FIITJEE

ALL INDIA TEST SERIES

FULL TEST – VII

JEE (Main)-2025

TEST DATE: 16-03-2025

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

(Single Choice Answer Type)

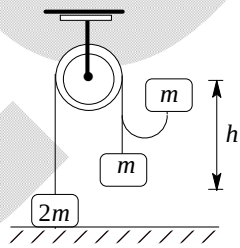
This section contains **20 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. In a two slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the plane of slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5} cm. If the distance between the slits is 10^{-3} m, calculate the wavelength of the light used.

(A) 4500 Å (B) 3000 Å

(C) 9000 Å (D) 6000 Å

2. A mass 2m rests on a horizontal table. It is attached to a light inextensible string which passes over a smooth pulley and carries a mass m at the other end. If the mass m is raised vertically through a distance h and is then dropped, then the speed with which the mass 2m begins to rise is:



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

(C) $\frac{\sqrt{gh}}{2}$ (D) $\sqrt{gh}$

3. A particle starts moving with initial velocity from the origin of co-ordinates at time t = 0 and moves in the xy plane with a constant acceleration α in the y-direction. Its equation of motion is $y = \beta x^2$. Its velocity component in the x-direction is:

(A) α / β (B) $\sqrt{2\alpha / \beta}$

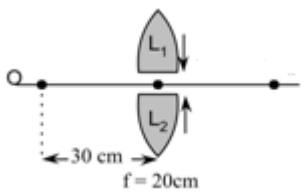
(C) $\alpha / 2\beta$ (D) $\sqrt{\alpha / 2\beta}$

4. By what percent the energy of a satellite has to be increased to shift if from an orbit of radius r to $\frac{3}{2}r$?

(A) 66.7% (B) 33.3%

(C) 15% (D) 20.3%

5. A point object O is placed at a distance of 0.3 m from a convex lens (focal length 0.2 m) cut into two halves each to which is displacement by 0.005 m thus making separation between them of 2×0.005 as shown in fig. Find the position of the image. Find the distance between the images.



(A) 0.003 m (B) 0.002 m

(C) 0.004 m (D) 0.001 m

6. The relation between U, p and V for an ideal gas in an adiabatic process is given by relation $U = a + bpV$. Find the value of adiabatic exponent (γ) of this gas:

(A) $\frac{b+1}{b}$ (B) $\frac{b+1}{a}$

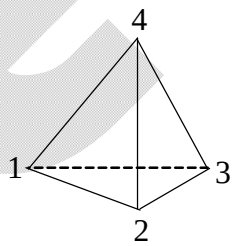
(C) $\frac{a+1}{b}$ (D) $\frac{a}{a+b}$

7. A metal disc of radius a rotates with a constant angular velocity ω about is axis. The potential difference between the centre and the rim of the disc is ($m = mass$ of electron, $e =$ charge on electron):

(A) $\frac{m\omega^2 a^2}{e}$ (B) $\frac{1}{2}\frac{m\omega^2 a^2}{e}$

(C) $\frac{e\omega^2 a^2}{2m}$ (D) $\frac{e\omega^2 a^2}{m}$

8. Six wires each of resistance r form a tetrahedron. The equivalent resistance between corners $1\text{-}2$ and $1\text{-}3$ are respectively:



(A) $\frac{r}{2}, \frac{r}{2}$ (B) r, r

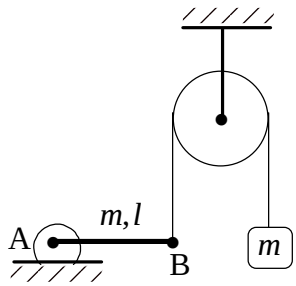
(C) $\frac{r}{2}, r$ (D) $r, \frac{r}{2}$

9. The ionization potential of Li^{++} ion is 122.4 V. Find the value of its first excitation potential.

(A) 91.8v (B) 45.9 V

(C) 122.4V (D) 28.4 V

10. Uniform rod AB is hinged at the end A in a horizontal position as shown in the figure. The other end of the rod is connected to a block through a massless string as shown. The pulley is smooth and massless. Masses of the block and the rod are same and are equal to 'm'. Acceleration due to gravity is g. The tension in the thread and angular acceleration of the rod just after release of block from this position are:



(A) $\frac{3mg}{8}, \frac{g}{8l}$ (B) $\frac{5mg}{8}, \frac{3g}{8l}$

(C) $\frac{mg}{8}, \frac{5g}{8l}$ (D) $\frac{7mg}{8}, \frac{7g}{8l}$

11. A radioactive sample has 6.0×10^{18} active nuclei at a certain instant. How many of these nuclei will still be in the same active state after two half-lives?

(A) 3×10^{18} (B) 1.5×10^{18}

(C) 0.75×10^{18} (D) 6×10^{18}

12. A particle performs SHM of amplitude A along a straight line. When it is at a distance $\sqrt{3}/2$ A from mean position, its kinetic energy gets increased by an amount $1/2 m\omega^2 A^2$ due to an impulsive force. Then its new amplitude becomes:

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

(C) $\sqrt{2}A$ (D) $\sqrt{5}A$

13. Find the constant b in Moseley's equation $\sqrt{\nu}$ = a (Z – b) from the following data.

Element	Z	Wavelength of K_a X-ray
Mo	42	71 pm
Co	27	178.5 pm

(A) 1.43 (B) 1.11

(C) 1 (D) 1.37

14. A 70 cm long sonometer wire is in unison with a tuning fork. If the length of the wire is decreased by 1.0 cm, it produces 4 beats per sec. with the same tuning fork. Find the frequency of the tuning fork -

(A) 276 $\sec^{-1}$ (B) 272 $\sec^{-1}$

(C) 269 $\sec^{-1}$ (D) 280 $\sec^{-1}$

15. Mr. Sanjay wants to calculate the current and power dissipated in an LCR series circuit. He connected 100W resistance to an AC source of 200 V and angular frequency 300 radian/sec. When he removed only the capacitance, the current was found to be lagging behind the voltage by 60°. While on removing the inductance he found, the current leading the voltage by 60°. Find the value of current and the power dissipated obtained by him

(A) 200 Watt (B) 100 Watt

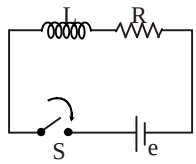
(C) 400 Watt (D) 300 Watt

16. The length of a wire between the two ends of a sonometer is 105 cm. Where the two bridges should be placed so that the fundamental frequencies of the three segments are in the ratio of 1:3:15.

(A) 75 cm, 25 cm, (B) 25 cm, 75 cm,

(C) 75 cm, 100 cm, (D) None of these

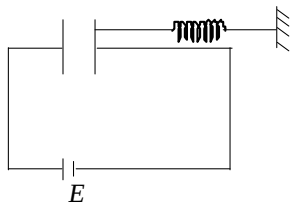
17. In an LR circuit as shown in fig. when the switch is closed how much time will it take the current to grow a value $\frac{\eta\varepsilon}{R}$ (where η < 1)



(A) (L/R) ln $\left|\frac{1}{\eta}\right|$ (B) (L/R) ln $\left|\frac{1}{1-\eta}\right|$

(C) (2L/R) ln $\left|\frac{1}{\eta}\right|$ (D) None of these

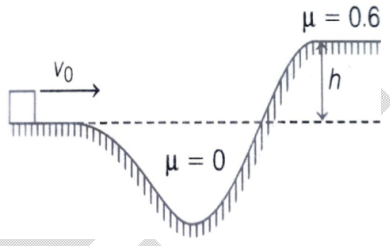
18. One plate of a capacitor is connected to a spring as shown in figure. Area of both the plates is A. In steady state, separation between the plates is $0.8d$ (spring was unstretched and the distance between the plates was d when the capacitor was uncharged). The force constant of the spring is approximately:



(A) $\frac{4\varepsilon_0 AE^2}{d^3}$ (B) $\frac{2\varepsilon_0 AE}{d^2}$

(C) $\frac{6\varepsilon_0 E^2}{Ad^3}$ (D) $\frac{\varepsilon_0 AE^3}{2d^3}$

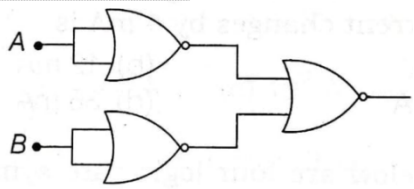
19. In the figure, a block slides along a track from one level to a higher level, by moving through an intermediate valley. The track is frictionless until the block reaches the higher level. There a frictional force stops the block in a distance d. The block's initial speed v_0 in $6\,m/s$, the height difference h is $1.1m$ and the coefficient of kinetic fraction μ is 0.6. The value of d is (g = 10 m/s^2)



(A) $1.17m$ (B) $1.71m$

(C) $3.41m$ (D) $2.81m$

20. The combination of the gates shown in the figure produces:



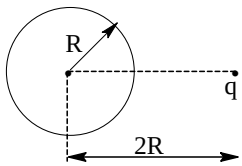
(A) NOR gate
(B) OR gate
(C) AND gate
(D) XOR gate

SECTION – B

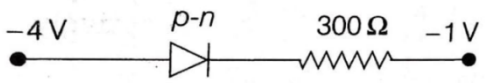
(Numerical Answer Type)

This section contains **5** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

21. A point charge is placed outside a spherical shell as shown in the figure. Find the electric potential (in kilo volt) on the surface of shell (Take: $q=1\mu c$ and $R=50cm$)

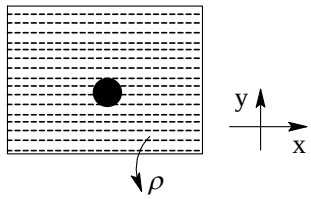


22. What is the current in the circuit shown below?

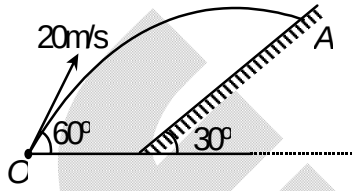


23. The pressure and volume of an ideal gas are related as $P=\frac{a}{1+\left(\frac{V}{b}\right)^3}$, where 'a' and 'b' are constants. The translational kinetic energy due to the thermal motion of the gas sample at volume $V=b$, (given that $ab=12\,kJ$) is $n\,kJ$. Find n.

24. A small spherical ball of density same as that of liquid is released from rest in a vessel filled completely with a liquid and accelerating with acceleration $5\hat{i}+5\hat{j}\,m/s$ as shown in the figure. Find the initial acceleration of ball just after the release with respect to vessel.



25. A ball is projected from the point *O* with velocity 20 m/s at an angle of $60°$ with horizontal as shown in figure. At highest point of its trajectory it strikes a smooth plane of inclination $30°$ at point *A*. The collision is perfectly inelastic. The maximum height from the ground attained by the ball is $\frac{75}{k}$ meter. Find the value of k? (g = 10 m/s^2)



Chemistry

PART – B

SECTION – A

(Single Choice Answer Type)

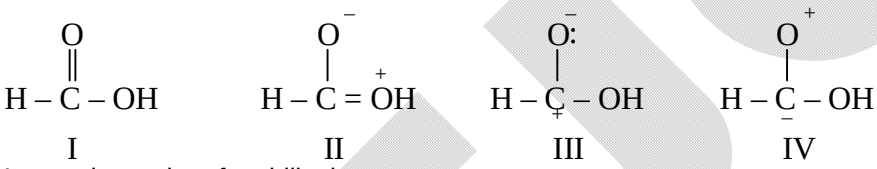
This section contains **20 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

26. Which of the following molecule has highest bond angle?
(A) NH_3 (B) H_2O
(C) Cl_2O (D) CH_4

27. Identify the least stable ion amongst the following
(A) Li^- (B) Be^-
(C) B^- (D) C^-

28. When sulphur is dissolved in oleum, a deep blue solution containing polyatomic sulphur cation is obtained. The formula of the cation present is
(A) S_4^{2+} (B) S_8^{2+}
(C) S_{19}^{2+} (D) S_{16}^{+2}

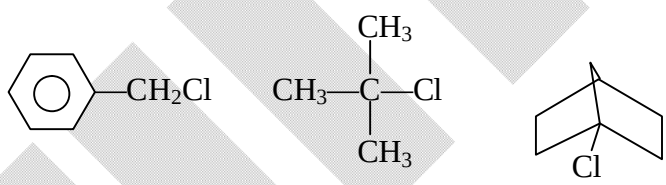
29.



I II III IV

Increasing order of stability is
(A) I < III < II < IV (B) IV < III < II < I
(C) III < IV < II < I (D) II < IV < III < I

30. There is formation of precipitate almost instantly when alcoholic $AgNO_3$ reacts with



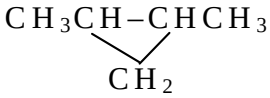
(I) (II) (III)

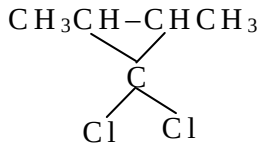
(A) I, II and III (B) I and II
(C) II and III (D) I and III

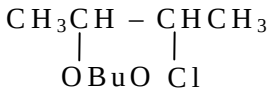
31. In the detection of nitrogen, blue/green colour is due to formation of Prussian blue. It is:
(A) $Fe_4^{III}\left[Fe^{II}(CN)_6\right]$ (B) $NaFe^{II}\left[Fe^{III}(CN)_6\right]$
(C) $Na_4\left[Fe(CN)_6\right]$ (D) $Na_3\left[Fe(CN)_6\right]$

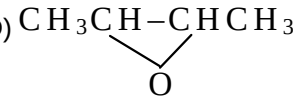
32. An alkane with the formula C_6H_{14} can be prepared by the hydrogenation of only two alkenes (C_6H_{12}). IUPAC name of the alkane is:
(A) 2, 2-dimethylbutane (B) 2, 3-dimethylbutane
(C) 2-methyl-pentane (D) *n*-hexane

33. $CH_3CH=CHCH_3 + CHCl_3 + t - BuOK \rightarrow A$. A is:

(A) 

(B) 

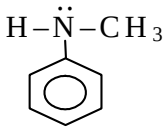
(C) 

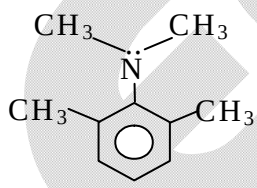
(D) 

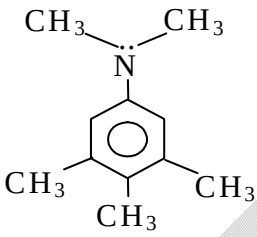
34. Glucose is added to 1 litre water to such an extent that $\Delta T_f / K_f$ becomes equal to 1/1000, the wt. of glucose added is

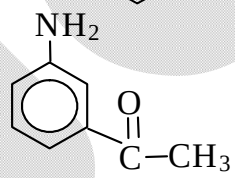
(A) 180 g
(B) 18 g
(C) 1.8 g
(D) 0.18 g

35. Which of the following is most basic?

(A) 

(B) 

(C) 

(D) 

36. Cellulose on hydrolysis with dil. H_2SO_4 gives -

(A) $\alpha - D - glucose$
(B) $\beta - D - glucose$
(C) $D - fructose$
(D) none of these

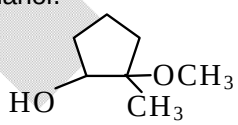
37. Which of the following is the example of condensation polymer

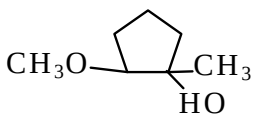
(A) Polystyrene
(B) Terylene
(C) Polyethene
(D) Polypropene

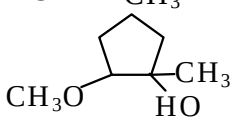
38. Tin reacts with-

(A) Hot conc. HCl
(B) Conc. HNO_3
(C) $HgCl_2$ on heating
(D) All of these

39. If the starting material is 1-methyl-1, 2-epoxy-cyclopentane, of absolute configuration, decide which one compound correctly represent the product of its reaction with sodium methoxide in methanol.

(A) 

(B) 

(C) 

(D) all of these

40. Pick out the incorrect statement for XeF_6–
(A) XeF_6 is hydrolysed partially to form $XeOF_4$
(B) It reacts with SiO_2 to from XeF_4
(C) On complete hydrolysis, it forms XeO_3
(D) It acts as F^- acceptor when treated with alkali metal fluoride, but cannot act as F^- donor to form complexes.

41. An inorganic compound gives a white ppt. with a solution of $AgNO_3$, a white ppt. with dil. H_2SO_4 and impart green colour to flame. The probable compound is
(A) $CuCl_2$ (B) $BaCl_2$
(C) $Cu(NO_3)_2$ (D) $PbCl_2$

42. When $CH_2 = CH–COOH$ is reduced with $LiAlH_4$, the compound obtained will be
(A) $CH_3–CH_2–COOH$ (B) $CH_2 = CH–CH_2OH$
(C) $CH_3–CH_2–CH_2OH$ (D) $CH_3–CH_2–CHO$

43. In the electronic configuration of nitrogen has $1s^7$, it would have energy lower than that of the normal ground state configuration $1s^2 2s^2 2p^3$ because the electrons would be closer to the nucleus. Yet $1s^7$ is not observed because it violates
(A) Heisenberg uncertainty principle (B) Hund's rule
(C) Pauli's exclusion principle (D) Bohr postulates of stationary orbits

44. A mixture of calcium ethanoate and calcium methanoate is heated strongly. The expected product is
(A) acetaldehyde (B) Ethyl methyl ketone
(C) diethyl ketone (D) Propyl ketone

45. Among the following complexes which one will show co-ordination isomerism?
(A) $[Cr(NH_3)_6]\,[CoCl_6]$ (B) $[Cr(NH_3)_6]Cl_2$
(C) $[Co(en)_2Cl_2]Cl$ (D) $[Cr(en)_2Cl_2]^+$

SECTION – B

(Numerical Answer Type)

This section contains **5** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

46. A large irregularly–shaped closed tank is first evacuated and then connected to a 55 litre cylinder containing compressed nitrogen gas. The gas pressure in the cylinder, originally at 21.4 atm, falls to 1.5 atm after it is connected to the evacuated tank. Volume of the tank in litres is $x\times10$, then the value of 'x' is_____.

47. Number of neutrons in 18 mL of water (density of water = 1 gm/mL) is $x\times10^{23}$. The value of 'x' is _____. (where, $N_A = 6\times10^{23}$)

48. A solution containing H^+ and D^+ ions is in equilibrium with a mixture of H_2 and D_2 gases at 25ºC. If partial pressure of both the gases are 1.0 atm, then $\log\frac{[D^+]}{[H^+]}$ is $x\times10^{-2}$. The value of 'x' is (approximate value to nearest integer) _____. [$E^o(D^+/D_2) = –0.003V$]

49. The solubility product of AgI at 25ºC is 1.0×10^{-16} $mol^2\ L^{-2}$. The solubility of AgI in 10^{-x} N solution of KI at 25ºC is approximately (in mol L^{-1}) is 1×10^{-12} mol/L. Find the value of 'x'.

50. 0.7 g of Na_2CO_3. x H_2O is dissolved in 100 ml, 20 ml of which required 19.8 ml of 0.1 N HCl. The value of x is ____.

Mathematics

PART – C

SECTION – A

(Single Choice Answer Type)

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

51. A function $f:R\to R$ is defined as $f(x)=3x^2+1$. Then $f^{-1}(x)$ is

(A) $\frac{\sqrt{x-1}}{3}$ (B) $\frac{1}{3}\sqrt{x-1}$

(C) f^{-1} does not exist (D) $\sqrt{\frac{x-1}{3}}$

52. $\lim\limits_{x\to\frac{\pi}{3}}\frac{\sin\left(\frac{\pi}{3}-x\right)}{2\cos x-1}$ is equal to:

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

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

53. Let $f(x)=\int e^x(x-1)(x-2)\,dx$. Then $f(x)$ decreases in the interval?

(A) $(2,\infty)$ (B) $(-2,-1)$

(C) $(1,2)$ (D) $(-\infty,1)\cup(2,\infty)$

54. If $I=\int\frac{x^2-1}{x^3\sqrt{2x^4-2x^2+1}}$ is equal to:

(A) $\frac{\sqrt{2x^4-2x^2+1}}{x^2}+C$ (B) $\frac{\sqrt{2x^4-2x^2+1}}{x}+C$

(C) $\frac{\sqrt{2x^4-2x^2+1}}{2x^2}+C$ (D) None of these

55. The area enclosed between the curves $y=ax^2$ *and* $x=ay^2\,(a>0)$ is $1\,sq.unit$, then the value of a is:

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

(C) 1 (D) $\frac{1}{3}$

56. The solution of the differential equation $\frac{dy}{dx}=(4x+y+1)^2$ is:

(A) $4x+y+1=2\tan(2x+y+C)$ (B) $4x+y+1=2\tan(x+2y+C)$

(C) $4x+y+1=2\tan(2y+C)$ (D) $4x+y+1=2\tan(2x+C)$

57. For $x\in R$, the expression $\frac{x^2+2x+c}{x^2+4x+3c}$ can take all real values if $c\in$:

(A) $(1,2)$ (B) $[-1,1]$

(C) $(0,1)$ (D) $(-1,0)$

58. The third term of a G.P. is 2. Then the product of the first five terms is:

(A) 2^3 (B) 2^4

(C) 2^5 (D) None of these

59. If the system of linear equations

$x+2ay+az=0$

$x+3by+bz=0$

$x+4cy+cz=0$

Has a non-zero solution, then a, b, c:

(A) are in A.P. (B) are in G.P.

(C) are in H.P. (D) satisfy $a+2b+3c=0$

60. The number of points of intersection of the curves represented by

$\arg(z-2-7i)=\cot^{-1}(2)$ and $\arg\left(\frac{z-5i}{z+2-i}\right)=\pm\frac{\pi}{2}$

(A) 0 (B) 1

(C) 2 (D) None of these

61. If all the roots of $z^3+az^2+bz+c=0$ are of unit modulus, then:

(A) $|a|\le 3$ (B) $|b|\le 3$

(C) $|c|=1$ (D) All of these

62. If M be a square matrix of order 3 such that $|\mathrm{M}|=2$, then $\left|\mathrm{adj}\left(\frac{\mathrm{M}}{2}\right)\right|$ equals to:

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{8}$ (D) $\frac{1}{16}$

63. How many ways are there to arrange the letters of the word ''GARDEN'' with the vowels in alphabetical order?

(A) 120 (B) 480

(C) 360 (D) 240

64. If $\left(1+x+x^2\right)^n=\sum_{r=0}^{2n} a_r x^r$, then $a_r-{}^nC_1\cdot a_{r-1}+{}^nC_2\cdot a_{r-2}-{}^nC_3\cdot a_{r-3}+.....+(-1)^r\,{}^nC_r\cdot a_o$ is equal to: (r is not multiple of 3)

(A) 0 (B) ${}^nC_r$

(C) a_r (D) 1

65. If $\left(1+x\right)^{2010}=C_0+C_1x+C_2x^2+.....+C_{2010}x^{2010}$ than the sum of series $C_2+C_5+C_8+.....+C_{2009}$ equal to:

(A) $\frac{1}{2}\left(2^{2010}-1\right)$ (B) $\frac{1}{3}\left(2^{2010}-1\right)$

(C) $\frac{1}{2}\left(2^{2009}-1\right)$ (D) $\frac{1}{3}\left(2^{2009}-1\right)$

66. The boy comes from a family of two children. What is the probability that the other child is his sister?

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{1}{4}$

67. If A be any event in sample space then the maximum value of $3\sqrt{P(A)}+4\sqrt{P(A)}$ is:

(A) 4 (B) 2

(C) 5 (D) Cannot be determined

68. Least positive integral value of 'a' for which $\log_{\left(x+\frac{1}{x}\right)}\left(a^2-3a+3\right)>0;(x>0)$:

(A) 1 (B) 2

(C) 3 (D) 4

69. The minimum value of $x^2+y^2+z^2$ if $ax+by+cz=p$, is:

(A) $\left(\frac{p}{a+b+c}\right)^2$ (B) $\frac{p^2}{a^2+b^2+c^2}$

(C) $\frac{a^2+b^2+c^2}{p^2}$ (D) 0

70. The scalar triple product $\left[\vec{a}+\vec{b}-\vec{c}\ \ \vec{b}+\vec{c}-\vec{a}\ \ \vec{c}+\vec{a}-\vec{b}\right]$ is equal to:

(A) 0 (B) $\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

(C) $2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ (D) $4\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

SECTION – B

(Numerical Answer Type)

This section contains **5** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

71. Find the number of integers in the domain of $f(x)=\frac{1}{\sqrt{\ln\cos^{-1}x}}$.

72. If $x=\cos\theta$ and $y=\sin^3\theta$, then $\left|\frac{yd^2y}{dx^2}+\left(\frac{dy}{dx}\right)^2\right|$ at $\theta=\frac{\pi}{2}$ is:

73. For a positive integer n, let $I_n=\int_{-\pi}^{\pi}\left(\frac{\pi}{2}-|x|\right)\cos nx\,dx$. Find the value of $\left[I_1+I_2+I_3+I_4\right]$ where $[.]$ denotes greatest integer function.

74. Find the number of positive integral values of k for which $kx^2+(k-3)x+1<0$ for atleast one positive x.

75. The value of $\sum_{r=1}^{\infty}\frac{8r}{4r^4+1}$ is equal to: