FIITJEE

ALL INDIA TEST SERIES

JEE (Advanced)-2025

CONCEPT RECAPITULATION TEST – I

PAPER –2

TEST DATE: 24-04-2025

Time Allotted: 3 Hours **Maximum Marks: 180**

General Instructions:

- The test consists of total 51 questions.
- Each subject (PCM) has 17 questions.
- This question paper contains **Three Parts.**
- **Part-I** is Physics, **Part-II** is Chemistry and **Part-III** is Mathematics.
- Each **Part** is further divided into **Three Sections**: **Section-A, Section-B & Section-C**.
  Section – A *(01 – 04, 18 – 21, 35 – 38):* This section contains **TWELVE (12)** questions. Each question has **FOUR** options. **ONLY ONE** of these four options is the correct answer.
  Section – A *(05 –07, 22 – 24, 39 – 41):* This section contains **NINE (09)** questions. Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
  Section – B *(08 – 13, 25 – 30, 42 – 47):* This section contains **EIGHTEEN (18)** numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.
  Section – C *(14 –17, 31 – 34, 48 – 51):* This section contains **SIX (06) paragraphs.** Based on each paragraph, there are **TWO (02)** questions of numerical answer type. The answer to each question is a **NUMERICAL VALUE (XXXXX.XX).** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.

MARKING SCHEME

Section – A (Single Correct): Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+3	If ONLY the correct option is chosen.
Zero Marks	:	0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	:	–1	In all other cases.

Section – A (One or More than One Correct): Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4	If only (all) the correct option(s) is (are) chosen;
Partial Marks	:	+3	If all the four options are correct but ONLY three options are chosen;
Partial marks	:	+2	If three or more options are correct but ONLY two options are chosen and both of which are correct;
Partial Marks	:	+1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	:	0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	:	–2	In all other cases.

Section – B: Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4	If ONLY the correct integer is entered;
Zero Marks	:	0	Question is unanswered;
Negative Marks	:	0	In all other cases.

Section – C: Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+3	If ONLY the correct integer is entered;
Zero Marks	:	0	Question is unanswered;
Negative Marks	:	0	In all other cases.

Physics

PART – I

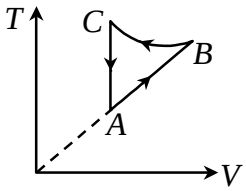
SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

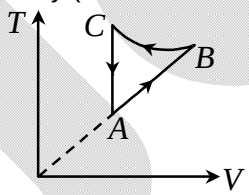
1. A current of 1.0 ampere is flowing in the sides of an equilateral triangle of side 4.5×10^{-2} m. Find the magnetic field at the centroid of the triangle. (Permeability constant $\mu_0 = 4\pi \times 10^{-7}$ V–s/A–m).

(A) 8×10^{-5} Tesla
(B) 4×10^{-5} Tesla
(C) 4×10^{-10} Tesla
(D) 4×10^{-20} Tesla

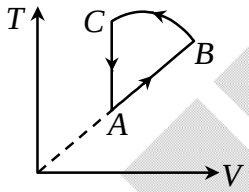
2. Two moles of an ideal gas is initially in state *A* having pressure 1.01×10^5 N/m^2 and temperature 300 K. Keeping pressure constant, the gas is taken to state *B*. Temperature at *B* is 500 K. The gas is then taken to state *C* in such a way that its temperature increases and volume decreases. Also from *B* to *C* the magnitude of $\frac{dT}{dV}$ increases. The volume of gas at *C* is equal to volume of gas at *A*. Now the gas is taken to initial state *A* keeping volume constant. *A* total of 1200 J of heat is with drawn from the sample in the cyclic process. The *T* – *V* graph for the cyclic process and work done in path *B* to *C* are respectively (Take *R* = 8.3 J/k/mol).

(A) 

and – 4520 J

(B) 

and – 460 J

(C) 

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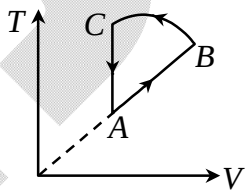
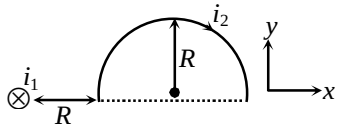
(D) 

and – 460 J

3. A very long current carrying wire is placed along *z*-axis having current of magnitude i_1 towards negative *z*-axis. A semicircular wire of radius *R* and having current i_2 is placed in *x*-*y* plane, such that line joining two end points of the semicircular wire passes through long wire as shown in figure. Nearest distance of semicircular wire from long wire is *R*. Net magnetic force on semicircular wire will be



(A) $\frac{\mu_0 i_1 i_2}{2\pi} \ln 3$
(B) $\frac{\mu_0 i_1 i_2}{2\pi} \ln \frac{3}{2}$
(C) zero
(D) $\frac{\mu_0 i_1 i_2}{2\pi}$

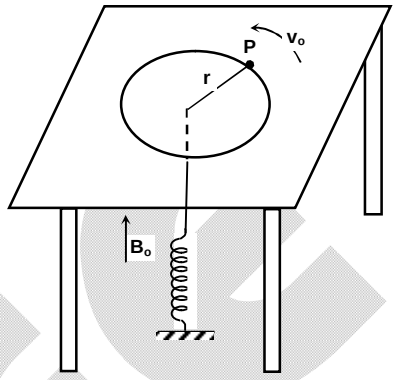
4. A non-conducting thin spherical shell of radius R has uniform surface charge density σ. The shell rotates about a diameter with constant angular velocity ω. Calculate magnetic induction B at the centre of the shell.

(A) $\frac{2}{3}\mu_0 \sigma \omega R$
(B) $\mu_0 \sigma \omega R$
(C) $\frac{2}{3}\mu_0 R$
(D) $\frac{2}{3}\omega R$

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

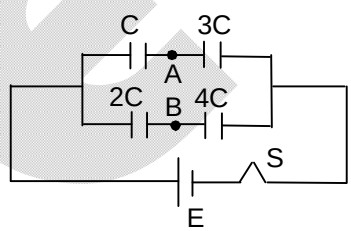
5. A particle mass m charge q is moving on a circular path on the surface of a frictionless table with speed v_o where a magnetic field B_o exists uniformly over the whole region. It is attached by a string which passes through a hole in the table to a spring as shown.



The spring is stretched by x_o. If now the magnetic field is increased slowly to $2B_o$,

(A) The extension in the spring will increase
(B) The speed of the particle will increase
(C) The speed of the particle will decrease
(D) The kinetic energy of the particle will decrease

6. Consider the circuit shown in figure.



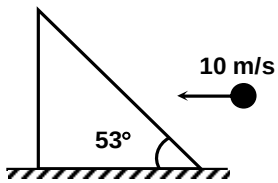
(A) Charges on capacitor 3C is $\frac{3CE}{4}$

(B) Potential deference between A & B is $\frac{-E}{12}$

(C) Heat generation in circuit is $\frac{25CE^2}{24}$

(D) Potential deference across capacitor 2C is $\frac{2E}{3}$

7. A ball of mass 2 kg moving horizontally with velocity 10 m/s hits a wedge of mass 5 kg placed on a horizontal surface as shown in the figure. Just after collision velocity of wedge is 3.2 m/s. There is no friction at any contact surface. Then (take sin 37° = 3/5)



(A) Speed of ball just after collision is $2\sqrt{10}$ m/s
(B) Impulse applied by ball on the wedge is 20 N-s
(C) Coefficient of restitution for the collision is approximately 0.68
(D) If the time of contact between ball and wedge during collision is 0.05 sec, the average force exerted by the horizontal surface on the wedge during collision is 260 N.

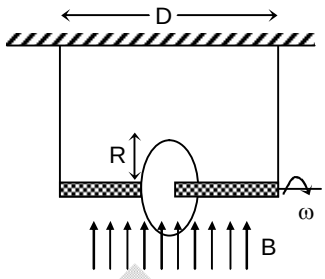
SECTION – B
(Numerical Answer Type)

*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

8. Let us assume that sun radiates like a black body with surface temperature at T_s = 6000 K and earth absorbs radiations coming from sun only. If both earth and sun are consider as perfect sphere with distance between centre of earth and centre of sun to be 200 times the radius of sun. Find the temperature (in Kelvin) of surface of earth in steady state (assume radiations incident on earth to be almost parallel)

9. When the voltage applied to an *X*-ray tube is increased from 10 kV to 20 kV the wavelength interval between the K_α line and the short wave cut off of the continuous *X*-ray spectrum increases by a factor 3. Find the atomic number of element of which the tube anti-cathode is made. (Rydberg's constant = 10^7 m^{-1})

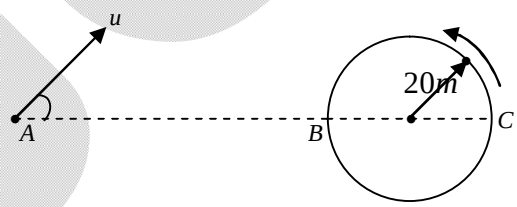
10. The axle of a circular wheel of radius R is held horizontally by two identical strings of equal lengths separated by a distance D. The tension in each string is T_0. The rim of the wheel carries a total charge + Q distributed uniformly on it. The wheel is vertical and is kept in a uniform vertical magnetic field $\vec{B}$. It is now rotated at an angular speed ω. The string break at a tension of $3T_0/2$. If the maximum possible value of ω at which the wheel can be rotated without breaking a string is $\frac{KT_0D}{QR^2B}$. Then find the value of K.



11. A particle moves is x, y plane. The position vector of particle at any time t is $\vec{r} = 2t\hat{i} + 2t^2\hat{j}$. If the rate of change of θ with time at $t = 2\text{sec}$ is $\frac{n}{17}\text{rad/sec}$ (θ is angle which velocity vector makes with x axis) then find the value of n.

12. Two particles *A* and *B* are separated from each other by a distance *l*. At time *t* = 0, particle *A* starts moving with uniform acceleration *a* along line perpendicular to initial line joining *A* and *B*. At the same moment, particle *B* starts moving with acceleration of constant magnitude *b* such that particle *B* always points towards the instantaneous position of *A*. (*b* > *a*). Find the distance (in m) travelled by *B* till the moment *B* converges with *A*. (Take *b* = 3 m/s^2, *a* = 1 m/s^2 and *l* = 8 m)

13. A particle is moving along a vertical circle of radius 20 m with a constant speed of 31.4m/s. Straight line *ABC* is horizontal and passes through the centre of the circle. A shell is fired from point *A* at the instant when particle is at *C*. If distance *AB* is $20\sqrt{3}$ m and shell collides with the particle at *B*,
the smallest possible value of the angle (in degree) of projection, is 10 x, then find x. (π = 3.14 and g = 10 ms^{-2})

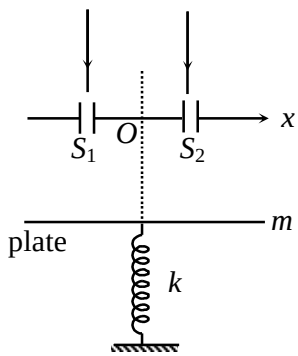


SECTION – C
(Numerical Answer Type)

*This section contains **TWO (02) paragraphs.** Based on each paragraph, there are **TWO (02)** questions of numerical answer type. The answer to each question is a **NUMERICAL VALUE (XXXXX.XX).** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

Paragraph for Question Nos. 14 and 15

Two slits S_1 and S_2 lie on the *x*-axis and symmetric with respect to *y*-axis are illuminated by a parallel monochromatic light beam of wavelength λ as shown. The distance between slits is *d* (>> λ). Point *O* is the mid point of the line S_1S_2 and this point is considered as the origin. The slits are in horizontal plane. The interference pattern is observed on a horizontal plate (acting as screen) of mass *m* which is connected to one end of a vertical massless spring of spring constant *k*. The other end of the spring fixed to ground. At *t* = 0, the plate is at a distance *D* (>> *d*) below the plane of slits and spring is in its natural length. The plate is released from rest from its initial position.

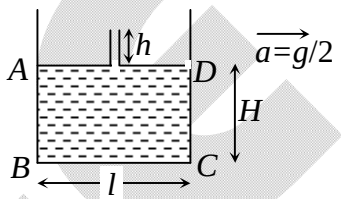


14. The rate by which fringe, width will increase when acceleration of plate is zero, is $\frac{\lambda g}{nd}\sqrt{\frac{m}{k}}$, find the value of n

15. The difference between two fringe widths when plate is at rest for a moment is $\frac{4\lambda mg}{ndk}$, find the value of n

Paragraph for Question Nos. 16 and 17

A container of square base of side *l* and height *H* is completely filled with a liquid of density ρ. And it is closed with the help of a square plate *AD* of side *l*. This plate has a vertical tube of radius *r* and height *h* (volume of the tube is negligible as compared to volume of the liquid) at its centre and a small hole at *D*. Just after giving a horizontal acceleration $a = g/2$ (towards right), find out



16. Velocity of the liquid flowing out though the tube, if $h < l/5$ is $\sqrt{2g\left(\frac{\ell}{n}-h\right)}$, then n is (neglect surface tension of the liquid)

17. Force exerted by the liquid on the bottom if tube is closed. (P_0 is atmospheric pressure) is $\left(P_0+\rho g\left(\frac{l}{n}+H\right)\right)l^2$. Find the value of n.

Chemistry

PART – II

SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

18. Choose the correct answer from given statements (T= True and F= False)
I. Standard boiling point of the liquid is slightly higher than normal boiling point because more and more molecules go to vapour phase and density of vapour rises.
II. Dimension of surface energy is Jm^{-2} and surface tension has Nm^{-1}
III. Surface tension decreases as the temperature is raised
IV. Glass is an extremely viscous liquid.
(A) FTTT (B) TTTF
(C) FFFT (D) FFFF

19. Choose the correct answer from given statements (T= True and F= False)
I. Pressure exerted by saturated water vapour is called aqueous tension.
II. In kinetic molecular theory of gases (KTG), At Any particular time, different particles in the gas have different speed and different kinetic energies.
III. In KTG, the distribution of speeds remain constant at a particular temperature.
IV. In KTG, particles of gas did not move in all possible direction in straight lines.
V.Liquefaction of H_2 and He is difficult due to Critical temperature are too low.
(A) TTTTT (B) TTTFF
(C) TFTFF (D) TFTFT

20. In unit of $\left|\frac{11\times me^4}{1152\left(\in_0 \pi\hbar\right)^2}\right|$, the difference between energy levels corresponding from 4 to 5 total nodes present in wave function ψ for a hydrogen like atom is
(A) 0.04 (B) 0.05
(C) 0.06 (D) 0.07

21. Choose the correct answer from given statements (T= True and F= False)
I. Ion dipole forces are Vander Waals force.
II. London forces are always attractive and internal energy is inversely proportional to the sixth power of the distance between two interacting particles ($1/r^6$).
III. Dipole-Dipole interaction energy between stationary polar molecules (solid) is proportional to $1/r^3$
IV. Dipole-Dipole interaction energy between rotating polar molecules is proportional to $1/r^6$
(A) FTTT (B) TTFF
(C) TFTF (D) FTFT

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

22. A volume of 100 ml of 0.5 N-H_2SO_4 solution of neutralized with 200 ml of 0.2 M-NH_4OH in a constant pressure calorimeter which resulted 1.4ºC rise in temperature. The heat capacity of the calorimeter system is 1.5 kJ/ºC. Some useful thermochemical equations are
$HCl + NaOH \rightarrow NaOH + H_2O + 57$ kJ
$CH_3COOH + NH_4OH \rightarrow CH_3\,COONH_4 + H_2O + 48.1$ kJ
Which of the following statements are correct?
(A) Enthalpy of neutralization HCl vs. NH_4OH is –52.5 kJ/mol.
(B) Enthalpy of dissociation (ionization) of NH_4OH is 4.5 kJ/mol
(C) Enthalpy of dissociation (ionization) of CH_3COOH is 4.4 kJ/mol
(D) ΔH for $2H_2O(l) \rightarrow 2H^+(aq) + 2OH^-(aq)$ is 114 kJ.

23. Which ions produces green colour on Bunsen flame?

(A) BO_3^{3-} (B) Ba^{2+}

(C) Ca^{2+} (D) Li^{+}

24. Two moles of an ideal gas $\left(C_{v,m} = 1.5R\right)$ is subjected to the following changes in states:

(A) (500 K, 5 bar) $\xrightarrow[\text{Expansion}]{\text{Reversible Isothermal}}$

(B) $\xrightarrow{\text{Isochoric Cooling}}$ (C) (250 K, 1 bar) $\xrightarrow[\text{compression}]{\text{Single statge adiabatic}}$ D (3 bar)

The correct statement(s) is/are

(A) The pressure at B is 2.0 bar.

(B) The temperature at D is 450 K.

(C) $\Delta H_{CD} = 1000R$

(D) $\Delta U_{BC} = 375R$

SECTION – B
(Numerical Answer Type)

*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

25. Equimolar mixture of two gases, A_2 and B_2 is taken in a rigid vessel at constant temperature 300 K. The gases achieve equilibrium as:

$A_2(g) \rightleftharpoons 2A(g), K_P = x$ atm

$B_2(g) \rightleftharpoons 2B(g), K_p = y$ atm

$A_2(g) + B_2(g) \rightleftharpoons 2AB(g), K_P = 2$

If the initial pressure in the container was 2 atm and the final pressure at equilibrium is 2.75 atm in which the partial pressure of AB(g) is 0.5 atm, the value of y:x is {y:x is **INTEGER value**}

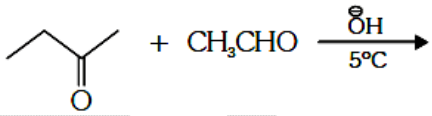
26. How many number of active hydrogen atoms are present in a compound (mol. Mass 90), 0.45 g of which when treated with Na metal liberates 112 ml of the H_2 gas at STP?

27. Define the oxidation states of Mn in product of the given reaction

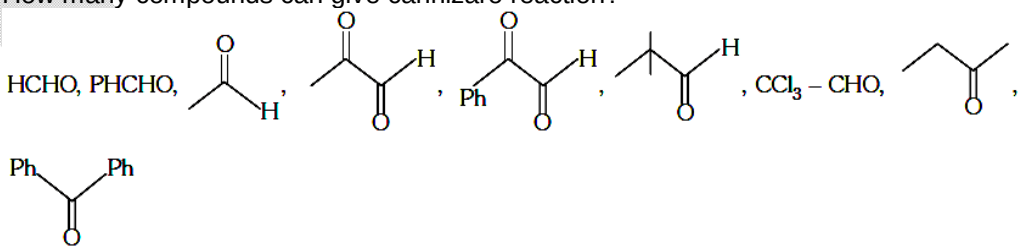
$3K_2MnO_4 + 2H_2O + 4CO \rightarrow 2X + Y + 4KHCO_3$

If the oxidation state of Mn in product X and Y are n_1 and n_2 respectively. Then find out the value of $(n_1 + n_2)$

28. How many alcohol products will be obtained in above reaction? (excluding stereoisomerism)

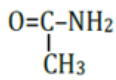


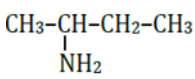
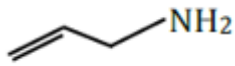
29. How many compounds can give cannizaro reaction?

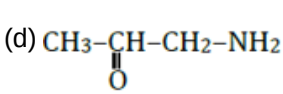
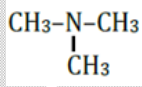


30. How many of the following will give isocyanide (carbylamine) test positive:

(a) $CH_3 - CH_2 - NH_2$ (b) $CH_2 = CH - NH_2$

(c)  (d) $Ph - NH_2$

(e)  (f) 

(g) $CH_3 - CH_2 - NH - CH_3$ (d)  (i) 

SECTION – C
(Numerical Answer Type)

*This section contains **TWO (02) paragraphs.** Based on each paragraph, there are **TWO (02)** questions of numerical answer type. The answer to each question is a **NUMERICAL VALUE (XXXXX.XX).** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

Paragraph for Question Nos. 31 and 32

Potassium crystallizes in BCC lattice, with a unit cell length, a = 5.0 Å. (K = 39)

31. What is the distance (in Å) between nearest neighbours?

32. Find the value of Y/6 where Y= Nearest neighbours does each K atom have?

Paragraph for Question Nos. 33 and 34

A glass tube AD of uniform cross section of length 100 cm contains two columns of air (assume ideal behaviour) AB and CD, separately by a column of mercury (BC) of length 20 cm. When the tube is horizontal, AB = 20 cm and CD = 60 cm. When the tube is held vertically with the end 'A' up, the mercury column down 10 cm. Let assume that both end of tube are closed.

33. What is the pressure of air in the air columns, when the tube was horizontal?

34. What will be the length of the gas column AB when the tube is held vertically with the end D up?

Mathematics

PART – III

SECTION – A
(One Options Correct Type)

*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

35. Let $f : R - \{3, 5\} \to R$, $f(x) = \frac{(x-2)(x-4)}{(x-3)(x-5)}$ then which of following is correct
(A) f(x) = k has two distinct positive solutions $\forall$ k $\in$ (0, ∞)
(B) y = f(x) changes its concavity in the interval (3, 5)
(C) y = f(x) increases in some interval
(D) f(x) is into function

36. If $\sum_{n=1}^{\infty} \cot^{-1}\left(2 + \frac{n(n+1)}{2}\right) = \tan^{-1} a$, then 'a' is equal to
(A) 1 (B) 2
(C) 3 (D) 4

37. Let 100! = $N.10^n$. If N is relatively prime with 10 and unit digit of N is d, then n + d is equal to
(A) 26 (B) 28
(C) 30 (D) 32

38. For f(x) = mx the area of the triangle formed by (0, 0) the first quadrant point P(a, f(a)) and the reflection of the that point P about y = x is 1000. If m and a are positive integers, then m is
(A) 9 (B) 8
(C) 4 (D) 7

SECTION – A
(One or More than one correct type)

*This section contains **THREE (03)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).*

39. Let $\phi(x)$ = max. {|2x-1|, |x-1|}, $\psi(x)$ = max. {|x-3|, 3} and f(x) = min. {$\phi(x)$,$\psi(x)$} then
(A) the minimum value of f(x) is $\frac{1}{3}$
(B) the number of points where f(x) is not differentiable is 4
(C) f' (x) = 0 $\forall$ x $\in$ (2, 6)
(D) $f_{min} = f\left(\frac{1}{3}\right)$

40. If, S_1, S_2, S_3, S_4, S_5 are sets formed using all the roots of $z^n = 1$ as shown (n $\in$N, z $\in$ complex number)
$S_1 = \{z : z^{12} = 1, z \in C\}$
$S_2 = \{z : z^{15} = 1, z \in C\}$
$S_3 = \{z : z^{16} = 1, z \in C\}$
$S_4 = \{z : z^{18} = 1, z \in C\}$
$S_5 = \{z : z^{24} = 1, z \in C\}$

If, $n(S_i \cap S_j) > 3[i \neq j, 1 \leq 5]$ then number of such ordered pairs of S_i and S_j is

(A) less than 5
(B) less than 10
(C) less than 15
(D) less than 20

41. Let a function f: R $\rightarrow$ R is defined by f(x) = x + sin x and $\int_0^{\pi} f^{-1}(x)dx = I$, then

(A) $I > \int_0^1 \frac{1}{1+x^3}dx$
(B) $I < \int_0^1 e^{x^2}dx$
(C) $2 < I < 3$
(D) $\frac{\pi}{4} < I < \frac{\pi}{2}$

SECTION – B
(Numerical Answer Type)

*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

42. If $A = \begin{bmatrix} u & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, where $\left(u \neq -\frac{11}{3}\right)$ and det(adj(adjA)) = $(23)^4$, then the value of u is

43. If $\begin{vmatrix} 1 & x & x^2 \\ x & x^2 & 1 \\ x^2 & 1 & x \end{vmatrix} = 3$ then the value of $\begin{vmatrix} x^3-1 & 0 & x-x^4 \\ 0 & x-x^4 & x^3-1 \\ x-x^4 & x^3-1 & 0 \end{vmatrix}$ is _____

44. If a tetrahedron bounded by planes x = 0, y = 0, z = 0, x + y + z = 6 there exists a point Q which is equidistant from faces of tetrahedron. Now, a point P(x, y, z) moves such that its locus is inscribed in the tetrahedron and $|\overline{PQ}| = \text{cosntant}$. If $|\overline{PQ}| = \frac{2k}{k+\sqrt{k}}$ then k can be

45. If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + 7\hat{j} + 2\hat{k}$, $\vec{x}.\vec{a} = 0$, and $\vec{x}.\vec{c} = 0$ for some non-zero vector $\vec{x}$, then value of $\vec{a}.(\vec{b} \times \vec{c})$ is

46. The solution of $x^2dy - y^2dx + xy^2(x - y)dy = 0$ is $\ln\left|\frac{x-y}{xy}\right| = \frac{y^k}{2} + c$, then the value of k is

47. Tangents drawn from the point P(2, 3) to the circle $x^2 + y^2 - 8x + 6y + 1 = 0$ touch the circle at the points A and B. The circumcircle of the ΔPAB cuts the director circle of ellipse $\frac{(x+5)^2}{9} + \frac{(y-3)^2}{b^2} = 1$ orthogonally. Then the value of $\left(\frac{b^2}{9}\right)$ is _____

SECTION – C
(Numerical Answer Type)

*This section contains **TWO (02) paragraphs.** Based on each paragraph, there are **TWO (02)** questions of numerical answer type. The answer to each question is a **NUMERICAL VALUE (XXXXX.XX).** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places.*

Paragraph for Question Nos. 48 and 49

Let $h(x) = f(x) - g(x)$ where $f(x) = \sin^4 \pi x$ and $g(x) = \ln x$. Let $x_0, x_1, x_2, \ldots x_{n+1}$ be the roots of $f(x) = g(x)$ in increasing order.

48. In the above question the value of n is

49. The whole area bounded by $y = f(x)$, $y = g(x)$ and $x = 0$ is

Paragraph for Question Nos. 50 and 51

Let $f(x) = \begin{cases} \lim\limits_{n\to\infty}\left(\frac{px}{n}\sum\limits_{r=1}^{n}\frac{[r^2 - e^{-x} + r - 1]}{r(r+1)}\right) + \lambda & x > 0 \\ q, & x = 0 \\ \lim\limits_{n\to\infty}\left(\sum\limits_{r=1}^{n}\frac{(r^2 + r + e^x - 1)}{r(r+1)}\right) & x < 0 \end{cases}$

is differentiable in R(the set of all real number) (where [y] and {y} denote greatest integer function and fractional part function of y respectively)

50. The value of $p + q + \lambda$ is

51. The value of $f'(\ln 2) + f'\left(\ln\frac{1}{2}\right) + f'\left(\ln\left(\frac{3}{2^2}\right)\right) + \ldots\ldots\infty$ is