FIITJEE

ALL INDIA TEST SERIES

CONCEPT RECAPITULATION TEST – I

JEE (Main)-2025

TEST DATE: 20-01-2025

Time Allotted: 3 Hours **Maximum Marks: 300**

General Instructions:

- The test consists of total 75 questions.
- Each subject (PCM) has 25 questions.
- This question paper contains **Three Parts.**
- **Part-A** is Physics, **Part-B** is Chemistry and **Part-C** is Mathematics.
- Each part has only two sections: **Section-A and Section-B**.

  Section-A (01 – 20, 26 – 45, 51 – 70) *contains 60 multiple choice questions which have* ***only one correct answer****. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

  Section-B (21 – 25, 46 – 50, 71 – 75) *contains 15 Numerical based questions. The answer to each question is rounded off to the nearest integer value. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

Physics

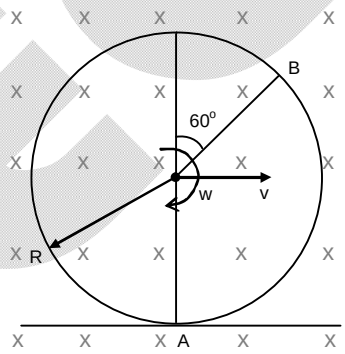
PART – A

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

1. In order to convert a miliammeter of range 1.0 mA and resistance 1.0 ohm into a voltmeter of range 10 V, a resistance of how many ohms should be connected with it and in what manner?
(A) 999 Ω in series (B) 999 Ω in parallel
(C) 9,999 Ω in series (D) 9,999 Ω in parallel

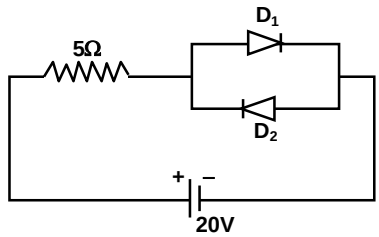
2. A conducting wheel is rolling on the ground in a uniform magnetic field B_o then the emf induced between points A and B; $V_A - V_B$ will be



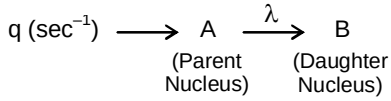
(A) $B_o w^2(\sqrt{3}R)$
(B) $-\frac{\sqrt{3}}{2}Bw^2R$
(C) $B_o w^2\sqrt{2}R$
(D) $-B_o w^2\left(\frac{\sqrt{5}}{2}\right)R$

3. Forces acting on a particle moving in a straight line varies with the velocity of the particle as $F = \frac{\alpha}{v}$ where α is constant. The work done by this force in time interval Δt is
(A) $\alpha\Delta t$ (B) $\frac{1}{2}\alpha\Delta t$
(C) $2\alpha\Delta t$ (D) $\alpha^2\Delta t$

4. In the figure shown below, chose the correct answer.
(A) Voltage across D_2 is 20 Volt.
(B) Voltage across D_1 is 20 Volt.
(C) Current through diode D_1 is 4A.
(D) Current through diode D_1 is 0 A.



5. In a radioactive reaction an unstable nucleus A dis-integrates into a stable nucleus B. But A is generated at a constant rate of q nucleus per second. Then at steady state number of nucleus of A will be



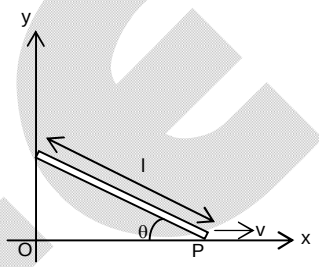
(A) $q\lambda$ (B) $\frac{q}{\lambda}$
(C) $q - \lambda$ (D) $\frac{\lambda}{q}$

6. Two narrow cylindrical pipes A and B have the same length. Pipe A is open at both ends and is filled with a monatomic gas of molar mass M_A. Pipe B is open at one end and closed at the other end, and is filled with a diatomic gas of molar mass M_B. Both gases are at the same temperature. If the frequency of the second harmonic in pipe A is equal to the frequency of the third harmonic in pipe B, what is the value of M_A/M_B?

(A) $\frac{100}{189}$ (B) $\frac{200}{189}$

(C) $\frac{400}{189}$ (D) $\frac{500}{189}$

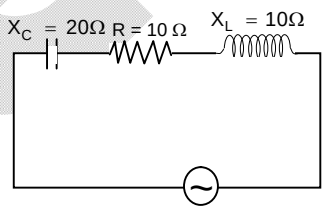
7. The end of a rigid rod of length l is moved with a constant velocity v. Find the speed of the midpoint of the rod



(A) $\frac{v}{2\sin\theta}$ (B) $\frac{v}{2}\tan\theta$

(C) $\frac{v}{2}\cot\theta$ (D) $\frac{v}{2\cos\theta}$

8. In LCR circuit shown in figure, then choose incorrect option



(A) Current will lead the voltage

(B) rms value of current is 20 A

(C) Power factor of the circuit is $\frac{1}{\sqrt{2}}$

(D) Voltage drop across resistance = voltage drop across inductor

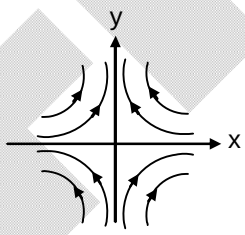
9. A tunnel is dug along diameter inside the surface of earth and a particle is projected from the centre of tunnel. The minimum velocity of particle such that it escape out from the earth's gravitation field is (Radius of earth = R_e)

(A) $\sqrt{2gR_e}$ (B) $\sqrt{\frac{3}{2}gR_e}$

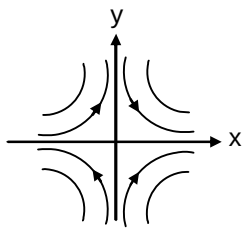
(C) $\sqrt{3gR_e}$ (D) $\sqrt{\frac{5}{2}gR_e}$

10. Electric potential is varying with x and y as $V = 2\left(x^2 - y^2\right)$. The corresponding field pattern is:

(A)



(B)



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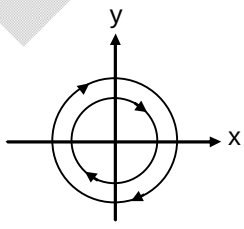

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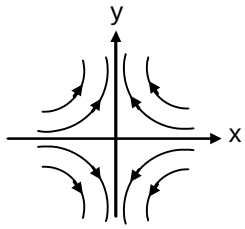
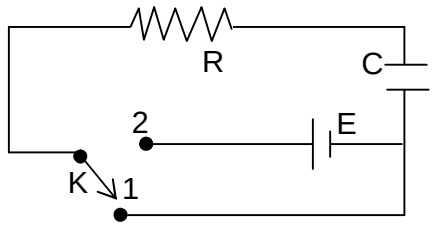


11. In the shown circuit involving a resistor of resistance R Ω, capacitor of capacitance C farad and an ideal cell of emf E volt, the capacitor is initially uncharged and the key is in position 1. At t = 0 second the key is pushed to position 2 for t_0 = RC seconds and then key is pushed bank to position 1 for t_0 = RC seconds. This process is repeated again and again. Assume the time taken to push key from position 1 to 2 and vice versa to be negligible.



The charge on capacitor at t = 2RC second is

(A) CE

(B) $CE\left(1-\frac{1}{e}\right)$

(C) $CE\left(\frac{1}{e}-\frac{1}{e^2}\right)$

(D) $CE\left(1-\frac{1}{e}+\frac{1}{e^2}\right)$

12. Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polaroid. If a third Polaroid whose polarization axis makes an angle θ with the polarization axis of first Polaroid, is placed between these polaroids then the intensity of light emerging from the last polaroid will be

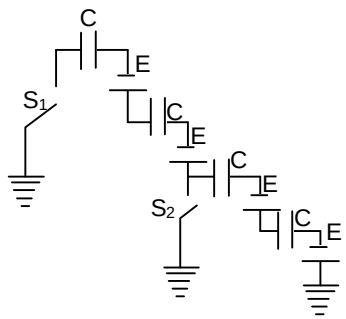
(A) $\left(\frac{I_0}{8}\right)\sin^2 2\theta$

(B) $\left(\frac{I_0}{4}\right)\sin^2 2\theta$

(C) $\left(\frac{I_0}{2}\right)\cos^4\theta$

(D) $I_0\cos^4\theta$

13. In the given circuit, all the capacitors are initially uncharged. After closing the switch S_1 for a long time suddenly S_2 is also closed and kept closed for a long time. Total heat produced after closing S_2 will be :



(A) $4C\varepsilon^2$

(B) $\frac{1}{2}C\varepsilon^2$

(C) $2C\varepsilon^2$

(D) 0

14. The resistivity of pure silicon is 2300 Ω-m and the mobilities of electrons and holes in it are 0.135 and 0.048 m^2/V-s respectively. The resistivity of a specimen of silicon doped with 10^{19} atoms of phosphorus per meter will be

(A) 4.6 Ω m

(B) 4 Ω m

(C) 4.4 Ω m

(D) 0 Ωm

15. A perfectly absorbing surface intercepts a parallel beam of monochromatic light of power 10 W (λ = 500 nm) incident on it normally the force exerted by light beam on the surface is

(A) $\frac{1}{4}\times10^{-7}$N

(B) $\frac{1}{3}\times10^{-7}$N

(C) $\frac{1}{2}\times10^{-7}$N

(D) 1×10^{-7} N

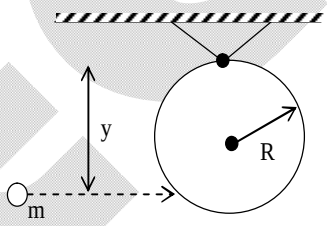
16. The efficiency of a Carnot cycle is 1/6. If on reducing the temperature of the sink by 65^0C, the efficiency becomes 1/3, the initial temperatures between which the cycle is working are

(A) 390 K, 325 K
(B) 780 K, 325 K
(C) 390 K, 162 K
(D) 300 K, 100 K

17. A spherical object of mass 1 kg and radius 1 m is falling vertically downward inside a viscous liquid in a gravity free space. At a certain instant the velocity of the sphere is 2 m/s. If the coefficient of viscosity of the liquid is $\frac{1}{18\pi}$ N-S/m^2, then velocity of ball will become 0.5 m/s after a time

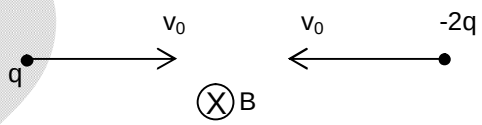
(A) ln 4 s
(B) 2 ln 4 s
(C) 3 ln 4 s
(D) 2 ln 2 s

18. A small ball of mass m hits the cylinder which is hinged at top and free to rotate in vertical plane as shown in figure. Mass of cylinder is M. Liner momentum of system (ball + cylinder)



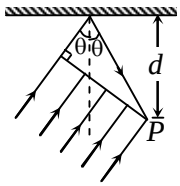
(A) Remains conserved if y = R
(B) Remains conserved if $y = \frac{3}{2}R$
(C) Remains conserved if $y = \frac{7}{5}R$
(D) Cannot be conserved for any value of y.

19. A charge particle q of mass m is placed at a distance d from another charge particle – 2q of mass 2m in a uniform magnetic field B as shown. If particles are projected towards each other with equal speed v_0, so that the two particles touches each other without collision during its motion. (Assume only force due to magnetic field acts on the particle)



(A) $\frac{qBd}{m}$
(B) $\frac{qBd}{2m}$
(C) $\frac{2qBd}{m}$
(D) $\frac{3qBd}{2m}$

20. A plane wave front of light is incident on a plane mirror. Intensity is maximum at P when



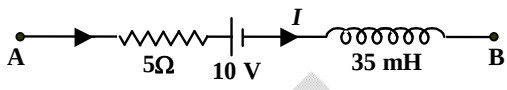
(A) $\cos\theta = \frac{\lambda}{2d}$
(B) $\cos\theta = \frac{3\lambda}{4d}$
(C) $\sec\theta - \cos\theta = \frac{3\lambda}{4d}$
(D) $\sec\theta - \cos\theta = \frac{\lambda}{2d}$

SECTION – B

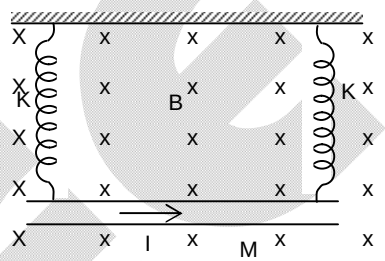
(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

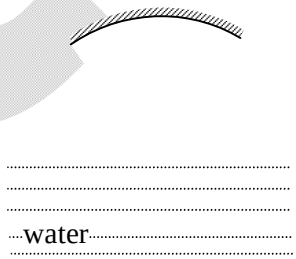
21. The network shown in Figure is part of a complete circuit. If at a certain instant the current (I) is 5A, and is decreasing at a rate of 10^3 A/s, then $V_B - V_A$ =



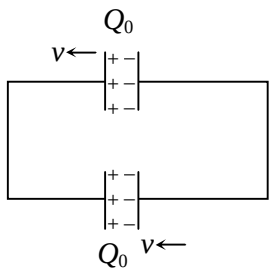
22. A metal rod of mass 10gm and length 25 cm is suspended on two springs as shown in figure. The springs are extended by 4 cm. When a 20 ampere current passes through the rod it rises by 1 cm. The magnetic field is $x \times 10^{-2}$ T ($g = 10$ m/s^2). Find the value of 10x.



23. A concave mirror of focal length 15 cm is placed in air at a height of 45 cm above the water surface as shown. The axis of the mirror is vertical and the reflecting surface faces the water surface. A point object is placed on the axis of concave mirror at a distance 35 cm above the water surface. Find the position of image formed after two successive processes- first reflection from the concave mirror and then first refraction from the water (reflective Index of water 4/3). The distance of image from water surface (in cm) is



24. Two identical capacitor connected as shown and having initial charge Q_0. Separation between plates of capacitor is d_0. Suddenly the left plate of upper capacitor and right plate of lower capacitor start moving with speed v towards left while other plate of capacitor remains fixed. (given $\frac{Q_0 v}{2d}$ =1 amp). Find the value of current (in amp) in the circuit.



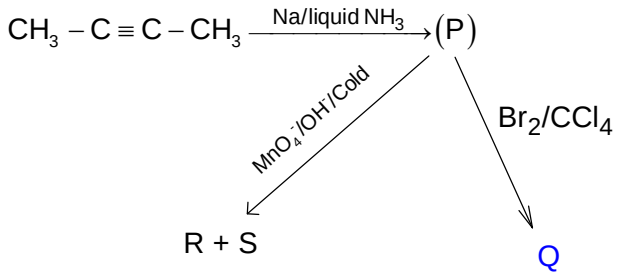
25. A point mass of 1 kg collides elastically with a stationary point mass of 5 kg. After their collision, the 1 kg mass reverses its direction and moves with a speed of 2 ms^{-1}. Find the kinetic energy (in mJ) of a particle of mass 6 kg moving with same velocity as that of centre of mass of the above two particles of mass 1 kg and 5 kg.

Chemistry

PART – B

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

26. 

Which of the following statement is correct about the products of above reaction?
(A) 'Q' contains no asymmetric carbon atom
(B) 'P' and 'Q' are functional isomers
(C) 50% of R and 50% of Q makes a racemic mixture
(D) 'P' has one stereoisomer

27. What is the wavelength of the motion of the electron of hydrogen atom along the fourth orbit?
[r_0 = Radius of first orbit of 'H' atom]
(A) $2\pi r_0$ (B) $4\pi r_0$
(C) $8\pi r_0$ (D) $16\pi r_0$

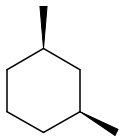
28. $SrCO_3(s) \rightleftharpoons Sr^{2+}(aq) + CO_3^{2-}(aq)$
Addition of which of the following substance can increase the solubility of $SrCO_3$ according to above reaction?
(A) NaCl (B) HCl
(C) K_2CO_3 (D) NaOH

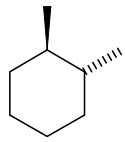
29. Which of the following is not identical between inorganic benzene and organic benzene?
(A) Number of atoms (B) Number of electrons
(C) Number of sigma bonds (D) Number of polar covalent bonds

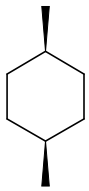
30. Which of the following is the strongest acid?
(A) $CH_3\underset{Cl}{C}HCH_2\underset{F}{C}HCOOH$ (B) $CH_3\underset{F}{C}HCH_2\underset{Cl}{C}HCOOH$
(C) $CH_3CH_2\underset{F}{\underset{|}{C}}H\underset{Cl}{\underset{|}{C}}HCOOH$ (D) $CH_3CH_2CH\underset{Cl}{\underset{|}{C}}H\underset{F}{\underset{|}{C}}HCOOH$

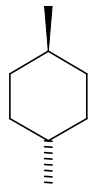
31. Which of the following are heating products of borax?
(A) Na_3B and $NaBO_2$ (B) Na_2O and B_2H_6
(C) $NaBO_2$ and B_2O_3 (D) Na_3B and $B_2O_{3=}$

32. Which of the following compounds has maximum number of stereoisomers?

(A) 

(B) 

(C) 

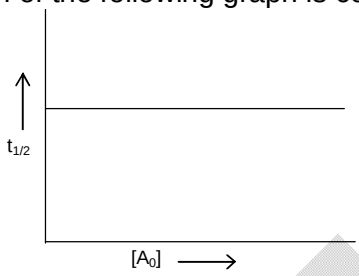
(D) 

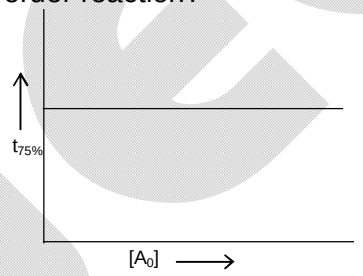
33. Which of the following molecule has square planar shape?

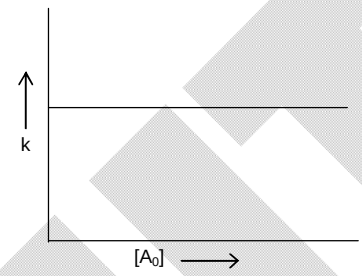
(A) CF_4 (B) SF_4

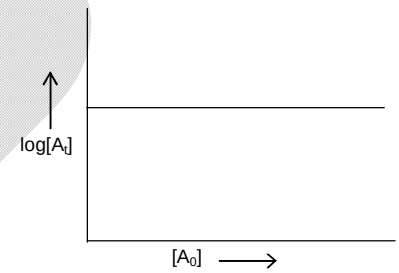
(C) XeF_4 (D) SeF_4

34. Which of the following graph is correct for a zero order reaction?

(A) 

(B) 

(C) 

(D) 

35. What is the pH of 10^{-2} M NaH_2PO_4?

[$p^{K_{a1}}$, $p^{K_{a2}}$ and $p^{K_{a3}}$ of H_3PO_4 are 7.2, 10.6 and 12.8]

(A) 9.7 (B) 8.01

(C) 10.6 (D) 8.9

36. In which of the following compound, nitrogen exhibits its lowest negative oxidation state?

(A) NH_2OH (B) NH_2NH_2

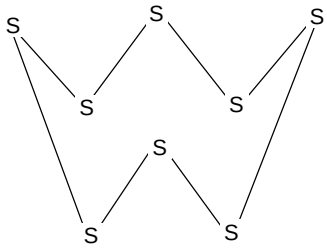
(C) NH_4Cl (D) KNO_3

37. Heat of neutralization of four monobasic acids A, B, C and D are -13.7, - 9.4, - 11.2 and –12.4 Kcal / mole respectively, when they are neutralized by a common base. The acidic character obeys the order

(A) A > B > C > D (B) A > D > C > B

(C) D > C > B > A (D) D > B > C > A

38. The oxidation number and hybridization of sulphur in S_8 molecule are respectively:

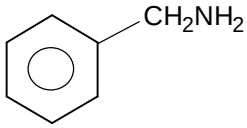
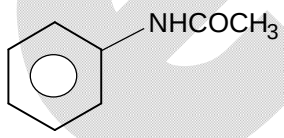
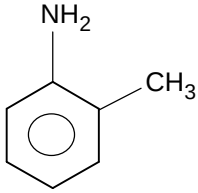
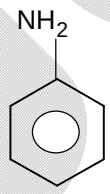


(A) +2 and sp^2
(B) +2 and sp^3
(C) zero and sp^2
(D) zero and sp^3

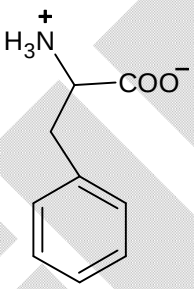
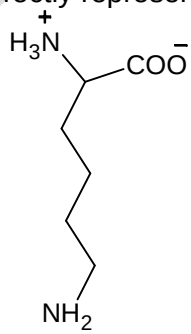
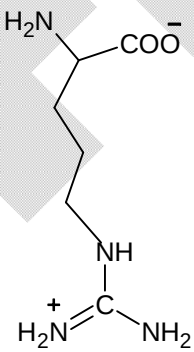
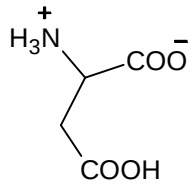
39. The relation between the molar conductance ($\wedge_m$) and equivalent conductance ($\wedge_e$) of the solution of $MgCl_2.KCl.6H_2O$ is

(A) $\wedge_m = \wedge_e \times 8$
(B) $\wedge_m = \wedge_e \times 3$
(C) $\wedge_e = \wedge_m \times 3$
(D) $\wedge_e = \wedge_m \times 8$

40. Which of the following is the strongest base?

(A) 
(B) 
(C) 
(D) 

41. Which of the following zwitter ionic form is not correctly represented for an amino acid?

(A) 
(B) 
(C) 
(D) 

42. Which one of the following has aromatic character ?
(A) Cyclopentadienyl cation (B) Cyclopentadienyl radical
(C) Cyclopentadienyl anion (D) Cyclopentadiene

43. Which of the following interhalogen compound does NOT exist?
(A) IF_3 (B) IF_4
(C) IF_5 (D) IF_7

44. The fraction of chlorine precipitated by $AgNO_3$ solution from $[Cr(NH_3)_5Cl]Cl_2$ is
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$
(C) $\frac{2}{3}$ (D) $\frac{1}{4}$

45. The following two equilibria exist simultaneously in a closed container of volume 2 L
$A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$
$A_2(g) + C(g) \rightleftharpoons A_2C(g)$
Which of the following change does not affect the concentration of AB(g)
(A) Increase in pressure (B) Addition of C
(C) Addition of He gas at constant volume (D) All of these

SECTION – B

(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

46. pH of 10^{-3} M solution of acetic acid ($K_a = 1 \times 10^{-5}$) is

47. For the reaction at 25°C
$A(g) + 2B(g) \rightleftharpoons 2C(g) + D(g)$
The initial concentration of B is 1.5 times the molar concentration of A. If at equilirbium, the concentration of A and D are equal. The equilibrium constant (K_c) at 25°C is

48. How many maximum number of electrons can be accommodated in the 9th period of the periodic table?

49. $A(g) \longrightarrow B(g) + 3C(g) + 4D(g)$
Above first order reaction takes place by taking A(g) in a container at 100 mm of Hg. What will be the total pressure in the container after one half-life period in mm of Hg unit?

50. $FeCl_3(aq) + K_4[Fe(CN)_6](aq) \longrightarrow \underset{\left(\text{Blue colour aqueous solution}\right)}{(P)}$
(P) is an ionizable complex salt. Reaction of the cation of (P) with NaOH forms a raddish brown precipitate. How many moles of NaOH required for complete reaction of all the cations obtained from (P)?

Mathematics

PART – C

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

51. Let $f(n)=\left[\frac{1}{3}+\frac{3n}{100}\right]n$, where $[n]$ denotes the greatest integer less than or equal to n. Then $\sum_{n=1}^{56} f(n)$ is equal to:

(A) 56 (B) 689
(C) 1287 (D) 1399

52. If α and β are the roots of the quadratic equation, $x^2 + x\sin\theta - 2\sin\theta = 0$, $\theta \in \left(0, \frac{\pi}{2}\right)$ then $\frac{\alpha^{12}+\beta^{12}}{(\alpha^{-12}+\beta^{-12})(\alpha-\beta)^{24}}$ is equal to:

(A) $\frac{2^{12}}{(\sin\theta+8)^{12}}$ (B) $\frac{2^{12}}{(\sin\theta-4)^{12}}$
(C) $\frac{2^{12}}{(\sin\theta-8)^{6}}$ (D) $\frac{2^{6}}{(\sin\theta+8)^{12}}$

53. The integral $\int \frac{\sin^2 x\cos^2 x}{(\sin^3 x+\cos^3 x)^2}dx$ is equal to:

(A) $\frac{1}{(1+\cot^3 x)}+c$ (B) $-\frac{1}{3(1+\tan^3 x)}+c$
(C) $\frac{\sin^3 x}{(1+\cos^3 x)}+c$ (D) $-\frac{\cos^3 x}{3(1+\sin^3 x)}+c$

54. If the tangent at a point P, with parameter t, on the curve $x=4t^2+3, y=8t^3-1, t\in R$, meets the curve again at a point Q, then the coordinates of Q are:

(A) $(16t^2+3, -64t^3-1)$ (B) $(4t^2+3, -8t^3-2)$
(C) (t^2+3, t^3-1) (D) $(t^2+3, -t^3-1)$

55. Let the system of linear equations
$x+y+kz=2$
$2x+3y-z=1$
$3x+4y+2z=k$
have infinitely many solutions. Then the system
$(k+1)x+(2k-1)y=7$
$(2k+1)x+(k+5)y=10$ has :
(A) infinitely many solutions
(B) unique solution satisfying $x-y=1$
(C) no solution
(D) unique solution satisfying $x+y=1$

56. Let S be the set of all solutions of the equation
$\cos^{-1}(2x)-2\cos^{-1}\left(\sqrt{1-x^2}\right)=\pi,\ x\in\left[-\frac{1}{2},\frac{1}{2}\right]$. Then $\sum_{x\in S}2\sin^{-1}\left(x^2-1\right)$ is equal to
(A) $\pi-\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$
(B) $\pi-2\sin^{-1}\left(\frac{\sqrt{3}}{4}\right)$
(C) $\frac{-2\pi}{3}$
(D) 0

57. Let the six numbers a_1,a_2,a_3,a_4,a_5,a_6 be in A.P. and $a_1+a_3=10$. If the mean of these six numbers is $\frac{19}{2}$ and their variance is σ^2, then $8\sigma^2$ is equal to
(A) 220
(B) 210
(C) 200
(D) 105

58. Let $\beta=\lim_{x\to0}\frac{\alpha x-\left(e^{3x}-1\right)}{\alpha x\left(e^{3x}-1\right)}$ for some $\alpha\in\mathbb{R}$. Then the value of $\alpha+\beta$ is:
(A) $\frac{14}{5}$
(B) $\frac{3}{2}$
(C) $\frac{5}{2}$
(D) $\frac{7}{2}$

59. Let e_1 and e_2 be the eccentricities of the ellipse, $\frac{x^2}{25}+\frac{y^2}{b^2}=1(b<5)$ and the hyperbola, $\frac{x^2}{16}-\frac{y^2}{b^2}=1$ respectively satisfying $e_1e_2=1$. If α and β are the distances between the foci of the ellipse and the foci of the hyperbola respectively, then the ordered pairs (α,β) is equal to:
(A) (8, 12)
(B) $\left(\frac{20}{3},12\right)$
(C) $\left(\frac{24}{5},10\right)$
(D) (8, 10)

60. The length of the minor axis (along y – axis) of an ellipse in the standard form is $\frac{4}{\sqrt{3}}$. If this ellipse touches the line, $x+6y=8$; then its eccentricity is:

(A) $\frac{1}{2}\sqrt{\frac{11}{3}}$ (B) $\sqrt{\frac{5}{6}}$

(C) $\frac{1}{2}\sqrt{\frac{5}{3}}$ (D) $\frac{1}{3}\sqrt{\frac{11}{3}}$

61. Two sides of a rhombus are along the lines, $x-y+1=0$ and $7x-y-5=0$. If its diagonals intersect at (–1, –2), then which one of the following is a vertex of this rhombus?

(A) $\left(\frac{1}{3},-\frac{8}{3}\right)$ (B) $\left(-\frac{10}{3},-\frac{7}{3}\right)$

(C) $(-3,-9)$ (D) $(-3,-8)$

62. In an isosceles triangle ABC, the vertex A is (6, 1) and the equation of the base BC is $2x+y=4$. Let the point B lie on the line $x+3y=7$. If (α,β) is the centroid ΔABC, then $15(\alpha+\beta)$ is equal to:

(A) 39 (B) 41

(C) 51 (D) 63

63. If $\frac{1}{(20-a)(40-a)}+\frac{1}{(40-a)(60-a)}+.....+\frac{1}{(180-a)(200-a)}=\frac{1}{256}$, then the maximum value of a is:

(A) 198 (B) 202

(C) 212 (D) 218

64. The coefficient of x^7 in the expression $(1+x)^{10}+x(1+x)^9+x^2(1-x)^8+.....+x^{10}$ is:

(A) 120 (B) 420

(C) 330 (D) 210

65. Let S be the set of all real roots of the equation, $3^x(3^x-1)+2=|3^x-1|+|3^x-2|$. Then S:

(A) contains at least four elements (B) is a singleton

(C) is an empty set (D) contains exactly two elements

66. Let ${}^nC_r$ denote the binomial coefficient of x^r in the expansion of $(1+x)^n$. If $\sum_{k=0}^{10}(2^2+3k)\,{}^{10}C_k=\alpha.3^{10}+\beta.2^{10}$, $\alpha,\beta\in R$, then $\alpha+\beta$ equal to _____.

(A) 10 (B) 18

(C) 19 (D) 20

67. The number of ways, 16 identical cubes, of which 11 are blue and rest are red, can be placed in a row so that between any two red cubes there should be at least 2 blue cubes, is _____

(A) 50 (B) 28
(C) 56 (D) 60

68. Let $\vec{a}$ and $\vec{b}$ be two unit vectors such that $\left|\vec{a}+\vec{b}\right|=\sqrt{3}$. If $\vec{c}=\vec{a}+2\vec{b}+3\left(\vec{a}\times\vec{b}\right)$, then $2\left|\vec{c}\right|$ is equal to:

(A) $\sqrt{55}$ (B) $\sqrt{37}$
(C) $\sqrt{51}$ (D) $\sqrt{43}$

69. Let $\vec{a}$ and $\vec{b}$ be two vectors. Let $\left|\vec{a}\right|=1$, $\left|\vec{b}\right|=4$ and $\vec{a}.\vec{b}=2$. If $\vec{c}=\left(2\vec{a}\times\vec{b}\right)-3\vec{b}$, then the value of $\vec{b}.\vec{c}$ is

(A) –24 (B) –48
(C) –84 (D) –60

70. If $\vec{a}=\alpha\hat{i}+\beta\hat{j}+3\hat{k}$, $\vec{b}=-\beta\hat{i}-\alpha\hat{j}-\hat{k}$ and $\vec{c}=\hat{i}-2\hat{j}-\hat{k}$ such that $\vec{a}.\vec{b}=1$ and $\vec{b}.\vec{c}=-3$, then $\frac{1}{3}\left(\left(\vec{a}\times\vec{b}\right).\vec{c}\right)$ is equal to _____.

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

SECTION – B

(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

71. The number of values of x in the interval $\left(\frac{\pi}{4},\frac{7\pi}{4}\right)$ for which $14\operatorname{cosec}^2 x-2\sin^2 x=21-4\cos^2 x$ holds, is _____

72. Let $f:R\to R$ be a function defined as $f(x)=\begin{cases}3\left(1-\frac{|x|}{2}\right) & \text{if } |x|\le 2\\ 0 & \text{if } |x|>2\end{cases}$

Let $g:R\to R$ be given by $g(x)=f(x+2)-f(x-2)$. If n and m denote the number of points in R where g is not continuous and not differentiable, respectively, then $n+m$ is equal to ____

73. If the matrix $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 3 & 0 & -1\end{bmatrix}$ satisfies the equation $A^{20}+\alpha A^{19}+\beta A=\begin{bmatrix}1 & 0 & 0\\ 0 & 4 & 0\\ 0 & 0 & 1\end{bmatrix}$ for some real numbers α and β, then $\beta-\alpha$ is equal to _____

74. Let $A=\{0,3,4,6,7,8,9,10\}$ and R be the relation defined on A such that $R=\{(x,y)\in A\times A: x-y \text{ is odd positive integer or } x-y=2\}$. The minimum number of elements that must be added to the relation R, so that it is a symmetric relation, is equal to __

75. Consider a circle $C_1: x^2+y^2-4x-2y=\alpha-5$. Let its mirror image in the line $y=2x+1$ be another circle $C_2: 5x^2+5y^2-10fx-10gy+36=0$. Let r be the radius of C_2. Then $\alpha+r$ is equal to _____