FIITJEE

ALL INDIA TEST SERIES

FULL TEST – VIII

JEE (Main)-2025

TEST DATE: 18-03-2025

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.**

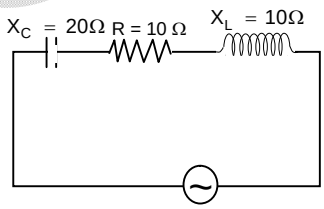
1. A uniform solid brass sphere is rotating with angular speed ω_0 about a diameter. If its temperature is now increased by 100^0C. What will be its new angular speed (Given $\alpha_{brass} = 2.0 \times 10^{-5} \text{per}^0\text{C}$)

   (A) $1.1\,\omega_0$ (B) $1.01\,\omega_0$

   (C) $0.996\,\omega_0$ (D) $0.824\,\omega_0$

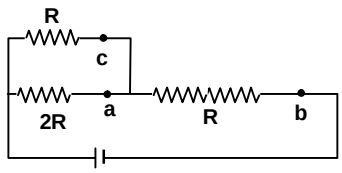
2. When a positively charged conductor is connected to earth,
   (A) electrons flow from the earth to the conductor
   (B) protons flow from the conductor to the earth
   (C) electrons flow from the conductor to the earth
   (D) any of (A) or (C) may happen

3. In LCR circuit shown in figure, then choose incorrect option
   (A) Current will lead the voltage
   (B) rms value of current is 20 A
   (C) Power factor of the circuit is $\frac{1}{\sqrt{2}}$
   (D) Voltage drop across resistance = voltage drop across inductor

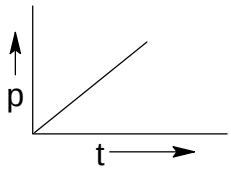


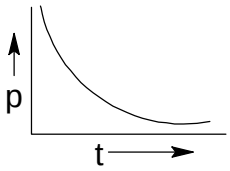
4. The mass of a body is measured as 10.1 kg. The possible percentage error in the measurement is
   (A) $\pm$ 1% (B) $\pm$ 0.1%
   (C) $\pm$ 10% (D) $\pm$ 0.01%

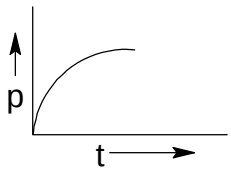
5. Referring to the shown circuit, the current will be minimum in
   (A) a
   (B) b
   (C) c
   (D) same in all the branches

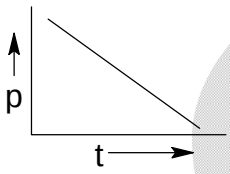


6. A soap bubble is blown slowly at the end of a tube by a pump supplying air at a constant rate. Which one of the following graphs represents the correct variation of the excess of pressure inside the bubble with time?

(A) 

(B) 

(C) 

(D) 

7. There is a 90^0 bend in a pipe line in which water is flowing at speed v. The cross sectional area of pipe is A. The force exerted by pipe walls on water at bend is

(A) $\sqrt{3}\,A\,v^2\rho$ (B) $\sqrt{2}\,Av^2\rho$

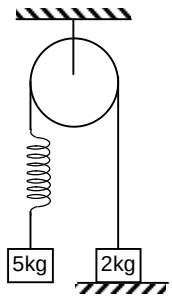
(C) $Av^2\rho$ (D) $\sqrt{5}\,Av\rho$

8. A uniform solid hemisphere of radius r is joined to uniform solid right circular cone of base of radius r. Both have same density. The centre of mass of the composite solid lies on the common face. The height (h) of the cone is

(A) 2r (B) $\sqrt{3}\,r$

(C) 3r (D) $r\sqrt{6}$

9. System shown in figure is released from rest pulley and spring is massless and friction is absent everywhere. The speed of 5 kg block when 2 kg block leaves the contact with ground is (K = 40 N/m & g = 10 m/s^2)



(A) $\sqrt{2}$ m/s (B) $2\sqrt{2}$ m/s

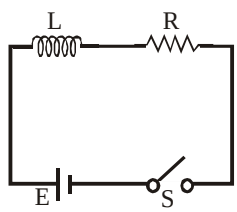
(C) 2 m/s (D) $4\sqrt{2}$ m/s

10. One half mole of a monoatomic ideal gas absorbs 1200 J of heat energy while performing 2196 J of work. The temperature of the gas increases by

(A) 160^0C (B) 80^0C

(C) 40^0C (D) -160^0C

11. In the LR circuit as shown in figure, the switch is closed at t = 0. Mark the incorrect statement of the following:



(A)The current increases with time

(B)The current increases with a decreasing rate

(C)The voltage drop across the inductor increases

(D)The voltage drop across the resistor increases

12. A charged particle of unit mass and unit charge moves with velocity of $\vec{v} = (8\hat{i} + 6\hat{j})\text{m/s}$ in a magnetic field of $\vec{B} = 2\hat{k}T$. Choose the correct alternative

(A) The path of the particle may be $x^2 + y^2 - 4x - 21 = 0$

(B) The path of the particle may be $x^2 + y^2 - 4x - 5 = 0$

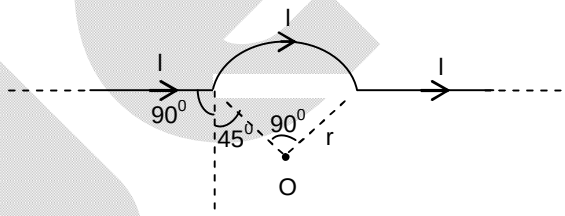
(C) The path of the particle may be $x^2 + y^2 + 2x - 8 = 0$

(D) The path of the particle may be $x^2 + y^2 - 2x - 15 = 0$

13. A source of sound is moving towards a stationary observer with a speed of 50 m/s. The observer measures the frequency of the source as 1000 Hz. The speed of sound is 350 m/s. The apparent frequency measured by the observer when the source is moving away after crossing the observer is

(A) 750 Hz (B) 850 Hz
(C) 1150 Hz (D) 1250 Hz

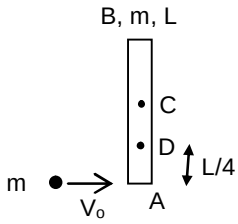
14. The magnetic field at the centre O of the arc in figure is (r is the radius of circular arc)



(A) $\frac{\mu_0 I}{4\pi \times r}\left[\sqrt{2} + \pi\right]$ (B) $\frac{\mu_0 I}{2\pi r}\left[\frac{\pi}{4} + 1\left(\sqrt{2} - 1\right)\right]$

(C) $\frac{\mu_0}{4\pi} \times \frac{I}{r}\left[\sqrt{2} + r\right]$ (D) $\frac{\mu_0}{4\pi} \times \frac{I}{r}\left[\sqrt{2} + \frac{\pi}{4}\right]$

15. A thin, uniform rod of mass M and length L is at rest on a smooth horizontal surface. A particle of same mass M collides with the rod at one end perpendicular to its length with velocity V_o and sticks to it. C is the middle point of the rod and D is a point at a distance of L/4 from end A. The time taken by the rod to turn through 90^o after collision is



(A) $\frac{L}{V_o}$ (B) $\frac{\pi L}{V_o}$

(C) $\frac{3\pi L}{5V_o}$ (D) $\frac{5\pi L}{12V_o}$

16. A string of length 1m and linear mass density 0.01 kg m^{-1} is stretched to a tension of 100 N. When both ends of the string are fixed, the three lowest frequencies for standing wave are f_1, f_2 and f_3. When only one end of the string is fixed, the three lowest frequencies for standing wave are n_1, n_2 and n_3. Then

(A) $n_3 = 5n_1 = f_3 = 125$ Hz (B) $f_3 = 5f_1 = n_2 = 125$ Hz

(C) $f_3 = n_2 = 3f_1 = 150$ Hz (D) $n_2 = \frac{f_1 + f_2}{2} = 75$ Hz

17. A simple pendulum is suspended from the ceiling of the lift. When the lift is at rest, its time period is T. With what acceleration should lift be acceleration upwards in order to reduce its time period to T/2?

(A) 9g (B) g
(C) 2g (D) 3g

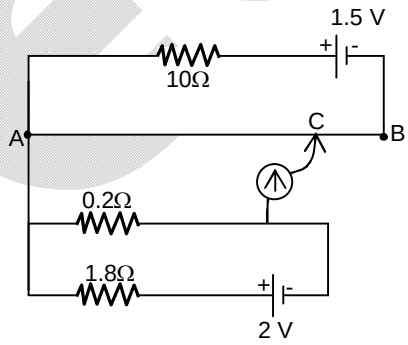
18. A tunnel is dug along diameter inside the surface of earth and a particle is projected from the centre of tunnel. The minimum velocity of particle such that it escape out from the earth's gravitation field is (Radius of earth = R_e)

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

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

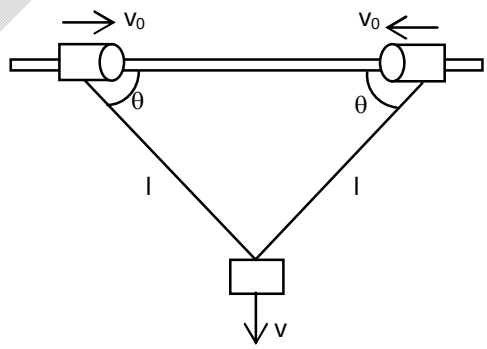
19. In the figure, AB is a uniform wire of length 100 cm whose resistance is 5 Ω. If galvanometer reads zero, then AC =

(A) 10cm (B) 20cm
(C) 40cm (D) 80cm



20. In the shown figure two identical beads slide along a smooth horizontal rod as shown in figure. The relation between v and v_0 in the shown position will be

(A) $v = v_0 \cot\theta$
(B) $v = v_0 \sin\theta$
(C) $v = v_0 \tan\theta$
(D) $v = v_0 \cos\theta$



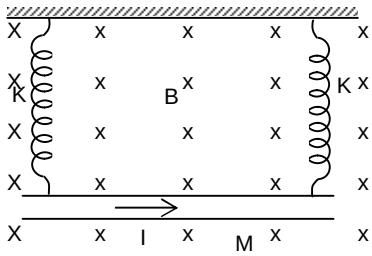
SECTION – B

(Numerical Answer Type)

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

21. K_α wavelength emitted by an atom of atomic number Z = 11 is λ. Find the atomic number for an atom that emits K_α radiation with wavelength 4λ.

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



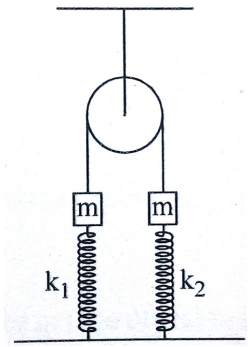
23. In a certain hypothetical radioactive decay process, species A decays into species B and species B decays into species C according to the reactions

$$A \longrightarrow 2B + \text{particles} + \text{energy}$$
$$B \longrightarrow 3C + \text{particles} + \text{energy}$$

The decay constant for species A is $\lambda_1 = 1\,\text{sec}^{-1}$ and that for species B is $\lambda_2 = 100\,\text{sec}^{-1}$. Initially 10^4 moles of species of A were present while there was none of B and C. It was found that species B reaches its maximum number at a time $t_0 = 2\ln(10)$sec. If maximum number of moles of B is N, then 10 N is:

24. In YDSE experiment if the screen is shifted by a distance of 0.5 m away from the slit, 3rd maxima is shifted by 3×10^{-4} m. The slit width is 2×10^{-3}m. If the wavelength (in nm) used in the experiment is 'k', find the value of 'k'.

25. On the diagram, two blocks of equal mass are connected by an ideal string. The values of m = 1 kg and k_2 = 100 N/m are given. Initially, both springs are relaxed. Then the left block is slowly pulled down a distance 0.1 m and released. The maximum possible value of k_1 (in N/m) for which both blocks will have same magnitude of acceleration just after releasing, is k. Both spring have natural length of 2m. Then find the value of k..



Chemistry

PART – B

SECTION – A

(Single Choice Answer Type)

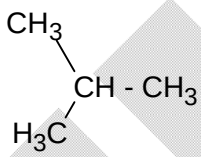
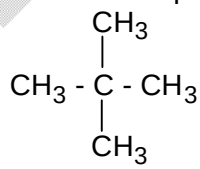
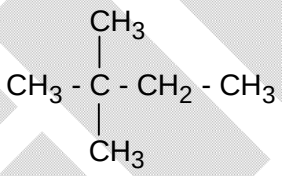
This section contains **20 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

26. Molar heat capacity of an ideal gas at constant volume is given by $C_v = 2 \times 10^{-2}$ J (in Joule). If 3.5 mole of this ideal gas are heated at constant volume from 300 K to 400 K the change in internal energy will be
(A) 7 (B) 4
(C) 8 (D) 6

27. The compound X – CH_2COOH will be the strongest acid if X is:
(A) CH_3 (B) NO_2
(C) F (D) OH

28. $BCl_3 + H_2 + C \xrightarrow{1700-1800^oC} Product(s)$
The product(s) of above reaction is/are
(A) $CCl_4 + B_2H_6$ (B) $B_4C + HCl$
(C) $B + Cl_2 + CH_4$ (D) $B_2H_6 + CHCl_3$

29. Atomic radii of Ti, Zr and Hf vary
(A) Ti > Zr > Hf (B) Ti < Zr < Hf
(C) Ti < Hf < Zr (D) Ti < Zr = Hf

30. Which of the following hydrocarbon can form one monochloro product with Cl_2/light?
(A) 
(B) 
(C) 
(D) $CH_3CH_2CH_3$

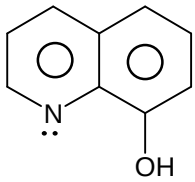
31. Dehydration of alcohols produces
(A) alkanes (B) alkenes
(C) alkynes (D) aldehydes

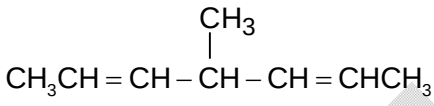
32. The shape of $[Co(NH_3)_6]^{3+}$ is:
(A) Tetrahedral (B) Trigonal bipyramidal
(C) Octahedral (D) Square planar

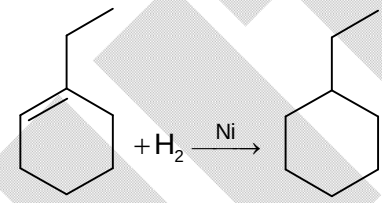
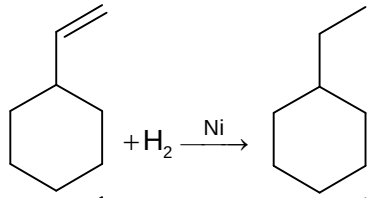
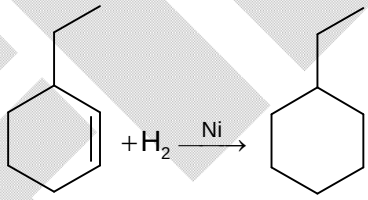
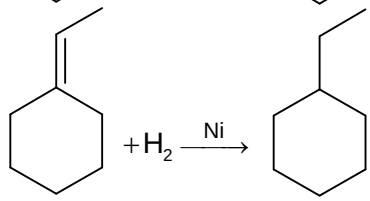
33. $AgNO_3$ solution will not give white precipitate with:
(A) $[Co(NH_3)_3Cl_3]$ (B) $[Co(NH_3)_4Cl_2]Cl$
(C) $[Co(NH_3)_5Cl]Cl_2$ (D) $[Co(NH_3)_6]Cl_3$

34. Which of the following compound exhibits tautomerism?
(A) chloroethane (B) ethanol
(C) ethoxyethane (D) nitroethane

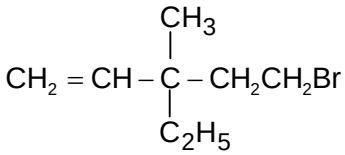
35. Which of the following two reagents form silicates when react with silica (SiO_2)?
(A) NaCl and Na_2S (B) NaOH and Na_2CO_3
(C) Na_2SO_4 and $NaNO_3$ (D) NaBr and $NaHSO_4$

36. In which combinations, all the ligands are ambient in nature?
(A) NO_2^-, $\bar{S}CN$ and $\bar{C}N$ (B) EDTA, $\bar{S}CN$
(C) H_2O,  (D) All of these

37. 
How many stereoisomer(s) is/are possible for the above compound?
(A) 2 (B) 3
(C) 4 (D) 6

38. Which of the following reaction produces maximum heat?
(A) 
(B) 
(C) 
(D) 

39. Which of the following substance can decrease the ionization of CH_3COOH in water?
$CH_3COOH(l) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$
(A) NaOH (B) NH_4Cl
(C) K_2CO_3 (D) NaCl

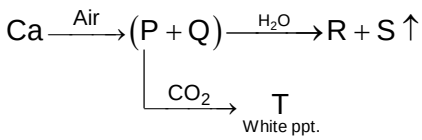
40. 

Which of the following substance converts the above optically active compound to optically inactive compound?

(A) HBr
(B) Br_2/CCl_4
(C) HBr/R_2O_2
(D) Br_2/H_2O

41. Which substance is used for refining of Nickel in Mond's process?

(A) I_2
(B) CO
(C) CO_2
(D) MnO

42. 

Which of the following is 'U'?

(A) CH_3COONH_4
(B) NH_2CONH_2
(C) NH_2COONH_4
(D) NH_2COOH

43. Which of the following orbital has the maximum number of radial nodes?

(A) 4s
(B) 4p
(C) 4d
(D) 4f

44. In which case bond length of C – O bond is maximum

(A) Carboxylate ion
(B) Phenoxide ion
(C) p-nitro phenoxide ion
(D) 2, 4 di-nitro phenoxide ion

45. Which of the following overlap forms the strongest sigma bond?

(A) 2s – 2s
(B) $2p_x – 2p_x$
(C) $3p_y – 3p_y$
(D) $2p_x – 3p_x$

SECTION – B

(Numerical Answer Type)

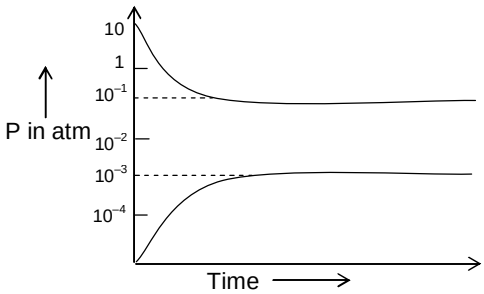
This section contains **5** Numerical based questions. The answer to each question is rounded off to the nearest integer value.

46. The energy of an electron of hydrogen atom is -13.6 eV when it is 0.53 $\overset{o}{A}$ away from the nucleus. When the hydrogen atom is supplied with 12.75 eV energy the electron moves to a higher orbit. If the distance of that orbit from the nucleus in is expressed as $\frac{x}{100}\overset{o}{A}$. What is the value of x?

47. 56.7 g anhydrous oxalic acid ($H_2C_2O_4$) completely decolourises 200 mL of acidified $KMnO_4$ solution. If the molarity of the $KMnO_4$ solution is expressed as $\left(\frac{20+x}{100}\right)$ M. What is the value of x?

48. A large number of structural isomers are possible with formula $C_4H_{11}N$
If x = Number of primary amines,
y = Number of secondary amines and
z = number of tertiary amines, then
What is (x + y + z)

49. The temperature of a sample of diatomic ideal gas is increased by 4.5 times of its initial value. At this temperature the molecules are completely dissociated into atoms. How many times will the gas velocity increase from initial value due to the change?

50. 

The plot of partial pressure of the product and reactant is given above. What is the value of ΔG^o in L atm unit at temperature 'T'?
[Assume 2.303 RT = 4 L atm mol^{-1}]

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. The area bounded by the x – axis, part of the curve $y = 1 + x^{-2}$ and the ordinates x = 1 and x = 2 is divided into equal parts by the ordinate at $x = a$ such that $a = \frac{3+\sqrt{p}}{8}$, then the value of p is

(A) 70 (B) 71
(C) 72 (D) 73

52. $\lim\limits_{y\to\infty} \frac{\sqrt{1+\sqrt{1+y^4}}-\sqrt{2}}{y^4} =$

(A) $4\sqrt{2}$ (B) $\frac{1}{4\sqrt{2}}$
(C) $\sqrt{2}$ (D) 0

53. If the parabola $y = ax^2 + bx + c$ has vertex at (4, 2) and $\lambda \in [1, 3]$, and the maximum value of product abc is λ, then $\frac{|\lambda|}{24}$ is

(A) 2 (B) 4
(C) 6 (D) 8

54. Let P be a point on the line segment joining $A(5\cos\alpha, 5\sin\alpha)$ and $B(5\cos\beta, 5\sin\beta)$ such that $3PA = 2PB$ then the locus of P is if $|\alpha - \beta| = \frac{\pi}{3}$

(A) $x^2 + y^2 = 13$ (B) $x^2 + y^2 = 19$
(C) $x^2 + y^2 = 1$ (D) $x^2 + y^2 = 25$

55. Let z_1, z_2 and z_3 are three complex numbers such that $|z_1| = |z_2| = |z_3| = 1$ and

$$\frac{z_1}{z_2 z_3} + \frac{z_2}{z_3 z_1} + \frac{z_3}{z_1 z_2} = -1$$

then the number of possible integral values of $|z_1 + z_2 + z_3|$ is

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

56. Let P be any point on the line $x-y+3=0$ and A be a fixed point (3, 4). If the family of lines given by the equations $(3\sec\theta+5\operatorname{coesc}\theta)x+(7\sec\theta-3\operatorname{cosec}\theta)y+11(\sec\theta-\operatorname{cosec}\theta)=0$ are concurrent at a point B for all permissible value of θ, then maximum value of $|PA-PB|$ is

(A) 3 (B) $2\sqrt{10}$

(C) $2\sqrt{34}$ (D) 5

57. Let $P(x)$ be a quadratic polynomial such that $P(1)=-1$, if $\int\frac{p(x)dx}{(2x-3)^2(3x-2)^2}=\frac{1}{5}\ell n|f(x)|+C$ where C is constant of integration and $f(x)$ is a rational function such that $\lim\limits_{x\to\infty}f(x)=\frac{4}{3}$, then value of $|f(1)|$ is

(A) 1 (B) 2

(C) 3 (D) 4

58. Let f be a function defined by $f(x)=\begin{cases}(x-r)^2, & r-1\le x<r+1\\ 1, & r+1\le x\le r+2\end{cases}$

Where r = 3k, $k\in I$. Find the value of $\sqrt{\int_0^{45}f(x)dx}$

(A) 1 (B) 3

(C) 5 (D) 7

59. If $f(x)$ is an even function which is also periodic with the period T and $\int\limits_0^a f(x)dx=3$ and $\int\limits_{-T/2}^{3T/2}f(x)dx=18$, then $\int\limits_{-a}^{a+5T}f(x)dx$ is equal to

(A) 31 (B) 43

(C) 51 (D) 71

60. Let $f(x)=2\tan^{-1}x$ and $g(x)$ be a differentiable function satisfying $g\left(\frac{x+2y}{3}\right)=\frac{g(x)+2g(y)}{3}\ \forall\ x,y\in R$ and $g'(0)=1$ and $g(0)=2$. The number of integers 'x' satisfying $f^2(g(x))-5f(g(x))+4>0$ where $x\in(-10,20)$ is greater than or equal to

(A) 5 (B) 6

(C) 7 (D) 8

61. Area bounded by the straight lines $x^2y-y^3-x^2+5y^2-8y+4=0$ is equal to (in sq. units)

(A) 1 (B) 3

(C) 5 (D) 7

62. If $\left(2xy - y^2 - y\right)dx = \left(2xy + x - x^2\right)dy$ and $y(1) = 1$, then the value of $12\left|y(-1)\right|$ is

(A) 12 (B) 13
(C) 15 (D) 17

63. The point (2, 1) is translated parallel to the line $L: x - y = 4$ by $2\sqrt{3}$ units. If the new point Q lies in the third quadrant, then the equation of the line passing through Q and perpendicular to L is

(A) $x + y = 2 - \sqrt{6}$ (B) $x + y = 3 - 3\sqrt{6}$
(C) $x + y = 3 - 2\sqrt{6}$ (D) $2x + 3y = 1 - \sqrt{6}$

64. A circle C touches the line $x = 2y$ at the point (2, 1) and intersects the circle $C_1: x^2 + y^2 + 2y - 5 = 0$ at two points P and Q such that PQ is a diameter of C_1. Then the length of diameter of C is:

(A) $7\sqrt{5}$ (B) 15
(C) $\sqrt{285}$ (D) $4\sqrt{15}$

65. Three circles of radii a, b, c (a < b < c) touch each other externally. If they have x – axis as a common tangent, then

(A) a, b, c are in A.P. (B) $\frac{1}{\sqrt{b}} = \frac{1}{\sqrt{a}} + \frac{1}{\sqrt{c}}$
(C) $\frac{1}{\sqrt{a}} = \frac{1}{\sqrt{b}} + \frac{1}{\sqrt{c}}$ (D) $\sqrt{a}, \sqrt{b}, \sqrt{c}$ are in A.P.

66. If pair of variable straight lines $x^2 + 4y^2 + \alpha xy = 0$ (α is real parameter) cuts the ellipse $x^2 + 4y^2 = 4$ at two points A and B, then the locus of point of intersection of tangents at A and B of ellipse

(A) $x^2 - 4y^2 = 0$ (B) $4x^2 - y^2 = 0$
(C) $x^2 - xy + 4y^2$ (D) $x^2 - xy - 4y^2 = 0$

67. If $\arg\frac{\left(z - (10 + 6i)\right)}{\left(z - (4 + 2i)\right)} = \frac{\pi}{4}$ then the perimeter of locus of z is:

(A) $\sqrt{13}\left(\frac{\pi}{4}\right)$ (B) $3\sqrt{13}\,\pi$
(C) $3\sqrt{13}\left(\frac{\pi}{4}\right)$ (D) $3\sqrt{26}\left(\frac{\pi}{2}\right)$

68. The sum of all values of $\theta \in \left(0, \frac{\pi}{2}\right)$ satisfy $\sin^2 2\theta + \cos^4 2\theta = \frac{3}{4}$ is

(A) $\frac{\pi}{2}$ (B) π

(C) $\frac{3\pi}{8}$ (D) $\frac{5\pi}{4}$

69. The value of $\frac{1}{3^2+1} + \frac{1}{4^2+2} + \frac{1}{5^2+3} + \ldots\ldots\ldots\text{to } \infty$ is?

(A) $\frac{31}{13}$ (B) $\frac{13}{36}$

(C) $\frac{31}{36}$ (D) $\frac{1}{36}$

70. Let $x = \sin 1^o$, then the value of the expression $\frac{1}{\cos 0^o \cos 1^o} + \frac{1}{\cos 1^o \cos 2^o} + \frac{1}{\cos 2^o \cos 3^o} + \ldots + \frac{1}{\cos 44^o \cos 45^o}$ is equal to

(A) x (B) $\frac{1}{x}$

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

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.

71. If $\left({}^{40}C_0\right) + \left({}^{41}C_1\right) + \left({}^{42}C_2\right) + \ldots + \left({}^{60}C_{20}\right) = \frac{m}{n}\,{}^{60}C_{20}$, m and n are coprime, then maximum value of 'm + n' is equal to

72. Let $P(A \cap B) = \frac{1}{4}$ and $P(B) = \frac{1}{3}$, where $P\left(\frac{(A \cap B)}{(A \cup \bar{B})}\right) = \frac{k}{22}$, then 'k' is equal to

73. The line which contains all points (x, y, z) which are of the form $(x, y, z) = (2, -3, 4) + \lambda(1, 2, -3)$ intersects the plane $2x + 3y - z = 13$ at the point P and intersects the yz – plane at Q. If the distance between P and Q is $a\sqrt{b}$, where $a, b \in N$ and $a > 3$, then $\frac{a+b}{3}$ equals

74. Let S be the set (2, 3, 5, 7, 11). Suppose A and B are two matrices of order 2 each with distinct elements belonging to set S. The probability that the matrix AB has at least one odd entry is

75. If $\cos^{-1}\sqrt{p} + \cos^{-1}\sqrt{1-p} + \cos^{-1}\sqrt{1-q} = \frac{3\pi}{4}$ then q =