

FIITJEE
ALL INDIA TEST SERIES
JEE (Advanced)-2025
FULL TEST – VIII
PAPER –2
TEST DATE: 27-04-2025

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

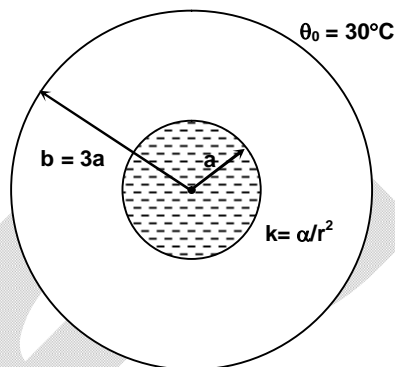
PART – I

SECTION – A

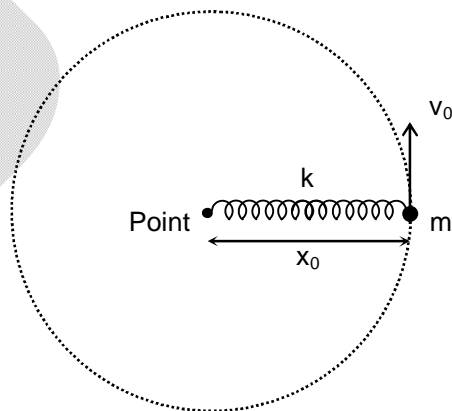
(One Options Correct Type)

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.

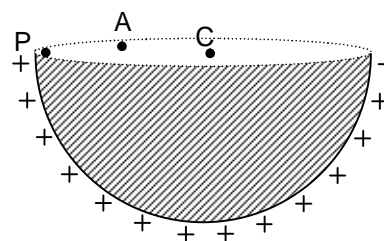
1. Water of mass 'm' and specific heat capacity 'S' is kept in the spherical cavity of radius 'a' of a thick spherical shell of inner and outer radii a and 3a respectively which is placed in a surrounding at temperature $\theta_0 = 30^\circ\text{C}$ as shown in the figure. Thermal conductivity of the shell varies as $k = \frac{\alpha}{r^2}$, where α is a constant. If initial temperature of water is 70°C , then the time required to decrease the temperature of water from 70°C to 50°C is



- (A) $\frac{mSa\ln 2}{4\pi\alpha}$
 (B) $\frac{mSa\ln 2}{2\pi\alpha}$
 (C) $\frac{2mSa\ln 2}{3\pi\alpha}$
 (D) $\frac{4mSa\ln 2}{3\pi\alpha}$
2. A hypothetical massless spring having negligible relaxed length and follows the relation between force F and extension x as $F = cx^{-2}$, where c is constant and x is extension in spring. Spring can only be broken if it stretched upto a very large length. A point mass is performing circular motion with help of spring as shown, with speed v_0 . The velocity needed for mass to break the spring is close to:
- (A) $2v_0$
 (B) $\sqrt{2}v_0$
 (C) $3v_0$
 (D) $2\sqrt{2}v_0$

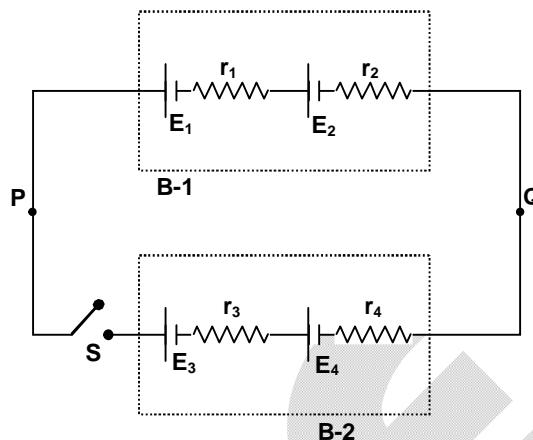


3. A non conducting hemispherical shell of radius 'R' has uniform surface charge density σ . Point 'C' is center of hemispherical shell. Point 'A' and point 'P' lie on the flat surface of the shell. The distance between C and A is R/2 and between C and P is R. Choose the correct option(s).



- (A) The potential at point P is $\frac{\sigma R}{2\epsilon_0}$
 (B) The potential at point A is $\frac{\sigma R}{4\epsilon_0}$
 (C) Work done by electrostatic force if a charge ' q_0 ' is moved from P to A is $\frac{-q_0\sigma R}{4\epsilon_0}$
 (D) Work done by electrostatic force if a charge ' q_0 ' is moved from P to A is $\frac{q_0\sigma R}{4\epsilon_0}$

4. A battery B-1 is made by using two cells of emf E_1 and E_2 and internal resistance r_1 and r_2 respectively. Another battery B-2 is made by using different cells of emf E_3 and E_4 and internal resistance r_3 and r_4 respectively. Now they are connected with points P and Q as shown in the figure. All cells are rechargeable. Now switch is closed at $t = 0$, then choose the INCORRECT option.



- (A) The potential difference across both the battery will be equal.
 (B) Rate of heat dissipation in both batteries is equal.
 (C) One battery will charge the other battery.
 (D) Rate of loss in chemical energy of one battery is more than the rate of gain in chemical energy of the other.

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 is projected at an angle of θ with the horizontal, with initial speed u . If the magnitude of velocity of projectile motion and time are related as $v^2 - 100t^2 + 400t - 800 = 0$. Then which of the following is correct. (take $g = 10 \text{ m/s}^2$)
 (A) Angle of projection is 45° .
 (B) Maximum height attained by particle is 20 meter.
 (C) Range of the particle is 80 meter.
 (D) Projection velocity is 40 m/sec.

6. A system of four semi-circular wires of radius a , carrying current I as shown in the figure.

(A) The magnetic field at 'O' due to current carrying loop

is $\frac{\mu_0 I}{2\pi R} \ln(\sqrt{2} + 1)(\hat{k})$

(B) The magnetic field at 'O' due to current carrying loop

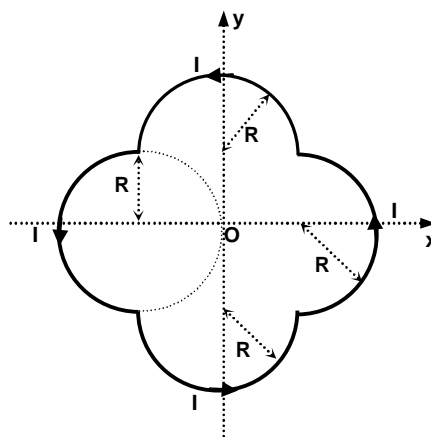
is $\frac{\mu_0 I}{\pi R} \ln(\sqrt{2} + 1)(\hat{k})$

(C) The magnetic moment of the system is

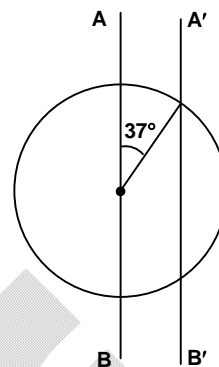
$4R^2 I (2 + \pi)(+\hat{k})$

(D) The magnetic moment of the system is

$2R^2 I (2 + \pi)(+\hat{k})$



7. A ring of radius 2 m is kept on a smooth horizontal surface. A rod of sufficient length can slide over the ring as shown. Initially rod is kept along the diameter of the ring. Now, a velocity of magnitude 12 m/s is given to rod towards right and 8 m/s to ring towards left. After some time rod reaches at position A'B'. Choose the correct option(s) for position of A'B'.
- (A) Magnitude of velocity of point of intersection relative to ring is 25 m/s.
- (B) Magnitude of acceleration of point of intersection is $\frac{3125}{8} \text{ m/s}^2$.
- (C) Ratio of tangential acceleration to radial acceleration of point of intersection is 3/4.
- (D) Magnitude of tangential acceleration is $\frac{1875}{8} \text{ m/s}^2$.

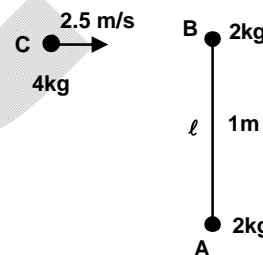


SECTION – B

(Numerical Answer Type)

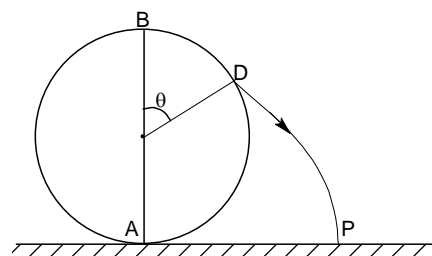
This section contains **SIX (06)** Numerical based questions. The answer to each question is a **NON-NEGATIVE INTEGER VALUE**.

8. Two particles A and B each of mass 2 kg are connected by a massless rod of length $\ell = 1\text{m}$. Another particle C of mass 4 kg moving with a velocity 2.5 m/s (perpendicular to the rod AB) collides with the particle B as shown in the figure. Coefficient of restitution, $e = \frac{1}{2}$ and the system is placed in a gravity free space. The angular velocity (in rad/s) of the rod just after collision is k rad/s. Find the value of 10k.

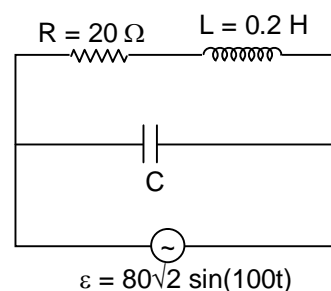


9. A conducting square loop of side 2.0 cm is rotated through 180° about one of its diagonals in 0.20 s. A uniform magnetic field exists in the region which is perpendicular to the plane of the loop initially. If average induced emf is 20 mV, find the magnitude of the magnetic field (in Tesla).
10. A particle slides down the surface of a smooth fixed sphere of radius R starting from rest at the highest point B. Particle leaves the sphere at some point and then strikes the horizontal plane passing through the lowest point A of the sphere, at point P. The distance AP is given by

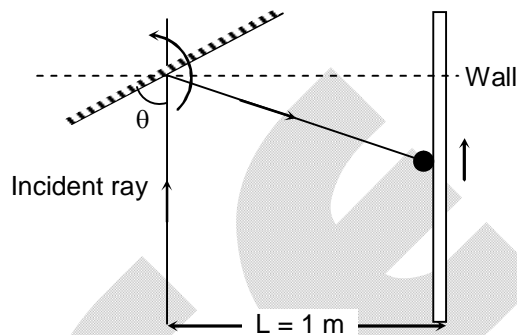
$$AP = \frac{n}{27} [\sqrt{n} + 4\sqrt{2}]R \text{ where 'n' is an integer, find n. (Take } g = 10 \text{ m/s}^2\text{).}$$



11. In the AC circuit shown in the figure, the rms current through the source is 2A. Find the value of capacitance C (in μF).



12. A droplet of water in uniform fog is formed. It then falls sweeping up the fog lying in its path. Assume that it retains all the fog in its path, remains spherical and experiences zero drag. Drop attains a constant value of acceleration after a large time interval. Its acceleration is given by $\frac{g}{K}$. Find the value of K.
13. A light ray is incident on a rotating mirror, which is rotating with angular speed 3 rad/s as shown in figure. The speed of bright spot on the wall when $\theta = 30^\circ$.

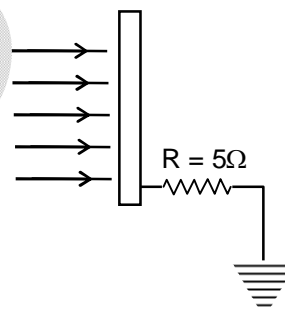


SECTION – C (Numerical Answer Type)

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

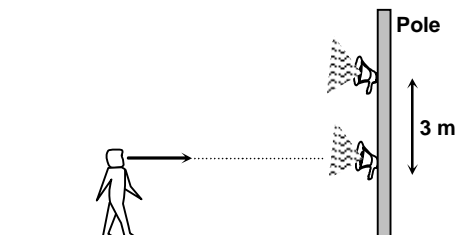
A large metal plate having area 1 m^2 is exposed to light of intensity 6.62 W/m^2 . Frequency of light is $3.2 \times 10^{15} \text{ Hz}$ which is greater than threshold value of photoemission. Emitted electrons are swept away immediately after emission. ($h = 6.62 \times 10^{-34}$)



14. The current through resistor in steady state in ampere is.....
15. The potential of plate in steady state in volt is

Paragraph for Question Nos. 16 and 17

An oscillation of frequency 680 Hz drives two speakers. The speakers are fixed on a vertical pole at distance 3 m from each other as shown in the figure. A person whose height is almost same as that of the lower speaker walked towards the lower speaker in a direction perpendicular to the pole. Assuming that there is no reflection of sound from the ground and speed of sound is $v = 340 \text{ m/s}$. Answer the following questions.



16. As the person walks towards the pole, his distance from the pole when he first hears a minimum in sound intensity is nearly
17. As the person walks towards the pole, the total number of times the person hears a minimum in sound intensity will be

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.

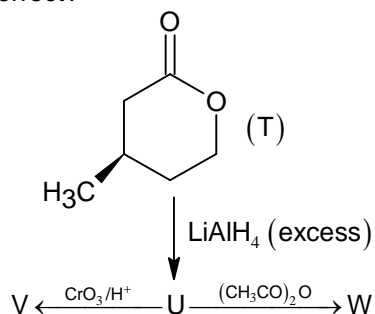
18. What is not produce in given reaction change?
 Sodium - amalgam $\xrightarrow{\text{Water}}$
 (A) H_2 (B) NaOH
 (C) Hg (D) O_2
19. The compound formed by dissolving gold and platinum in aqua-regia is
 (A) $[\text{AuCl}_4]^{3-}$ and $[\text{PtCl}_6]^{2-}$ (B) $[\text{AuCl}_4]^-$ and $[\text{PtCl}_6]^{4-}$
 (C) $[\text{AuCl}_4]^-$ and $[\text{PtCl}_6]^{2-}$ (D) $[\text{AuCl}_4]^-$ and $[\text{PtCl}_6]^{2-}$
20. What is the emf of a cell containing two hydrogen electrodes, the negative one in contact with 10^{-6} M OH^- and the positive one in contact with a $0.1 \text{ M CH}_3\text{COONH}_4$ solution?
 Given $\text{pK}_a (\text{CH}_3\text{COOH}) = 4.74$ and $\text{pK}_a (\text{NH}_4^+) = 9.26$
 (A) 0.059 volt (B) 0.59 volt
 (C) 0.0059 volt (D) 5.9 volt
21. $\text{PhCONH}_2 + \text{H} \begin{array}{c} \text{Me} \\ | \\ \text{C} \\ | \\ \text{CONH}_2 \end{array} \text{D} \xrightarrow[\Delta]{\text{Br}_2 + \text{KOH}} ?$
 Which of the following statement is incorrect regarding the given reaction?
 (A) PhNH_2 and $\text{H} \begin{array}{c} \text{Me} \\ | \\ \text{C} \\ | \\ \text{NH}_2 \end{array} \text{D}$ are produced
 (B) Cross – over products PhNH_2 and $\text{H} \begin{array}{c} \text{Me} \\ | \\ \text{C} \\ | \\ \text{*NH}_2 \end{array} \text{D}$ are also produced
 (C) Migration of $-\text{R}$ (alkyl group) of $\text{R} - \text{CONH}_2$ takes place with retention of configuration.
 (D) PhCONHBr and $\text{H} \begin{array}{c} \text{Me} \\ | \\ \text{C} \\ | \\ \text{CONHBr} \end{array} \text{D}$ are the intermediates formed

SECTION – A

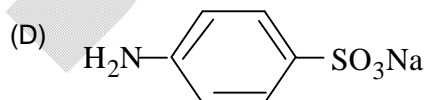
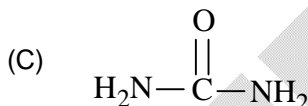
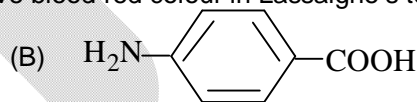
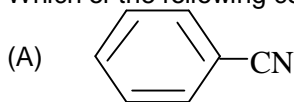
(One or More than one correct type)

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. With reference to the scheme given, which of the following statement(s) about T, U, V and W is/are correct?



- (A) T is soluble in hot aqueous NaOH
 (B) U is optically active
 (C) Molecular formula of W is $\text{C}_{10}\text{H}_{18}\text{O}_4$
 (D) V gives effervescence on treatment with aqueous NaHCO_3
23. Which of the following compound(s) does not give blood red colour in Lassaigne's test ?



24. In the given question K_a values of five weak acids are given. K_a for $\text{HA} = 10^{-8}$, $\text{HB} = 10^{-6}$, $\text{HC} = 2 \times 10^{-8}$, $\text{HD} = 10^{-10}$, $\text{HE} = 10^{-7}$.
 Select the correct statement(s) as per the information. Given : $\log 2 = 0.3$.
 (A) Among NaA, NaB, NaC, NaD and NaE, the NaD is most extensively hydrolysed.
 (B) Among NaA, NaB, NaC, NaD and NaE, the NaB is most extensively hydrolysed.
 (C) pH of 0.1 (M) aqueous solution of NaB is approximately 9.5.
 (D) 0.1 (M) solution of HE and 0.01 (M) solution of HB are isohydric to each other approximately.

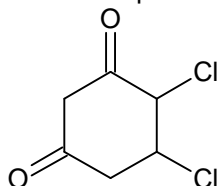
SECTION – B

(Numerical Answer Type)

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

25. How many of the following reagents reduce nitrobenzene in azobenzene?
 LiAlH_4 , Sn / HCl , $\text{Zn} + \text{NaOH} / \text{MeOH}$, NaBH_4 , NH_4HS
26. Difference between n^{th} and $(n + 1)^{\text{th}}$ Bohr's radius of H-atom is equal to its $(n - 1)^{\text{th}}$ Bohr's radius. The value of n is

27. For isothermal expansion of an ideal gas into vacuum, among the following, how many are zero?
 ΔE , ΔH , ΔT , q , P_{ext} , ΔS_{sys} , ΔS_{surr} , ΔS_{total} , ΔG_{sys}
28. The amount of water produced (in g) in the oxidation of 1 mole of white phosphorus (P_4) with conc. HNO_3 to a compound with highest oxidation state of phosphorus is:
29. Mole fraction of solute in some solution is $1/n$. If 50% of solute molecules dissociate into two parts and remaining 50% get dimerised, new mole fraction of solvent becomes $4/5$. Find value of n .
30. When the following compound is named correctly according to IUPAC convention, what would be the sum of position of two chlorine atoms?



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

An ideal mixture of liquids A and B with 2 moles of A and 2 moles of B has a total vapour pressure of 1 atm at a certain temperature. Another mixture with 1 mole of A and 3 moles of B has vapour pressure greater than 1 atm. When 4 moles of C are added to 2nd mixture, the vapour pressure comes down to 1 atm. Vapour pressure of C in pure state $p_c^0 = 0.8$ atm. If vapour pressure of pure A = x atm and vapour pressure of pure B = y atm.

31. The value of x is _____?
32. The value of y is _____?

Paragraph for Question Nos. 33 and 34

Potassium crystallizes in a body-centred cubic lattice, with an unit cell length $a = 5.20 \text{ \AA}$. If the distance between nearest neighbours is ' x ' and the distance between next nearest neighbour is y , then

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. If 7 balls are drawn one by one with replacement from a bag containing 5 balls numbered 0, 2, 3, 4, and 5, then number of ways in which a sum of 30 can be obtained, is not a multiple of
 (A) 3 (B) 5
 (C) 7 (D) 8
36. If $\sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \left[\frac{mn}{3^n} \left(\frac{1}{3^m} - \frac{n}{n \cdot 3^m + m \cdot 3^n} \right) \right] = \frac{p}{q}$ (where p and q are relatively prime), then $q - 3p$ is
 (A) 2 (B) 3
 (C) 4 (D) 5
37. Consider three sets
 $A = \{x : 2\cos 2x + 2(\sqrt{3} + 1)\cos x + 2 + \sqrt{3} = 0\}$
 $B = \{x : 2(\sin 3x + \sin x) + \sqrt{3} = 0\}$
 $C = \{x : \sqrt{2} - 1 < \tan x < \sqrt{2} + 1\}$
 If the sum of elements in $A \cap B \cap C$ is equal to $5k\pi$; $x \in \left[0, \frac{15\pi}{2}\right]$, then the value of k is
 (A) $\frac{52}{15}$ (B) $\frac{52}{25}$
 (C) $\frac{52}{5}$ (D) 3
38. Let $y(x)$ be a solution of the differential equation $y^2 \frac{dx}{dy} + x^2 e^{\frac{y(x-y)}{x}} = 2x(y-x)$. If $y(1) = 0$ and $y(x_0) = 1$, then the value of $\frac{1}{x_0} - \log_e(2e-1)$ is equal to
 (A) 0 (B) -1
 (C) 1 (D) $\frac{1}{2}$

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. If $f(x)$, $g(x)$ and $h(x)$ are polynomials of degree 2 and $\Delta(x) = \begin{vmatrix} f(x) & g(x) & h(x) \\ f(x-a) & g(x-a) & h(x-a) \\ f(x-b) & g(x-b) & h(x-b) \end{vmatrix}$, then
 (A) $\Delta'(x)$ is independent of x
 (B) $\Delta''(x)$ is independent of x but dependent on a and b
 (C) $\Delta''(x)$ is independent of x, a and b
 (D) $\Delta'''(x)$ is independent of x, a and b

40. A cubic equation with real coefficients $p(x) = 0$ has one real root (α) and two complex roots ($\beta \pm i\gamma$) represented by A, B and C on the argand plane respectively. Then
 (A) roots of $p'(x) = 0$ are complex if A lies inside one of the two equilateral triangles with base BC
 (B) roots of $p'(x) = 0$ are real if A lies inside one of the two equilateral triangles with base BC
 (C) roots of $p'(x) = 0$ are complex if A, B, C are vertices of an isosceles (not equilateral) triangle
 (D) roots of $p'(x) = 0$ are real and equal if $\frac{\alpha - \beta}{\gamma} = \pm\sqrt{3}$

41. Let $A = \begin{bmatrix} 1 & 3 & 0 \\ 0 & 3 & 0 \\ 0 & -2 & 3 \end{bmatrix}$ be a given matrix. If $B = A^4 - 4A$ and $C = 15A^2 - 7A^3 - A$, then (Tr (M) and

Det (M) represents trace and determinant of matrix M respectively)

(A) $\text{Tr}(B + C) = 28$

(B) $\text{Tr}(B + C) = 14$

(C) $\text{Det}(\text{Adj}(B + C)) = 576$

(D) $\sqrt{\text{Det}(\text{Adj}(\text{Adj}(B + C)))} = (576)^2$

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 6 digit numbers are formed using the digits 1 and 8 only and n_1, n_2, n_3 are the numbers of such 6 digits numbers which are divisible by 231, 84 and 63 respectively, then $n_3 - n_2 - n_1$ is
43. If $\int \frac{(e^x - 1)\sin x - (e^x - 1 - x)\cos x}{1 + (e^x - 1 - x - \cos x)(e^x - 1 - x + \cos x)} = f[g(x)] + c$ where c is constant of integration and $\lim_{x \rightarrow 0} g(x) = 0$. If $\lim_{x \rightarrow 0} \left(\frac{f(x)}{x} + \frac{g(x)}{x} \right) = \frac{m}{n}$ where $m, n \in \mathbb{N}$, then the minimum value of $m + n$ is
44. Let ABCD be a square with vertices A(0, 0), B(4, 0), C(4, 4), D(0, 4). The square is folded in such a way that corner B always lies on AD. As B moves on AD, the crease thus formed always touches a fixed parabola whose length of latus rectum is
45. Five cards are drawn from a pack of 52 cards. If the probability of getting exactly 3 Diamonds and 2 Jack is P, then the value of $\frac{866320}{649}P$ is
46. Let $I = \int_0^1 \frac{(x^9 - x^5 + x)}{(3x^8 - 4x^4 + 6)^{\frac{3}{4}}} dx$, then the value of $(12I)^4$ is
47. The square of the product of reciprocal of roots of the equation $2\cot^{-1}(2x - 1) + \sin^{-1}x = \pi$ 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

The line $x + 2y + a = 0$ intersect the circle $x^2 + y^2 = 4$ at points A and B. Another line $12x - 6y - 41 = 0$ intersect the circle $x^2 + y^2 - 4x - 2y + 1 = 0$ at two distinct points C and D. Let another circle $S = 0$ is passing through the points A, B, C and D

48. If the equation of circle $S = 0$ is $x^2 + y^2 + 2gx + 2fy + c = 0$, then $|2g + 2f + c|$ is
49. Values of a is

Paragraph for Question Nos. 50 and 51

Given $f(x + y + z) = f(x) f(y) f(z) \forall x, y, z \in \mathbb{R}$ and $f(2) = 4$ and $f'(0) = 3$

50. Number of possible value(s) of $f(0)$ is/are
51. Sum of digits of $f'(2)$ is