties of solid & Fluid

Chemistry :- Atomic structure, Periodic table, Chemical bonding, P-Block (B & C)

Mathematics :- Binomial theorem, P & C, Statics

3

PART TEST

CLASS-XIth

Date :-

Time :- 3:00 Hrs.

Marks :- 300

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.
 - (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **-1 mark** for wrong answer.
 - (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10**. The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **-1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :-

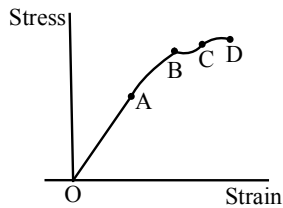
School Name :-

Student's Signature :-

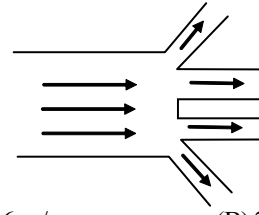
Invigilator's Signature :-

PHYSICS
SECTION-A

1. To determine the young's modulus by searle's method a student gets the stress v/s strain graph as shown in diagram. Which portion should give the best result –

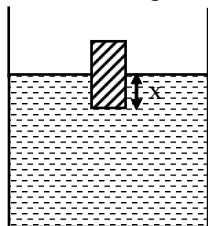


- (A) BC (B) CD (C) AC (D) OA
2. If a liquid does not wet glass, its angle of contact is:
(A) zero (B) acute
(C) obtuse (D) right angle
3. A liquid having area of free surface 'A' has an orifice at a depth 'h' with an area 'a' below liquid surface, then the velocity V of flow through the orifice is -
(A) $\sqrt{2gh}$ (B) $\sqrt{2gh} \sqrt{\frac{A^2}{A^2 - a^2}}$
(C) $\sqrt{2gh} \sqrt{\frac{A}{A - a}}$ (D) None of these
4. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied -
(A) length = 50 cm, diameter = 0.5 mm
(B) length = 100 cm, diameter = 1 mm
(C) length = 200 cm, diameter = 2 mm
(D) length = 300 cm, diameter = 3 mm
5. Two rain drops reach the earth with their terminal velocities in the ratio 4 : 9. The ratio of their radii is -
(A) 4 : 9 (B) 2 : 3 (C) 3 : 2 (D) 9 : 4
6. If two soap bubbles of different radii are connected by a tube,
(A) air flows from the bigger bubble to the smaller bubble till the sizes become equal
(B) air flows from bigger bubble to the smaller bubble till the sizes air interchanged
(C) air flows from the smaller bubble to the bigger
(D) there is no flow of air
7. Water is flowing through a channel that is 12 m wide with a speed of 0.75 m/s. The water then flows into four identical channels that have a width of 4.0m. The depth of the water does not change as it flows into the four channels. What is speed of the water in one of the smaller channels ?



- (A) 0.56 m/s (B) 2.3 m/s
(C) 0.25 m/s (D) 0.75 m/s
8. A small drop of steel falls from rest through a long height h in coaltar, the final velocity will be proportional to h^n , then n is -
(A) 1/2 (B) 1 (C) -1 (D) 0
9. The rubber cord catapult has a cross-section area 1 mm² and total unstretched length 10 cm. It is stretched to 12 cm and then released to project a stone of mass 5 gm. Taking Young's modulus Y of rubber as 5×10^8 N/m², the velocity of projection will be -
(A) 20 cm/s (B) 20 m/s
(C) 2 m/s (D) none of these
10. A very narrow capillary tube records a rise of 20 cm when dipped in water. When the area of cross section is reduced to one fourth of the former value, water will rise to a height of -
(A) 10 cm (B) 20 cm
(C) 40 cm (D) 80 cm
11. A wooden cube just floats inside water when a 200 g mass is placed on it. When the mass is removed, the cube is 2 cm above the water level. What is the size of each sides of the cube?
(A) 6 cm (B) 8 cm
(C) 10 cm (D) 12 cm
12. A solid ball of density ρ_1 and radius r falls vertically through a liquid of density ρ_2 . Assume that the viscous force acting on the ball is $F = krv$, where k is a constant and v its velocity. What is the terminal velocity of the ball ?
(A) $\frac{4\pi r^2(\rho_1 - \rho_2)}{3k}$ (B) $\frac{2\pi r(\rho_1 - \rho_2)}{3gk}$
(C) $\frac{2\pi g(\rho_1 + \rho_2)}{3gr^2k}$ (D) none of these
13. Bulk modulus of water is 2×10^9 Nm⁻². The change in pressure required to increase the density of water by 0.1% is -
(A) 2×10^9 Nm⁻² (B) 2×10^8 Nm⁻²
(C) 2×10^6 Nm⁻² (D) 2×10^4 Nm⁻²

14. Water rises to a height of 16.3 cm in a capillary of height 18 cm. If the tube is cut at a height of 12 cm, then-
- (A) water will come as a fountain from the capillary
 (B) water will stay at a height of 12 cm in capillary
 (C) the height of the water in the tube will be 10.3 cm
 (D) water will flow down the sides of the capillary tube
15. A block of iron is kept at the bottom of a bucket full of water at 2°C. The water exerts buoyant force on the block. If the temperature of water is increased by 1°C the temperature of iron block also increased by 1°C. The buoyant force on the block by water.
- (A) will increase
 (B) will decrease
 (C) will not change
 (D) may decrease or increase depending on the values of their coefficient of expansion
16. A newtonian fluid fills the clearance between a shaft and a sleeve. When a force of 800 N is applied to the shaft, parallel to the sleeve, the shaft attains a speed of 2 cm/s. If a force of 2.4 kN is applied instead, the shaft would move with a speed of -
- (A) 2 cm/s (B) 15 cm/s
 (C) 6 cm/s (D) None of these
17. Two wires of the same radius and material have their length in the ratio 1 : 2. If these are stretched by same force and strain produced in the two wires will be in the ratio -
- (A) 1 : 1 (B) 1 : 2 (C) 2 : 1 (D) 1 : 4
18. When a loaded boat enters into the sea from a river, it rises because :
- (A) There is more water in the sea than in river
 (B) sea water is denser than river
 (C) there is difference of temperature
 (D) sea is deeper than river
19. A uniform solid cube is floating in a liquid as shown in the figure, with part x inside the liquid. Some changes in parameters are mentioned in Column I. Assuming no other changes, match the following -



Column I

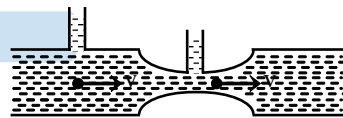
- (a) If density of the liquid
 (b) If height of the cube is
 (c) If the whole system is
 (d) If the cube is replaced by another cube of same size but lesser density, x will

Column II

- (p) Increase decreases, x will
 (q) Decreases increased keeping base area and density same, x will
 (r) Remain same accelerated upward, then x will
 (s) May increase or decrease
- (A) a → p, b → p, c → r, d → q
 (B) a → s, b → r, c → q, d → p
 (C) a → r, b → p, c → q, d → s
 (D) a → p, b → q, c → r, d → s
20. What is the velocity v of a metallic ball of radius r falling in a tank of liquid at the instant when its acceleration is one half that of a freely falling body ? (The densities of metal and of liquid are ρ and σ respectively and the viscosity coefficient of the liquid is η) -
- (A) $\frac{r^2 g}{9\eta} (\rho - 2\sigma)$ (B) $\frac{r^2 g}{9\eta} (2\rho - \sigma)$
 (C) $\frac{r^2 g}{9\eta} (\rho - \sigma)$ (D) $\frac{2r^2 g}{9\eta} (\rho - \sigma)$

SECTION-B

21. To measure the flow rate in a gas pipeline a narrowing is made in it and the pressure difference between the wide and the narrow parts of the pipe is measured. Find the gas flow rate, if its density is 1.4 kg/m³, the diameter of the pipe is 50 mm, the diameter of the narrowing is 30 mm and the pressure difference is 18 cm of water. The compressibility of the gas is to be neglected.

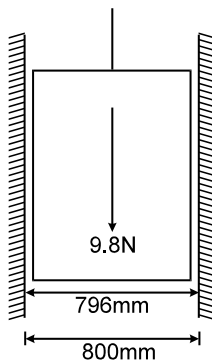


22. A wire of length '2m' is clamped horizontally between two fixed support. A mass m = 5kg is hanged from middle of wire. The vertical and depression in wire (in cm) in equilibrium is (Young modulus of wire = 2.4 × 10⁹ N/m², cross-sectional area = 1 cm²)
23. A ball is immersed in water kept in container and released. At the same time container is accelerated in horizontal direction with acceleration, $\sqrt{44} \text{ m/s}^2$. Acceleration of ball w.r.t. container (in m/s²) is (specific gravity of ball = 12/17, g = 10m/s²) -
24. A liquid flows out drop by drop from a vessel through a vertical tube with an internal diameter of 2 mm, then the total number of drops that flows out during 10 grams of the liquid flow out: [Assume that the diameter of the neck of a drop at the moment it breaks away is equal to the internal diameter of tube and surface tension is 0.02 N/m]

25. The cross-section of a bar is given by $\left[1 + \frac{x^2}{100}\right]$ cm², where 'x' is the distance from one end. If the extension under a load of '20 k N' on a length of 10 cm is $\lambda \times 10^{-3}$ cm then find λ .
 $Y = 2 \times 10^5$ N/mm².

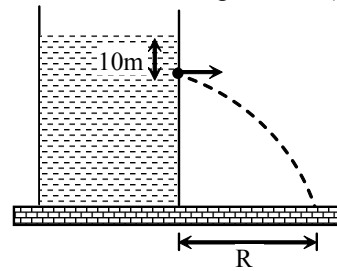
26. A glass capillary sealed at the upper end is of length 0.11 m and internal diameter 2×10^{-5} m. This tube is immersed vertically into a liquid of surface tension 5.06×10^{-2} N/m. When the length $x \times 10^{-2}$ m of the tube is immersed in liquid then the liquid level inside and outside the capillary tube becomes the same, then the value of x is : (Assume atmospheric pressure is $1.01 \times 10^5 \frac{N}{m^2}$)

27. A piston of 796 mm diameter and 200 mm long works in a cylinder of 800 mm diameter as shown in figure. If the annular space is filled with a lubricating oil of viscosity 5 centipoises, calculate the constant speed (nearest to integer) (in m/s) of descent of piston in vertical position. The weight of piston and the axial load are 9.8 N.

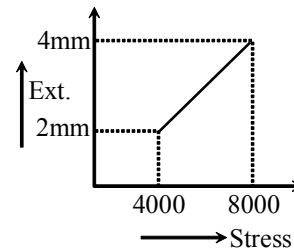


28. A large tank is filled with water (density = 10^3 kg/m³). A small hole is made at a depth 10 m below water surface. The range of water issuing out of the hole is R on ground. What extra pressure (in atm) must be applied on the water surface so that the range becomes 2R :

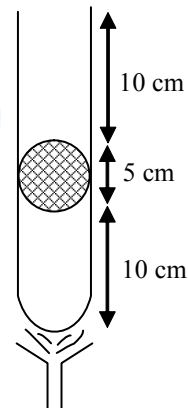
(take 1 atm = 10^5 Pa and $g = 10$ m/s²)

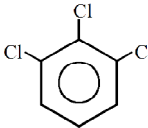
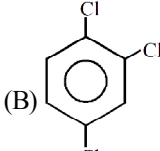
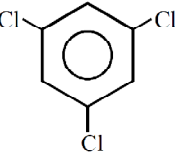
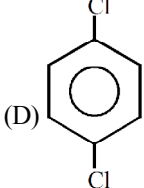
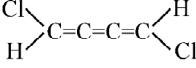


29. In determination of young modulus of elasticity of wire, a force is applied and extension is recorded. Initial length of wire is '1m'. The curve between extension and stress is depicted then young modulus of wire will be $K \times 10^9$ N/m², where K is



30. A mercury pallet is trapped in a tube as shown in figure. The tube is slowly heated to expel all mercury inside it (Isothermal condition). Heat given to the tube in 10^{-3} J is : ($\rho_{Hg} = 13.6$ gm/cc, Atmospheric pressure = 10^5 Pa, cross-section area of tube = 2 cm²)



31. The energy difference between two electronic states is 46.12 kcal/mole. What will be the frequency of the light emitted when an electron drops from the higher to the lower energy state (Planck's constant = 9.52×10^{-14} kcal s mol⁻¹)
 (A) 4.84×10^{15} cycles s⁻¹
 (B) 4.84×10^{-5} cycles s⁻¹
 (C) 4.84×10^{-12} cycles s⁻¹
 (D) 4.84×10^{14} cycles s⁻¹
32. For H-atom, the energy required for the removal of electron from various subshells is given as under 3s, 3p, & 3d are E_1 , E_2 , E_3 respectively. The order of the energies would be –
 (A) $E_1 > E_2 > E_3$ (B) $E_3 > E_2 > E_1$
 (C) $E_1 = E_2 = E_3$ (D) None of these
33. A photon was absorbed by a hydrogen atom in its ground state and the electron was promoted to the fifth orbit. When the excited atom returned to its ground state, visible and other quanta were emitted. Other quanta are –
 (A) $2 \rightarrow 1$ (B) $5 \rightarrow 2$
 (C) $3 \rightarrow 1$ (D) $4 \rightarrow 1$
34. Four sets of values of quantum numbers (n, ℓ , m and s) are given below. Which set does not provide a permissible solution of the wave equation?
 (A) $3, 2, -2, \frac{1}{2}$ (B) $3, 3, 1, -\frac{1}{2}$
 (C) $3, 2, 1, \frac{1}{2}$ (D) $3, 1, 1, \frac{1}{2}$
35. **Statement-1** : δ -bonds are formed by four lobes interaction of d-orbitals.
Statement-2 : d_{z^2} orbital does not have nodal plane.
 (A) Statement-1 is true, Statement-2 is true and Statement-2 is correct explanation for Statement-1
 (B) Statement-1 is true, Statement-2 is true and Statement-2 NOT the correct explanation for Statement-1
 (C) Statement-1 is true, Statement-2 is false
 (D) Statement-1 is false, statement-2 is true.
36. Among the following species, identify the isostructural pairs : $\text{NF}_3, \text{NO}_3^-, \text{BF}_3, \text{H}_3\text{O}^+, \text{HN}_3$
 (A) $[\text{NF}_3, \text{NO}_3^-]$ and $[\text{BF}_3, \text{H}_3\text{O}^+]$
 (B) $[\text{NF}_3, \text{HN}_3]$ and $[\text{NO}_3^-, \text{BF}_3]$
 (C) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{NO}_3^-, \text{BF}_3]$
 (D) $[\text{NF}_3, \text{H}_3\text{O}^+]$ and $[\text{HN}_3, \text{BF}_3]$
37. Molecular shapes of SF_4, CF_4 and XeF_4 are :
 (A) the same, with 2, 0 and 1 lone pair of electrons respectively
 (B) the same, with 1, 1 and 1 lone pair of electrons respectively
 (C) different with 0, 1 and 2 lone pair of electrons respectively
 (D) different with 1, 0 and 2 lone pair of electrons respectively
38. Which of the following statement is not correct regarding SF_2Cl_2 molecule?
 (A) Two axial bond lengths are longer compared to two equatorial bond lengths.
 (B) Two S-F bond lengths are identical.
 (C) Two S-Cl bond lengths are identical.
 (D) Lone pair is not changing its position.
39. Which has maximum dipole moment ?
 (A)  (B) 
 (C)  (D) 
40. Choose the correct option for the following molecule in view of chemical bonding

 (A) non-planar (B) $\mu \neq 0$
 (C) A & B both (D) $\mu = 0$
41. Boron forms BX_3 type of halides. The correct increasing order of Lewis - acid strength of these halides is:
 (A) $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$
 (B) $\text{BI}_3 > \text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
 (C) $\text{BF}_3 > \text{BI}_3 > \text{BCl}_3 > \text{BBr}_3$
 (D) $\text{BF}_3 > \text{BCl}_3 > \text{BI}_3 > \text{BBr}_3$
42. Which one of the following statements is not true regarding diborane ?
 (A) It has two bridging hydrogens and four perpendicular to the rest.
 (B) When methylated, the product is $\text{Me}_4\text{B}_2\text{H}_2$.
 (C) The bridging hydrogens are in a plane perpendicular to the rest.
 (D) All the B-H bond distances are equal.

43. An inorganic compound (A) made of two most occurring elements into the earth crust, having polymeric tetrahedral network structure. With carbon compound (A) produces a poisonous gas (B) which is the most stable diatomic molecule. Compounds (A) and (B) will be
 (A) $\text{SiO}_2, \text{CO}_2$ (B) SiO_2, CO
 (C) SiC, CO (D) SiO_2, N_2
44. $\text{RCl} \xrightarrow{\text{Cu power}} \text{R}_2\text{SiCl}_2 \xrightarrow{\text{H}_2\text{O}}$
 $\text{R}_2\text{Si}(\text{OH})_2 \xrightarrow{\text{condensation}} \text{A}$ Compound (A) is:
 (A) A linear silicone (B) A chlorosilane
 (C) A linear silane (D) A network silane
45. Which of the following model best describes the bonding within a layer of the graphite structure?
 (A) Metallic bonding
 (B) Ionic bonding
 (C) Non-metallic covalent bonding
 (D) Van der Waals force
46. Choose the correct statement :
 (A) $\text{Na}^+_{(\text{g})} > \text{Mg}^{2+}_{(\text{g})} > \text{Al}^{3+}_{(\text{g})}$ (Hydration energy)
 (B) $\text{Li}^+_{(\text{aq})} < \text{Na}^+_{(\text{aq})} < \text{K}^+_{(\text{aq})}$ (Ionic Mobility)
 (C) $\text{F}^-_{(\text{aq})} < \text{Cl}^-_{(\text{aq})} < \text{Br}^-_{(\text{aq})}$ (Hydrated radius)
 (D) $\text{CaF}_2 > \text{CaO}$ (Lattice energy)
47. In which of following cases the extent of back bonding is most effective?
 (A) BeF_2 (B) $(\text{CH}_3)_2\text{O}$
 (C) AsF_3 (D) Cl_3C^-
48. One element has atomic weight 39. Its electronic configuration is $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$. The true statement for that element is :
 (A) High value of IE (B) Transition element
 (C) Isotone with ${}_{18}\text{Ar}^{38}$ (D) None
49. Identify the correct order of acidic strengths of $\text{CO}_2, \text{CuO}, \text{CaO}, \text{H}_2\text{O}$:
 (A) $\text{CaO} < \text{CuO} < \text{H}_2\text{O} < \text{CO}_2$
 (B) $\text{H}_2\text{O} < \text{CuO} < \text{CaO} < \text{CO}_2$
 (C) $\text{CaO} < \text{H}_2\text{O} < \text{CuO} < \text{CO}_2$
 (D) $\text{H}_2\text{O} < \text{CO}_2 < \text{CaO} < \text{CuO}$
50. The increasing order of atomic radii of the following group 13 elements is
 (A) $\text{Al} < \text{Ga} < \text{In} < \text{Tl}$ (B) $\text{Ga} < \text{Al} < \text{In} < \text{Tl}$
 (C) $\text{Al} > \text{In} < \text{Ga} < \text{Tl}$ (D) $\text{Al} < \text{Ga} < \text{Tl} < \text{In}$

SECTION-B

51. What amount of energy should be added to an electron to reduce its de Broglie wavelengths from 100 to 50 pm?
52. A gas absorbs a photon of 300 nm and then re-emits two photons. One photon has a wavelength 600 nm. The wavelength of second photon is -
53. The threshold wavelength for photoelectric emission in tungsten is 2300 Å. What wavelength of light must be used to eject electrons with a maximum energy of 1.5 eV?
54. At what minimum kinetic energy must a hydrogen atom move for its inelastic head-on collision with another, stationary, hydrogen atom to make one of them capable of emitting a photon? Both atoms are supposed to be in the ground state prior to the collision.
55. How many bonded electrons pairs are present in IF_7 molecule?
56. The ratio of σ and π bonds in benzene is
57. The possible orientations in space for a d-orbital is
58. Calculate the % p character in the orbital occupied by the lone pairs in water molecule.
 [Given : $\angle\text{HOH}$ is 104.5° and $\text{Cos}(104.5^\circ) = -0.25$]
59. The experimental value of the dipole moment of HCl is 1.03 D. The length of the H–Cl bonds is 1.275 Å. The percentage of ionic character in HCl is :
60. The number of paired electrons in oxygen molecule is :

61. The sum of $\sum_{r=0}^n (-1)^r \frac{{}^n C_r}{r+2} C_r$ is equal to
 (A) $\frac{2}{n+1}$ (B) $\frac{2}{n-1}$
 (C) $\frac{2}{n+2}$ (D) $\frac{2}{n-2}$
62. If $(1+x)^{10} = \sum_{r=0}^{10} C_r x^r$ and $(1+x)^7 = \sum_{r=0}^7 d_r x^r$. If $P = \sum_{r=0}^5 C_{2r}$ and $Q = \sum_{r=0}^3 d_{2r+1}$, then $\frac{P}{Q}$ is equal to
 (A) 4 (B) 8 (C) 16 (D) 32
63. If terms independent of x in the expansion of $\left(3x - \frac{1}{x}\right)^{20}$ and $\left(x + \frac{\sqrt[9]{3^{10}}}{x}\right)^{18}$ are A and B respectively then $\left(\frac{9}{38}A + B\right)$ equals
 (A) $3^{10} \cdot {}^{19}C_8$ (B) $3^{10} \cdot {}^{19}C_9$
 (C) $3^9 \cdot {}^{20}C_8$ (D) $3^9 \cdot {}^{19}C_{40}$
64. The term that is independent of x , in the expansion of $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^9$ is
 (A) ${}^9C_6 \left(\frac{3}{2}\right)^5 \left(\frac{1}{3}\right)^4$ (B) ${}^9C_6 \left(\frac{1}{6}\right)^3$
 (C) ${}^9C_4 \left(\frac{3}{2}\right)^4 \left(-\frac{1}{3}\right)^5$ (D) ${}^9C_6 \left(\frac{3}{2}\right)^6 \left(\frac{1}{3}\right)^6$
65. If $(1+x)^n = C_0 + C_1x + C_2x^2 + \dots + C_nx^n$ and value of the expression $3 \cdot C_3 + 8 \cdot C_4 + 15 \cdot C_5 + 24 \cdot C_6 + 35C_7 + \dots + (n-2)$ terms $= n(n-\lambda) 2^{n-\mu} + n$, where $\lambda, \mu \in \mathbb{N}$, then $\lambda + \mu$ is equal to
 (A) 2 (B) 3 (C) 4 (D) 5
66. If $C_r = \binom{n}{r}$, then $\sum_{r=1}^n (-1)^{r-1} \frac{C_r}{r} =$
 (A) 0 (B) 1
 (C) $\sum_{r=1}^n \frac{1}{r}$ (D) $\sum_{r=1}^n \frac{(-1)^{r-1}}{r}$
67. If $(x+a)^n$ has only one middle term and only seventh term is numerically greatest term when $x = 3$, $a = 2$, then number of positive divisors of n is
 (A) 4 (B) 5 (C) 6 (D) 7
68. If $N = 2^3 \cdot 3^4 \cdot 5^2 \cdot 7^1$ then product of all divisors of N which are divisible by 5 is
 (A) N^{20} (B) N^{40} (C) $(5N)^{20}$ (D) $(5N)^{40}$
69. The number of different words which can be formed using all the letters from the word 'NARAYAN' so that N does not lie between any two A's, is
 (A) 126 (B) 105 (C) 63 (D) 42
70. The number of integers greater than one million that can be formed using the digits 2, 3, 0, 3, 4, 2, 3 is
 (A) 240 (B) 320 (C) 360 (D) 300
71. Sum of values of n satisfying the equation $\left(\frac{n!}{4!}\right)^2 + \frac{7! \cdot 5!}{4 \cdot 4!} = 240 \left(\frac{n!}{4!}\right)$ is
 (A) 11 (B) 12 (C) 13 (D) 14
72. If n is odd and ${}^nC_0 < {}^nC_1 < {}^nC_2 < \dots < {}^nC_r > {}^nC_{r+1} > {}^nC_{r+2} > \dots > {}^nC_n$ then $r =$
 (A) $\frac{n}{2}$ (B) $\frac{n-1}{2}$
 (C) $\frac{n-2}{2}$ (D) Does not exist
73. If p, q, r are prime numbers and α, β, γ are positive integers such that L.C.M. of α, β, γ is p^3q^2r and greatest common divisor of α, β, γ is pqr then the number of possible triplets (α, β, γ) will be
 (A) 6 (B) 12 (C) 72 (D) 96
74. The mean & variance of 7 observations are 8, 16 respectively. If 5 of the observations are 2, 4, 10, 12, 14, then the LCM of remaining two observations is
 (A) 16 (B) 24 (C) 20 (D) 14
75. Following is the record of goals scored by team A in football session
- | | | | | | |
|-------------------------|---|---|---|---|---|
| Numbers of goals scored | 0 | 1 | 2 | 3 | 4 |
| Numbers of match is | 1 | 9 | 7 | 5 | 3 |
- for team 'B' mean number of goals scored per match was 2 goals with standard deviation 1.25. The team which is more consistant
 (A) A
 (B) B
 (C) A and B both are same
 (D) Neither A Nor B

76. The mean of two samples of sizes 200 and 300 were found to be 25, 10 respectively. Their standard deviations were 3 and 4 respectively. Find the variance of combined sample of size 500
(A) 70 (B) 60 (C) 67.2 (D) 80
77. The average marks of 10 students in a class was 60 with standard deviation 4. While the average marks of other 10 students was 40 with a standard deviation 6. If all the 20 students are taken together, their standard deviation will be
(A) 5.0 (B) 7.5 (C) 9.8 (D) 11.2
78. The mean and variance of 5 observations of an experiment are 4 and 5.2 respectively. From these observations three are 1, 2 and 6 and $\lambda = |x_1 - x_2| + 8$ where x_1 & x_2 are remaining observations. Then number of solution of equation $10 - x^2 - 2x = \lambda$ are
(A) 1 (B) 2 (C) 3 (D) 4
79. The mean and variance of 10 numbers were calculated as 11.3 and 3.3 respectively. It was subsequently found that one of the a number was misread as 10 instead of 12. How does the variance change.
(A) variance decreases
(B) variance increases
(C) nothing can be said about variance
(D) variance remains unchanged.
80. If $(1 + ax)^n = 1 + 8x + 24x^2 + \dots$; then $\frac{a-n}{a+n}$ is equal to -
(A) 3 (B) -3 (C) -1/3 (D) 1/3

SECTION-B

81. The number of terms in $\left(x^3 + 1 + \frac{1}{x^3}\right)^{100}$ is -

82. Let $1 + \sum_{r=1}^{10} (3^r \cdot {}^{10}C_r + r \cdot {}^{10}C_r) = 2^{10}(\alpha \cdot 4^5 + \beta)$
where $\alpha, \beta \in \mathbb{N}$ and $f(x) = x^2 - 2x - k^2 + 1$.
If α, β lies between the roots of $f(x) = 0$, then find the smallest positive integral value of k .
83. The sum of rational terms in $(\sqrt{2} + \sqrt[3]{3} + \sqrt[6]{5})^{10}$ is
84. The expression $(x + \sqrt{x^3 - 1})^5 + (x - \sqrt{x^3 - 1})^5$ is a polynomial of degree -
85. Find the coefficient of the term independent of x in the expansion of $\left(\frac{x+1}{x^{2/3} - x^{1/3} + 1} - \frac{x-1}{x - x^{1/2}}\right)^{10}$
86. Number of permutations of all the letters in "ANABLAVA" that does not end with A can be expressed in the form of $\frac{m!}{n!}$, find $(m+n)$
87. A person has 3 sons. He owns 101 shares of the same amount of a company. He wants to give these shares to his sons so that no son should have more shares than the combined total of the other two. Find the number of ways in which he can distribute the shares.
88. How many 5 digit numbers are there which contains not more than two different digits ?
89. If the mean deviation about the median of the numbers $a, 2a, \dots, 50a$ is 50, then $|a|$ equals :
90. The variance of first 50 even natural number is