FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
PART TEST – I
PAPER –2
TEST DATE: 17-11-2024

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.

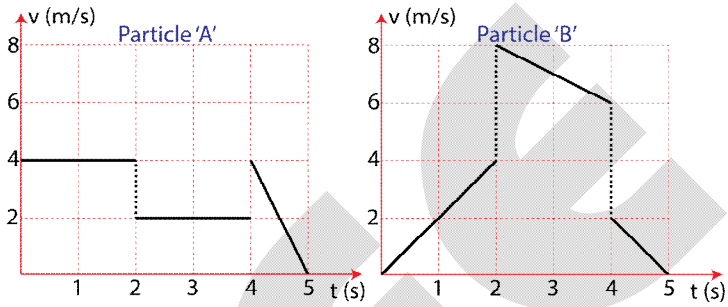
Physics

PART – I

SECTION – A
(One Options Correct Type)

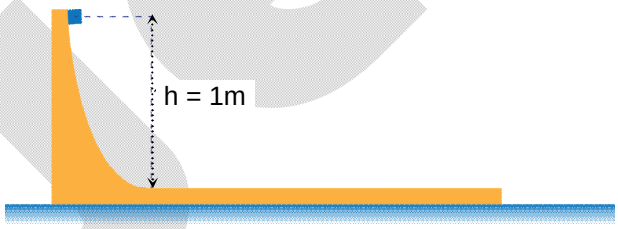
*This section contains **FOUR (04)** questions. Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.*

1. Two particles, A and B, begin their motion from the same initial position and travel in the positive x-direction. Over the next 5 seconds, their velocities 'v' change with time 't' as depicted in the accompanying figures. What is the largest separation between the two particles during this period?



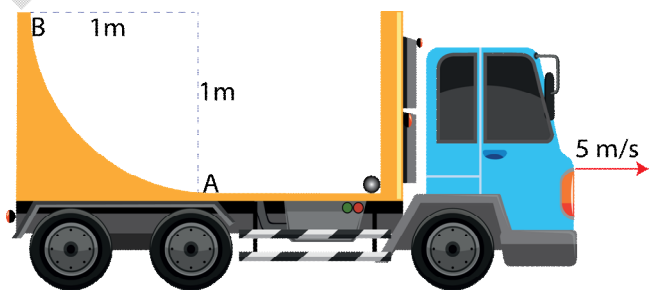
(A) 4 m (B) 5 m
(C) 6 m (D) 10 m

2. The top of a large block with a mass of 5 kg features a frictionless slope of height 1m, transitioning smoothly into a horizontal flat section. This block rests on a frictionless horizontal floor. A small block with a mass of 1 kg is released from rest from the top of the slope, slides down and then stops after sliding a distance of 2 m on the rough horizontal section of the larger block. The coefficient of friction between the blocks at the horizontal section of the larger block is



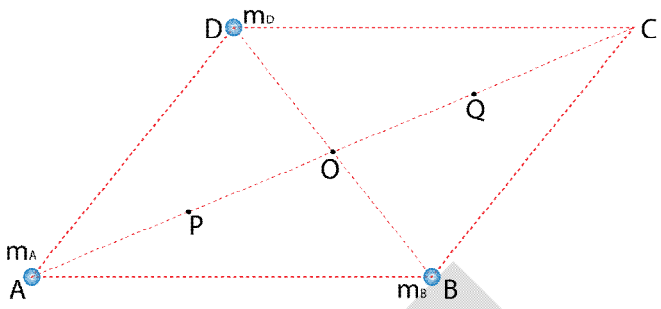
(A) 0.16 (B) 0.2
(C) 0.4 (D) 0.5

3. A small sphere is lying on the frictionless surface of a truck as shown. The portion AB is a quarter circle of radius R=1m. The truck is suddenly made to move with a constant speed of 5 m/s in the horizontal direction as shown. The speed of the sphere relative to ground when it leaves the truck for the first time is (Take g = 10 ms^{-2})



(A) $\sqrt{5}$ m/s (B) $2\sqrt{5}$ m/s
(C) 5 m/s (D) $\sqrt{30}$ m/s

4. Three particles of masses m_A, m_B, and m_D are kept at the vertices A, B, and D respectively of a parallelogram as shown. The centre of mass of the three particles lies at the point P which is the midpoint of AO (O is the intersection point of the diagonals of the parallelogram). Now, another mass m_C has to be kept at C so that the centre of mass of the four particles lies at Q (Q is the midpoint of OC). Choose the correct option:

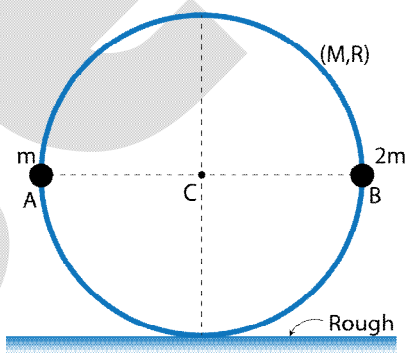


(A) $m_C = 3m_A$
(B) $m_C = 4m_A$
(C) $m_C = 4m_B$
(D) $m_C = 2m_D$

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 uniform circular ring of mass M(= 2m) and radius R is placed on a rough horizontal surface. Two particles of masses m and 2m are rigidly attached to the rings at points A and B respectively as shown in the figure. When the system is released from rest, the ring starts rolling without slipping on the rough horizontal surface. Now choose the correct option(s) just after the system is released from rest.



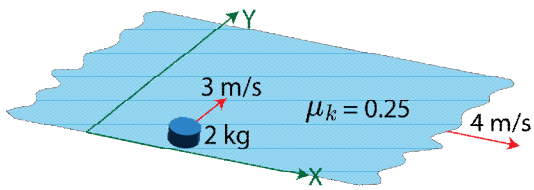
(A) The angular acceleration of the ring is $\frac{g}{5R}$.

(B) The angular acceleration of the ring is $\frac{g}{10R}$

(C) The frictional force on the ring due to the horizontal surface is $\frac{mg}{2}$.

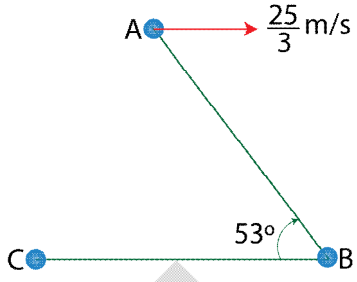
(D) The normal reaction on the ring due to the horizontal surface is $\frac{49mg}{10}$.

6. A disc of mass 2 kg is given an initial velocity $3\hat{j}$ m/s and allowed to slide over a horizontal conveyor belt that lies on the X-Y plane and moves at a constant velocity $4\hat{i}$ m/s. The coefficient of friction between the belt and the disc is 0.25 and the width of the belt is sufficient to prevent the disc from falling. Choose the correct option(s). (Take g = 10 ms^{-2})



(A) Friction on the disc acts along the positive X-direction.
(B) Total work done by friction on the disc is 7J.
(C) The disc will keep sliding for 1.2 s.
(D) The radius of curvature of the trajectory of the disc relative to ground at t = 0, is 4.5 m.

7. Three small spherical balls A, B, and C with masses 2 kg, 2 kg, and 1 kg respectively are connected by identical elastic and almost inextensible threads. They are placed on a frictionless horizontal floor, with the threads forming straight lines and an angle of 53° between them as shown in the figure. Ball A is projected with a velocity $\frac{25}{3}$ m/s parallel to the thread connecting balls B and C. Choose the correct option(s) (Take $\tan 53° = \frac{4}{3}$)



(A) The speed of ball 'B' when it starts to move is 5 m/s
(B) The speed of ball 'B' when it starts to move is $\sqrt{17}$ m/s
(C) The speed of ball 'C' when it starts to move is 4 m/s
(D) The speed of ball 'C' when it starts to move is 3 m/s

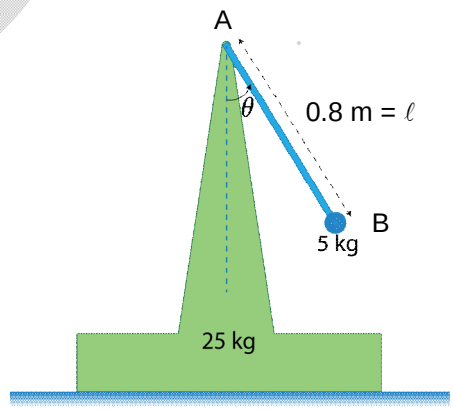
SECTION – B

(Numerical Answer Type)

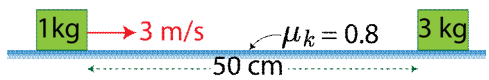
*This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.*

8. Two motorboats travel upstream in a river with velocities of 5 m/s and 6 m/s relative to the water. When the faster boat overtakes the slower one, a buoy is dropped from the slower boat. After some time, both boats turn around simultaneously and continue moving at the same speed relative to the water. They switch off their engines when they reach the buoy again. Given that the maximum separation between the boats after the buoy is dropped is 100 meters and the water flow velocity in the river is 2 m/s, what is the numerical value of the distance (in meter) between the points where the faster boat passes the buoy?

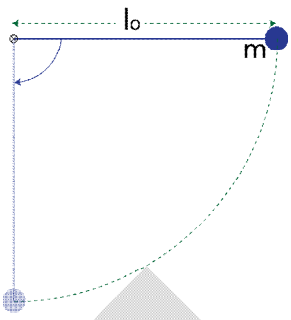
9. A motor is mounted on the top of a pole that is rigidly fixed to a platform. A light rod of length 0.8 m is attached to the motor shaft at one end A, with a small ball of mass 5 kg attached at the other end B. The rod can rotate in a vertical plane, driven by the motor. The combined mass of the platform, pole, and motor is 25 Kg. The motor rotates the rod at a constant angular velocity. The platform is positioned on a horizontal surface with a coefficient of friction $\mu = \frac{1}{2\sqrt{2}}$. Find the rod's minimum angular velocity (in rad/s) that will cause the platform to slide. (Take g = 10 ms^{-2})



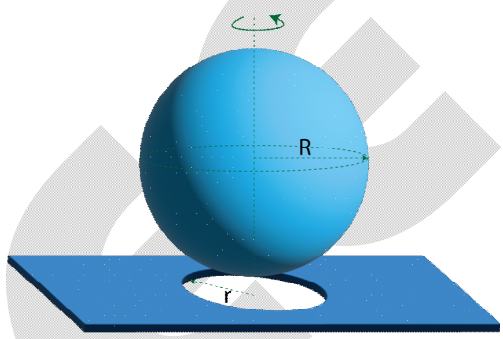
10. A 1 kg block is sliding on a rough horizontal floor towards a stationary 3 kg block. When the blocks are 50 cm apart, the velocity of the first block is 3 m/s as shown in the figure. The coefficient of friction between the floor and the blocks is 0.8 and the collision between the blocks is perfectly elastic. If the separation between the two blocks when they come to rest is $\left(\frac{k}{8}\right)$ cm, then find the value of k. (Take g = 10 m/s²).



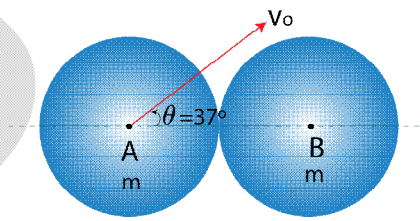
11. A light rod of length ℓ_0 can freely rotate about one end in the vertical plane, with a small sphere of mass m attached to the other end. The rod is released from rest from the horizontal position and becomes vertical after 4 seconds. If the same procedure is repeated with a rod of length $4\ell_0$, how long (in seconds) will it take for the rod to rotate from the horizontal position to the vertical position?



12. A homogeneous sphere with a radius of R = 10 cm , rotating about its vertical diameter is gently placed on a hole with a radius of $r_1 = 5\sqrt{3}$ cm in a fixed horizontal slab. The centre of the hole is directly below the centre of the sphere. The sphere stops rotating after a time interval $\Delta t_1 = 5.0\,s$. Calculate the time interval (in seconds) required for the same sphere to stop if it is placed rotating with the same angular velocity on a hole with a radius of $r_2 = 5.0\,cm$ in another identical horizontal slab.



13. A ball 'A' of mass, m=1 kg moving with an initial velocity v_0 = 5 m/s collides elastically with another stationary ball 'B' of the same mass m=1 kg. At the moment of impact, the angle between the straight line passing through the centres of the balls and the direction of the initial velocity of the striking ball 'A' is θ = 37°. Assuming the balls are smooth then find the kinetic energy (in Joule) of the striking ball that turned into elastic potential energy at the moment of the maximum deformation.

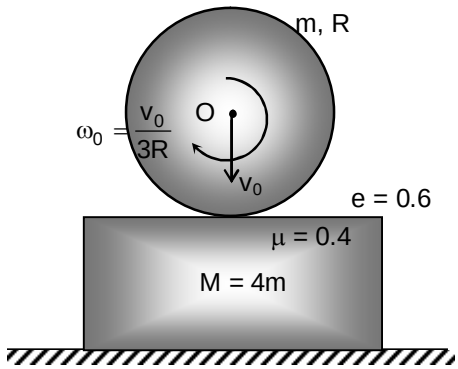


SECTION – C
(Numerical Answer Type)

*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

A uniform hollow sphere of mass 'm' and radius 'R' having initial angular velocity $\omega_0\left(=\frac{v_0}{3R}\right)$ collides with the rough horizontal surface of a plank of mass M(= 4m) with a vertical velocity v_0 as shown in the figure. The coefficient of restitution of collision is e = 0.6 and the coefficient of friction between the hollow sphere and the plank is μ = 0.4. The plank is placed on a smooth horizontal surface. Now answer the following questions. (Given v_0 = 16.5 m/s, R = 20 cm and m = 2.4 kg)

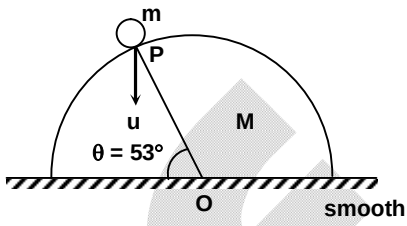


14. The angular velocity (in rad/s) of the hollow sphere just after collision is ……

15. The impulse (in N-s) due to friction on the hollow sphere during collision is ……

Paragraph for Question Nos. 16 and 17

A particle of mass m moving vertically downward with a velocity u = 25 m/s collides with a hemispherical body of mass M (= 3m) with coefficient of restitution e = 0.6 at a point P as shown in the figure. The hemispherical body is placed on a smooth horizontal surface. The coefficient of friction between the particle and the surface of the hemispherical body is $\mu = \frac{3}{29}$. (Take m = 1 kg)



Now answer the following questions.

16. The velocity (in m/s) of the hemispherical body just after collision is ……

17. The velocity (in m/s) of the particle just after collision is ……..

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. Which of the following silicates is a pyrosilicate?
(A) $Ca_3Si_3O_9$ (B) $Sc_2Si_2O_7$
(C) Zn_2SiO_4 (D) $Mg_2(SiO_3)_2$

19. Which of the following compound is formed when B_2O_3 reacts with P_2O_5?
(A) BPO_4 (B) PBO_3
(C) $P(BO_2)_3$ (D) BPO_3

20. The correct statement among the statements given below is
(A) Atomic radius of aluminium is less than the atomic radius of gallium
(B) Oxidation state of Thallium in $T\ell I_3$ is +3
(C) Boron does not form BF_6^{3-} ion
(D) H_3BO_3 is a tribasic acid

21. The rate law for the chemical reaction
$2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$
is given as
$\text{Rate} = k[NO]^2[O_2]$
The above reaction is carried out by taking 'a' moles of NO(g) and 'b' moles of O_2(g) in a closed vessel of volume V litre at temperature T. The initial rate of the reaction is r_1. When the volume of the vessel is reduced to $\frac{V}{4}$ litre, the initial rate of the reaction becomes r_2 at the same temperature. r_1 and r_2 are related as
(A) $r_1 = 16r_2$ (B) $r_2 = 16r_1$
(C) $r_2 = 64r_1$ (D) $r_2 = 8r_1$

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. The compound(s) which give H_2O_2 on treatment with dilute H_2SO_4 is/are
(A) BaO_2 (B) MnO_2
(C) SnO_2 (D) Na_2O_2

23. The **INCORRECT** statement(s) among the following statement is/are
(A) Bond angle in NF_3 is greater than the bond angle in NH_3
(B) CH_4 and CF_4 have same bond angle
(C) Bond angle in H_2S is greater than the bond angle in H_2O
(D) Bond angle in F_2O is less than the bond angle in Cl_2O

24. The correct statement(s) among the following is/are
(A) BeH_2 is a polymeric hydride
(B) $LiHCO_3$ does not exist in the solid state
(C) Beryllium carbide on hydrolysis produces C_2H_2 gas
(D) Calcium carbide when heated with N_2 gas at 1100^oC form calcium cyanamide

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. An equimolar mixture of $PCl_3(g)$ and $Cl_2(g)$ were placed in an evacuated closed vessel of fixed volume at 250^oC and the initial total pressure of the gaseous mixture was 'R' atm. After some time, the following equilibrium was established in which 75% of $PCl_3(g)$ were converted into $PCl_5(g)$

$$PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g) \qquad K_P = 3\ atm^{-1}$$

The value of R(in atm) is_____

26. A substance 'X' undergoes a reaction by first order kinetics. In 20 minutes it's concentration was reduced to one third of it's initial concentration. The time (in minutes) in which it's concentration will be reduced to one ninth of it's initial concentration is_____

27. The total number of molecules/ions among the following molecules/ions in which the hybridization of central atom is sp^3d^2 is _____

SF_6, XeF_4, $XeOF_2$, BrF_5, $[ICl_2]^-$, SF_3Cl, IF_7, Cl_2O, $POCl_3$

28. The total number of molecules among the following molecules which contain S – S linkage is_____

$H_2S_2O_5$, $H_2S_2O_4$, S_3O_9, $H_2S_2O_7$, $H_2S_2O_6$, $H_2S_4O_6$, $H_2S_2O_8$

29. How many of the following species undergo disproportion reaction under suitable conditions?

NH_3, NO_2, P_4, S_8, Cl_2, ClO_4^-, H_2O_2, ClO_3^-

30. At 25^oC, the concentration of PO_4^{3-} ions in a saturated solution of $Ca_3(PO_4)_2$ in pure water is 4×10^{-5} moles litre^{-1}. The K_{SP} of $Ca_3(PO_4)_2$ at 25^oC is $y\times10^{-25}$. The value $\frac{y}{54}$ 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. 31 and 32

Boron trifluoride when heated with sodium hydride at 450 K, a highly toxic gas 'P' and a salt 'Q' are formed. Compound 'P' on hydrolysis produces compound 'R' and $H_2(g)$. Compound 'P' on complete combustion produces an acidic oxide 'M' and a neutral oxide 'N'.
[Given atomic mass : H = 1, B = 10.8, Na = 23, F = 19]

31. Molecular weight of R is_____

32. The mass in gram of compound 'M' produced by the complete combustion of 5.52g of compound 'P' is_____

Paragraph for Question Nos. 33 and 34

At 25^oC, 40 ml of $\frac{M}{10}CH_3COOH$ solution was titrated with $\frac{M}{10}$ NaOH solution. It was observed that when 32 ml of $\frac{M}{10}$ NaOH solution was added the pH of the resulting solution was 'x' and when 40 ml of $\frac{M}{10}$ NaOH solution was added the pH of the resulting solution became 'y'.

[Given pK_a of CH_3COOH =4.74, log2 = 0.3, log5 = 0.7]

33. The value of x is_____

34. The value of 'y' is_____

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. $f : R \to R$ be a double differentiable function such that $f''(x) > 0 \ \forall \ x \in R$, for the following statements (b > a)

(i) $\dfrac{1}{(b-a)}\int_a^b f(x)\,dx > \dfrac{(f(a)+f(b))}{2}$

(ii) $\dfrac{2f(a)+f'(a)(b-a)}{2} < \dfrac{1}{(b-a)}\int_a^b f(x)\,dx$

(iii) $f\left(\dfrac{a+b}{2}\right) < \dfrac{1}{(b-a)}\int_a^b f(x)\,dx$

(iv) $\dfrac{1}{(b-a)}\int_a^b f(x)\,dx < \dfrac{2f(b)+f'(b)(a-b)}{2}$

which of the options list correct statements

(A) (i) & (iii) (B) (iv) & (i)
(C) (ii) & (iii) (D) (ii) & (iv)

36. Let $h(x) = \begin{cases} 2; & 0 \le x \le 2 \\ x; & 2 < x \le 4 \end{cases}$, $g(x) = \int_x^{h(x)} h(t)\,dt$, $0 \le x \le 4$ and $f(x) = \int_0^x g(t)\,dt$, $0 \le x \le 2$, then the area bounded by y = h(x), y = g(x) and y = f(x) is

(A) $\dfrac{19-8\sqrt{5}+4\sqrt{2}}{3}$ (B) $\dfrac{14-10\sqrt{5}+6\sqrt{2}}{3}$

(C) $\dfrac{17-10\sqrt{5}+4\sqrt{2}}{3}$ (D) none of these.

37. $P_0, P_1, P_2, \ldots P_n$ are points on the curve $y = x^2$, such that line joining P_{k-1} and P_k is perpendicular to line joining P_{k-2} and $P_{k-1} \ \forall \ k \in (2,3,\ldots n)$. $P_0 \equiv (0,0), P_1 \equiv (1,1)$ and d_n is distance between P_n & P_{n+1}. The value of $\lim\limits_{n\to\infty} \dfrac{d_n}{n}$ is

(A) $\sqrt{2}$ (B) $\dfrac{\sqrt{3}}{2}$

(C) $2\sqrt{2}$ (D) $3\sqrt{3}$

38. Let R be a relation on the set A = {1, 2, 3, 4, 5, 6, 7} defined as R = {(1, 2), (4, 6), (5, 6), (7, 7)}. The least number of element in an equivalence reaction R′, defined on the set A, which contains R is

(A) 18 (B) 12
(C) 15 (D) 49

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. $f : R \to R$ be a differentiable function such that $f(xyz) = f(x)\, f(y)\, f(z)$, $\forall\ x, y, z \in R$ & $|f'(1)| = 3$, then choose the correct option(s) :

(A) total number of functions satisfying above functional equation is 4

(B) total number of functions satisfying above functional equation is 2

(C) maximum value of $\left|\int_{-2}^{2} f(x)\,dx\right|$ is 8

(D) minimum value of $\int_{-2}^{2} f(x)\,dx$ is 0.

40. $f : R \to R$ be a twice differentiable function such that $f(x + f'(x)) \le f(x)$ & $f''(x) \ge 0$. Choose the correct option(s) :

(A) f(x) satisfies the differentiable equation $y' + y^2 = y(0)y(1)$

(B) f(x) can't have a strict local minima

(C) f(x) is many one function

(D) f(x) is surjective

41. $I = \int_{0}^{1} \frac{\sqrt{1-x} + \sqrt{x}}{1+\sqrt{2x}} f(x)\,dx$, choose the correct option(s) :

(A) if $f(x) = \sin\pi x$ then $I = \frac{\sqrt{2}}{\pi}$

(B) if $f(x) = (x - x^2)$ then $I = \frac{1}{6\sqrt{2}}$

(C) if $f(x) = \sqrt{2}$ then $I = 1$

(D) if $f(x) = \sqrt{2}$ then $I = \frac{1}{\sqrt{2}}$

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. Let $p = \lim_{y\to\infty}\left(\frac{2}{y^2}\left(\lim_{z\to\infty}\frac{1}{z^4}\left(\lim_{x\to 0}\frac{\left((y^2+y+1)x^k+1\right)^{z^2+z+1} - \left((z^2+z+1)x^k+1\right)^{y^2+y+1}}{x^{2k}}\right)\right)\right)^{y}$ where $k \in N$

and $q = \lim_{n\to\infty}\left(\frac{{}^{2n}C_n \cdot n!}{n^n}\right)^{1/n}$ where $n \in N$. The value of p.q is _____

43. $f : (2, \infty) \to R$ be a function such that $f(x) = \frac{2x-1}{x-2}$ &

$g(x) = f\left(\frac{x-2}{2x-1}\right) + f\left(\frac{1-2x}{2-x}\right) + f\left(f\left(\frac{x-2}{2x-1}\right)\right) + \frac{1}{f\left(f\left(\frac{x-2}{2x-1}\right)\right)}$. The minimum value of g(x) is _____

44. $P_0(x), P_1(x), P_2(x) \ldots P_n(x)$ is a sequence of polynomials defined by $P_{n+1}(x) = -xP_n(x) + \frac{d}{dx}P_n(x), P_0(x) = 1$. If $P_{2024}(0) = \frac{a!}{2^b \cdot c!}$, then a + b + c is _____

45. A tangent is drawn at point P to a cubic polynomial y = f(x) which intersects the curve again at Q, and again tangent drawn at Q intersect the curve at R. If A_1 is area bounded by y = f(x) and chord PQ and A_2 is area bounded by y = f(x) and chord QR, then value of $\frac{A_2}{A_1}$ is _____

46. $A_p = \{x : x \text{ divides } p, x, p \in N, p \le 60\}$ and define a function $f(p) = \sum_{\alpha_i \in A_p} (-1)^{\alpha_i}$. If f(p) = 4, then number of possible values of p is _____

47. The solution of the differentiable equation $x^2\,dy - y^2\,dx + xy^2(x - y)dy = 0$ is f(x, y) = 0, where f(1, 2) = 0. The curve f(x, y) = 0 and hyperbola (x – 2)(y + 2) + 4 = 0 intersects at (α, β) the value of $\alpha + \beta$ 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 $I(n,\lambda) = \int_0^{\pi/2} \frac{\sin^n x \cos^{2n} x + \lambda \sin^{n+2} x \cos^n x}{\lambda + \sin^n x + \cos^n x}\,dx$, where n ∈ odd natural numbers and $\lambda \in R^+$

48. The value of $\frac{\sum_{k=0}^{5} I(n, 2^k)}{\sum_{k=0}^{7} I(n, 3^k)}$ is

49. The value of $\sum_{n=1}^{201} n \cdot {}^{n-1}C_{\frac{n-1}{2}}\, I(n, n!)$ is, n ∈ odd natural numbers

Paragraph for Question Nos. 50 and 51

f(x) is cubic function with leading coefficient 1 and it satisfies following conditions :

(i) There exists no integer k such that f(k + 1)f(k – 1) < 0

(ii) $f'\left(-\frac{1}{4}\right) = -\frac{1}{4}$

(iii) $f'\left(\frac{1}{4}\right) > 0$

50. The value of f(4) is _____

51. If α, β are roots of $f'(x) = 0$, then value of $\left|\frac{1}{\alpha} + \frac{1}{\beta}\right|$ is _____