(a) $CH_3CH_2CONH_2$ (b) $(NH_2)_2CO$
(c) CH_3CONH_2 (d) CH_3NCO

150. $t_{1/4}$ can be taken as the time taken for the concentration of a reactant to drop to $\frac{3}{4}$ of its initial value. If the rate constant for a first order reaction is k, the $t_{1/4}$ can be written as :

(a) $0.75/k$ (b) $0.69/k$
(c) $0.29/k$ (d) $0.10/k$

Mathematics

1. If C is the mid point of AB and P is any point outside AB, then :

(a) $\vec{\mathbf{PA}} + \vec{\mathbf{PB}} + \vec{\mathbf{PC}} = \vec{\mathbf{0}}$

(b) $\vec{\mathbf{PA}} + \vec{\mathbf{PB}} + 2\vec{\mathbf{PC}} = \vec{\mathbf{0}}$

(c) $\vec{\mathbf{PA}} + \vec{\mathbf{PB}} = \vec{\mathbf{PC}}$

(d) $\vec{\mathbf{PA}} + \vec{\mathbf{PB}} = 2\vec{\mathbf{PC}}$

2. Let P be the point (1, 0) and Q a point on the locus $y^2 = 8x$. The locus of mid point of PQ is :

(a) $x^2 - 4y + 2 = 0$ (b) $x^2 + 4y + 2 = 0$
(c) $y^2 + 4x + 2 = 0$ (d) $y^2 - 4x + 2 = 0$

3. If in a frequency distribution, the Mean and Median are 21 and 22 respectively, then its Mode is approximately :

(a) 24.0 (b) 25.5
(c) 20.5 (d) 22.0

4. Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is :

(a) reflexive and symmetric only
(b) an equivalence relation
(c) reflexive only
(d) reflexive and transitive only

5. If $A^2 - A + I = 0$, then the inverse of A is :

(a) $I - A$ (b) $A - I$
(c) A (d) $A + I$

6. If the cube roots of unity are 1, ω, ω^2, then the roots of the equation $(x - 1)^3 + 8 = 0$, are :

(a) $-1, 1 + 2\omega, 1 + 2\omega^2$
(b) $-1, 1 - 2\omega, 1 - 2\omega^2$
(c) $-1, -1, -1$
(d) $-1, -1 + 2\omega, -1 - 2\omega^2$

7. $$\lim_{n \to \infty} \left[\frac{1}{n^2}\sec^2\frac{1}{n^2} + \frac{2}{n^2}\sec^2\frac{4}{n^2} + \dots + \frac{n}{n^2}\sec^2 1\right]$$ equals :

(a) $\frac{1}{2}\tan 1$ (b) $\tan 1$
(c) $\frac{1}{2}\operatorname{cosec} 1$ (d) $\frac{1}{2}\sec 1$

8. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is :

(a) $\frac{a}{b}$ (b) $\sqrt{ab}$
(c) ab (d) $2ab$

9. The differential equation representing the family of curves $y^2 = 2c(x + \sqrt{c})$, where $c > 0$, is a parameter, is of order and degree as follows :

(a) order 2, degree 2
(b) order 1, degree 3
(c) order 1, degree 1
(d) order 1, degree 2

10. ABC is a triangle. Forces $\vec{\mathbf{P}}, \vec{\mathbf{Q}}, \vec{\mathbf{R}}$ acting along IA, IB and IC respectively are in equilibrium, where I is the incentre of ΔABC. Then $\vec{\mathbf{P}} : \vec{\mathbf{Q}} : \vec{\mathbf{R}}$ is :

(a) $\cos A : \cos B : \cos C$
(b) $\cos\frac{A}{2} : \cos\frac{B}{2} : \cos\frac{C}{2}$
(c) $\sin\frac{A}{2} : \sin\frac{B}{2} : \sin\frac{C}{2}$
(d) $\sin A : \sin B : \sin C$

11. If the coefficients of r th, $(r + 1)$ th and $(r + 2)$ th terms in the binomial expansion of $(1 + y)^m$ are in AP, then m and r satisfy the equation :

(a) $m^2 - m(4r - 1) + 4r^2 + 2 = 0$
(b) $m^2 - m(4r + 1) + 4r^2 - 2 = 0$
(c) $m^2 - m(4r + 1) + 4r^2 + 2 = 0$
(d) $m^2 - m(4r - 1) + 4r^2 - 2 = 0$

12. In a triangle PQR, $\angle R = \frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0$, $a \neq 0$, then :

(a) $b = a + c$ (b) $b = c$
(c) $c = a + b$ (d) $a = b + c$

13. If the letters of the word SACHIN are arranged in all possible ways and these words are written out as in dictionary, then the word SACHIN appears at serial number :

(a) 602 (b) 603
(c) 600 (d) 601

14. The value of ${}^{50}C_4 + \sum_{r=1}^{6} {}^{56-r}C_3$ is :

(a) ${}^{56}C_4$ (b) ${}^{56}C_3$
(c) ${}^{55}C_3$ (d) ${}^{55}C_4$

15. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction ?

(a) $A^n = 2^{n-1}A + (n-1)I$
(b) $A^n = nA + (n-1)I$
(c) $A^n = 2^{n-1}A - (n-1)I$
(d) $A^n = nA - (n-1)I$

16. If the coefficient of x^7 in $\left[ax^2 + \left(\frac{1}{bx}\right)\right]^{11}$ equals the coefficient of x^{-7} in $\left[ax - \left(\frac{1}{bx^2}\right)\right]^{11}$, then a and b satisfy the relation :

(a) $ab = 1$ (b) $\frac{a}{b} = 1$
(c) $a + b = 1$ (d) $a - b = 1$

17. Let $f : (-1, 1) \rightarrow B$, be a function defined by $f(x) = \tan^{-1} \frac{2x}{1 - x^2}$, then f is both one-one and onto when B is the interval :

(a) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (b) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
(c) $\left[0, \frac{\pi}{2}\right)$ (d) $\left(0, \frac{\pi}{2}\right)$

18. If z_1 and z_2 are two non-zero complex numbers such that $|z_1 + z_2| = |z_1| + |z_2|$, then arg z_1 − arg z_2 is equal to :

(a) $-\frac{\pi}{2}$ (b) 0
(c) $-\pi$ (d) $\frac{\pi}{2}$

19. If $w = \frac{z}{z - \frac{1}{3}i}$ and $|w| = 1$, then z lies on :

(a) a parabola (b) a straight line
(c) a circle (d) an ellipse

20. If $a^2 + b^2 + c^2 = -2$ and

$$f(x) = \begin{vmatrix} 1 + a^2x & (1 + b^2)x & (1 + c^2)x \\ (1 + a^2)x & 1 + b^2x & (1 + c^2)x \\ (1 + a^2)x & (1 + b^2)x & 1 + c^2x \end{vmatrix},$$

then $f(x)$ is a polynomial of degree :

(a) 2 (b) 3
(c) 0 (d) 1

21. The system of equations

$\alpha x + y + z = \alpha - 1$
$x + \alpha y + z = \alpha - 1$
$x + y + \alpha z = \alpha - 1$

has no solution, if α is :

(a) 1 (b) not − 2
(c) either − 2 or 1 (d) − 2

22. The value of a for which the sum of the squares of the roots of the equation $x^2 - (a - 2)x - a - 1 = 0$ assume the least value is :

(a) 2 (b) 3
(c) 0 (d) 1

23. If the roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals :

(a) 1 (b) 2
(c) 3 (d) − 2

24. Suppose $f(x)$ is differentiable at $x = 1$ and $\lim_{h \to 0} \frac{1}{h} f(1 + h) = 5$, then $f'(1)$ equals :

(a) 6 (b) 5
(c) 4 (d) 3

25. Let f be differentiable for all x. If $f(1) = -2$ and $f'(x) \geq 2$ for $x \in [1, 6]$, then :

(a) $f(6) = 5$ (b) $f(6) < 5$
(c) $f(6) < 8$ (d) $f(6) \geq 8$

26. If f is a real-valued differentiable function satisfying $|f(x) - f(y)| \leq (x - y)^2$, $x, y \in R$ and $f(0) = 0$, then $f(1)$ equals :

(a) 1 (b) 2
(c) 0 (d) − 1

27. If x is so small that x^3 and higher powers of x may be neglected, then $\frac{(1 + x)^{3/2} - \left(1 + \frac{1}{2}x\right)^3}{(1 - x)^{1/2}}$ may be approximated as :

(a) $\frac{x}{2} - \frac{3}{8}x^2$ (b) $-\frac{3}{8}x^2$
(c) $3x + \frac{3}{8}x^2$ (d) $1 - \frac{3}{8}x^2$

28. If $x = \sum_{n=0}^{\infty} a^n$, $y = \sum_{n=0}^{\infty} b^n$, $z = \sum_{n=0}^{\infty} c^n$ where a, b, c are in AP and $|a| < 1, |b| < 1, |c| < 1$, then x, y, z are in :

(a) HP
(b) Arithmetico-Geometric Progression
(c) AP
(d) GP

29. In a triangle ABC, let $\angle C = \pi/2$, if r is the inradius and R is the circumradius of the triangle ABC, then $2(r + R)$ equals :

(a) $c + a$ (b) $a + b + c$
(c) $a + b$ (d) $b + c$

30. If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$, then $4x^2 - 4xy \cos \alpha + y^2$ is equal to :

(a) $-4 \sin^2 \alpha$ (b) $4 \sin^2 \alpha$
(c) 4 (d) $2 \sin 2\alpha$

31. If in a ΔABC, the altitudes from the vertices A, B, C on opposite sides are in HP, then $\sin A, \sin B, \sin C$ are in :

(a) HP
(b) Arithmetico-Geometric Progression
(c) AP
(d) GP

32. The normal to the curve $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ at any point 'θ' is such that :

(a) it is at a constant distance from the origin
(b) it passes through $(a\pi/2, -a)$
(c) it makes angle $\pi/2 + \theta$ with the x-axis
(d) it passes through the origin

33. A function is matched below against an interval where it is supposed to be increasing. Which of the following pairs is incorrectly matched ?

Interval	Function
(a) $(-\infty, -4]$	$x^3 + 6x^2 + 6$
(b) $\left(-\infty, \frac{1}{3}\right]$	$3x^2 - 2x + 1$
(c) $[2, \infty)$	$2x^3 - 3x^2 - 12x + 6$
(d) $(-\infty, \infty)$	$x^3 - 3x^2 + 3x + 3$

34. Let α and β be the distinct roots of $ax^2 + bx + c = 0$, then

$$\lim_{x \to \alpha} \frac{1 - \cos(ax^2 + bx + c)}{(x - \alpha)^2}$$ is equal to :

(a) $\frac{1}{2}(\alpha - \beta)^2$ (b) $-\frac{a^2}{2}(\alpha - \beta)^2$
(c) 0 (d) $\frac{a^2}{2}(\alpha - \beta)^2$

35. If $x\frac{dy}{dx} = y(\log y - \log x + 1)$, then the solution of the equation is :

(a) $\log\left(\frac{x}{y}\right) = cy$ (b) $\log\left(\frac{y}{x}\right) = cx$
(c) $x \log\left(\frac{y}{x}\right) = cy$ (d) $y \log\left(\frac{x}{y}\right) = cx$

36. The line parallel to the x-axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$, where $(a, b) \neq (0, 0)$ is :

(a) above the x-axis at a distance of (2/3) from it.
(b) above the x-axis at a distance of (3/2) from it.
(c) below the x-axis at a distance of (2/3) from it.
(d) below the x-axis at a distance of (3/2) from it.

37. A spherical iron ball 10 cm in radius is coated with a layer of ice of uniform thickness that melts at a rate of 50 cm^3/min. When the thickness of ice is 15 cm, then the rate at which the thickness of ice decreases, is :

(a) $\frac{5}{6\pi}$ cm/min (b) $\frac{1}{54\pi}$ cm/min
(c) $\frac{1}{18\pi}$ cm/min (d) $\frac{1}{36\pi}$ cm/min

38. $\int \left\{\frac{(\log x - 1)}{1 + (\log x)^2}\right\}^2 dx$ is equal to :

(a) $\frac{x}{(\log x)^2 + 1} + c$ (b) $\frac{xe^x}{1 + x^2} + c$
(c) $\frac{x}{x^2 + 1} + c$ (d) $\frac{\log x}{(\log x)^2 + 1} + c$

39. Let $f : R \to R$ be a differentiable function having $f(2) = 6$, $f'(2) = \left(\frac{1}{48}\right)$.

Then $\lim_{x \to 2} \int_6^{f(x)} \frac{4t^3}{x - 2} dt$ equals :

(a) 18 (b) 12
(c) 36 (d) 24

40. Let $f(x)$ be a non-negative continuous function such that the area bounded by the curve $y = f(x)$, x-axis and the ordinates $x = \pi/4$ and $x = \beta > \pi/4$ is $\left(\beta \sin \beta + \frac{\pi}{4} \cos \beta + \sqrt{2}\beta\right)$. Then $f\left(\frac{\pi}{2}\right)$ is :

(a) $\left(1-\frac{\pi}{4}+\sqrt{2}\right)$ (b) $\left(1-\frac{\pi}{4}-\sqrt{2}\right)$

(c) $\left(\frac{\pi}{4}-\sqrt{2}+1\right)$ (d) $\left(\frac{\pi}{4}+\sqrt{2}-1\right)$

41. If $I_1 = \int_0^1 2^{x^2} dx,\ I_2 = \int_0^1 2^{x^3} dx,$

$I_3 = \int_1^2 2^{x^2} dx$ and $I_4 = \int_1^2 2^{x^3} dx$, then :

(a) $I_3 > I_4$ (b) $I_3 = I_4$

(c) $I_1 > I_2$ (d) $I_2 > I_1$

42. The area enclosed between the curve $y = \log_e (x + e)$ and the co-ordinate axes is :

(a) 4 (b) 3

(c) 2 (d) 1

43. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines $x = 4, y = 4$ and the co-ordinate axes. If S_1, S_2, S_3 are respectively the areas of these parts numbered from top to bottom, then $S_1 : S_2 : S_3$ is :

(a) 1 : 1 : 1 (b) 2 : 1 : 2

(c) 1 : 2 : 3 (d) 1 : 2 : 1

44. If the plane $2ax - 3ay + 4az + 6 = 0$ passes through the mid point of the line joining the centres of the spheres $x^2 + y^2 + z^2 + 6x - 8y - 2z = 13$ and $x^2 + y^2 + z^2 - 10x + 4y - 2z = 8$, then a equals :

(a) 2 (b) -2

(c) 1 (d) -1

45. The distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} + 5\hat{j} + \hat{k}) = 5$ is :

(a) $\frac{10}{3}$ (b) $\frac{3}{10}$

(c) $\frac{10}{3\sqrt{3}}$ (d) $\frac{10}{9}$

46. For any vector $\vec{a}$, the value of $(\vec{a} \times \hat{i})^2 + (\vec{a} \times \hat{j})^2 + (\vec{a} \times \hat{k})^2$ is equal to :

(a) $4\vec{a}^2$ (b) $2\vec{a}^2$

(c) $\vec{a}^2$ (d) $3\vec{a}^2$

47. If non-zero numbers a, b, c are in HP, then the straight line $\frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$ always passes through a fixed point. That point is :

(a) $\left(1, -\frac{1}{2}\right)$ (b) $(1, -2)$

(c) $(-1, -2)$ (d) $(-1, 2)$

48. If a vertex of a triangle is $(1, 1)$ and the mid points of two sides through this vertex are $(-1, 2)$ and $(3, 2)$, then the centroid of the triangle is :

(a) $\left(\frac{1}{3}, \frac{7}{3}\right)$ (b) $\left(1, \frac{7}{3}\right)$

(c) $\left(-\frac{1}{3}, \frac{7}{3}\right)$ (d) $\left(-1, \frac{7}{3}\right)$

49. If the circles $x^2 + y^2 + 2ax + cy + a = 0$ and $x^2 + y^2 - 3ax + dy - 1 = 0$ intersect in two distinct points P and Q, then the line $5x + by - a = 0$ passes through P and Q for :

(a) exactly two values of a

(b) infinitely many values of a

(c) no value of a

(d) exactly one value of a

50. A circle touches the x-axis and also touches the circle with centre at $(0, 3)$ and radius 2. The locus of the centre of the circle is :

(a) a parabola (b) a hyperbola

(c) a circle (d) an ellipse

51. If a circle passes through the point (a, b) and cuts the circle $x^2 + y^2 = p^2$ orthogonally, then the equation of the locus of its centre is :

(a) $2ax + 2by - (a^2 + b^2 + p^2) = 0$

(b) $x^2 + y^2 - 2ax - 3by + (a^2 - b^2 - p^2) = 0$

(c) $2ax + 2by - (a^2 - b^2 + p^2) = 0$

(d) $x^2 + y^2 - 3ax - 4by + (a^2 + b^2 - p^2) = 0$

52. An ellipse has OB as semi minor axis, F and F' its foci and the angle FBF' is a right angle. Then the eccentricity of the ellipse is :

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{4}$

(c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

53. The locus of a point $P(\alpha, \beta)$ moving under the condition that the line $y = \alpha x + \beta$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is :

(a) a hyperbola (b) a parabola

(c) a circle (d) an ellipse

54. If the angle θ between the line $\frac{x+1}{1} = \frac{y-1}{2} = \frac{z-2}{2}$ and the plane $2x - y + \sqrt{\lambda}z + 4 = 0$ is such that $\sin\theta = \frac{1}{3}$. The value of λ is :

(a) $-\frac{4}{3}$ (b) $\frac{3}{4}$

(c) $-\frac{3}{5}$ (d) $\frac{5}{3}$

55. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is :

(a) 30° (b) 45°

(c) 90° (d) 0°

56. Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$, where $\overline{A}$ stands for complement of event A. Then events A and B are :

(a) mutually exclusive and independent

(b) independent but not equally likely

(c) equally likely but not independent

(d) equally likely and mutually exclusive

57. Three houses are available in a locality. Three persons apply for the houses. Each applies for one house without consulting others. The probability that all the three apply for the same house, is :

(a) 7/9 (b) 8/9

(c) 1/9 (d) 2/9

58. A random variable X has Poisson distribution with mean 2. Then $P(X > 1.5)$ equals :

(a) $\frac{3}{e^2}$ (b) $1 - \frac{3}{e^2}$

(c) 0 (d) $\frac{2}{e^2}$

59. Two points A and B move from rest along a straight line with constant acceleration f and f' respectively. If A takes m sec more than B and describes 'n' unit more than B in acquiring the same speed, then :

(a) $(f' - f)n = \frac{1}{2} ff' m^2$

(b) $\frac{1}{2}(f + f')m = ff' n^2$

(c) $(f + f')m^2 = ff' n$

(d) $(f - f')m^2 = ff' n$

60. A lizard, at an initial distance of 21 cm behind an insect, moves from rest with an acceleration of 2 cm/s^2 and pursues the insect which is crawling uniformly along a straight line at a speed of 20 cm/s. Then the lizard will catch the insect after :

(a) 24 s (b) 21 s

(c) 1 s (d) 20 s

61. The resultant R of two forces acting on a particle is at right angles to one of them and its magnitude is one third of the other force. The ratio of larger force to smaller one is :

(a) $3 : 2\sqrt{2}$ (b) $3 : 2$

(c) $3 : \sqrt{2}$ (d) $2 : 1$

62. Let $\vec{a} = \hat{i} - \hat{k}$, $\vec{b} = x\hat{i} + \hat{j} + (1 - x)\hat{k}$ and $\vec{c} = y\hat{i} + x\hat{j} + (1 + x - y)\hat{k}$. Then $[\vec{a}\ \vec{b}\ \vec{c}]$ depends on :

(a) neither x nor y (b) both x and y

(c) only x (d) only y

63. Let a, b and c be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}$, $\hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane, then c is :

(a) the harmonic mean of a and b

(b) equal to zero

(c) the arithmetic mean of a and b

(d) the geometric mean of a and b

64. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are non-coplanar vectors and λ is a real number, then

$$[\lambda(\vec{a} + \vec{b})\ \ \lambda^2 \vec{b}\ \ \lambda \vec{c}] = [\vec{a}\ \ \vec{b} + \vec{c}\ \ \vec{b}]$$

for :

(a) exactly two values of λ

(b) exactly three values of λ

(c) no value of λ

(d) exactly one value of λ

65. A and B are two like parallel forces. A couple of moment H lies in the plane of A and B and is contained with them. The resultant of A and B after combining is displaced through a distance :

(a) $\frac{H}{A - B}$ (b) $\frac{H}{2(A + B)}$

(c) $\frac{H}{A + B}$ (d) $\frac{2H}{A - B}$

66. The sum of the series

$$1 + \frac{1}{4 \cdot 2!} + \frac{1}{16 \cdot 4!} + \frac{1}{64 \cdot 6!} + \ldots \infty \text{ is :}$$

(a) $\frac{e + 1}{2\sqrt{e}}$ (b) $\frac{e - 1}{2\sqrt{e}}$

(c) $\frac{e + 1}{\sqrt{e}}$ (d) $\frac{e - 1}{\sqrt{e}}$

67. Let $x_1, x_2, \ldots, x_n$ be n observations such that $\Sigma x_i^2 = 400$ and $\Sigma x_i = 80$. Then a possible value of n among the following is :

(a) 12 (b) 9

(c) 18 (d) 15

68. A particle is projected from a point O with velocity u at an angle of 60° with the horizontal. When it is moving in a direction at right angle to its direction at O, then its velocity is given by :

(a) $\frac{u}{\sqrt{3}}$ (b) $\frac{2u}{3}$

(c) $\frac{u}{2}$ (d) $\frac{u}{3}$

69. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then k lies in the interval :

(a) $[4, 5]$ (b) $(-\infty, 4)$

(c) $(6, \infty)$ (d) $(5, 6]$

70. If $a_1, a_2, a_3, \ldots\ldots, a_n, \ldots$ are in GP, then the determinant

$$\Delta = \begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$$

is equal to :

(a) 2 (b) 4

(c) 0 (d) 1

71. A real valued function $f(x)$ satisfies the functional equation

$f(x - y) = f(x)\,f(y) - f(a - x)\,f(a + y)$

where a is a given constant and $f(0) = 1$, $f(2a - x)$ is equal to :

(a) $f(-x)$ (b) $f(a) + f(a - x)$

(c) $f(x)$ (d) $-f(x)$

72. If the equation

$a_n x^n + a_{n-1}x^{n-1} + \ldots\ldots + a_1 x = 0,$

$a_1 \neq 0$, $n \geq 2$, has a positive root $x = \alpha$, then the equation

$na_n x^{n-1} + (n-1)a_{n-1}x^{n-2} + \ldots + a_1 = 0$ has a positive root, which is :

(a) equal to α

(b) greater than or equal to α

(c) smaller than α

(d) greater than α

73. The value of $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1 + a^x}\,dx$, $a > 0$, is :

(a) 2π (b) $\frac{\pi}{a}$

(c) $\frac{\pi}{2}$ (d) $a\pi$

74. The plane $x + 2y - z = 4$ cuts the sphere $x^2 + y^2 + z^2 - x + z - 2 = 0$ in a circle of radius :

(a) $\sqrt{2}$ (b) 2

(c) 1 (d) 3

75. If the pair of lines $ax^2 + 2(a + b)xy + by^2 = 0$ lie along diameters of a circle and divide the circle into four sectors such that the area of one of the sectors is thrice the area of another sector, then :

(a) $3a^2 + 2ab + 3b^2 = 0$

(b) $3a^2 + 10ab + 3b^2 = 0$

(c) $3a^2 - 2ab + 3b^2 = 0$

(d) $3a^2 - 10ab + 3b^2 = 0$

ANSWERS

PHYSICS AND CHEMISTRY

1.	(d)	2.	(c)	3.	(a)	4.	(c)	5.	(d)	6.	(c)	7.	(c)	8.	(*)
9.	(d)	10.	(c)	11.	(d)	12.	(a)	13.	(b)	14.	(d)	15.	(d)	16.	(a)
17.	(c)	18.	(c)	19.	(b)	20.	(c)	21.	(a)	22.	(b)	23.	(a,d)	24.	(c)
25.	(c)	26.	(c)	27.	(b)	28.	(d)	29.	(c)	30.	(b)	31.	(c)	32.	(a)
33.	(c)	34.	(c)	35.	(a)	36.	(b)	37.	(d)	38.	(a)	39.	(b)	40.	(a)
41.	(a)	42.	(a)	43.	(c)	44.	(c)	45.	(c)	46.	(b)	47.	(d)	48.	(b)
49.	(b)	50.	(b)	51.	(d)	52.	(d)	53.	(a)	54.	(a)	55.	(a)	56.	(d)
57.	(a)	58.	(b)	59.	(a)	60.	(c)	61.	(b)	62.	(a)	63.	(d)	64.	(c)
65.	(c)	66.	(b)	67.	(c)	68.	(c)	69.	(a)	70.	(c)	71.	(a)	72.	(d)
73.	(d)	74.	(a)	75.	(c)	76.	(d)	77.	(c)	78.	(a)	79.	(c)	80.	(b)
81.	(c)	82.	(d)	83.	(d)	84.	(b)	85.	(b)	86.	(a)	87.	(a)	88.	(d)
89.	(d)	90.	(a)	91.	(b)	92.	(c)	93.	(d)	94.	(c)	95.	(d)	96.	(a)
97.	(a)	98.	(d)	99.	(b)	100.	(b)	101.	(b)	102.	(b)	103.	(a)	104.	(c)
105.	(d)	106.	(d)	107.	(a)	108.	(c)	109.	(c)	110.	(a)	111.	(b)	112.	(c)
113.	(d)	114.	(c)	115.	(a)	116.	(d)	117.	(b)	118.	(c)	119.	(c)	120.	(b)
121.	(c)	122.	(b)	123.	(a)	124.	(b)	125.	(b)	126.	(c)	127.	(b)	128.	(a)
129.	(a)	130.	(c)	131.	(c)	132.	(b)	133.	(b)	134.	(c)	135.	(d)	136.	(b)
137.	(c)	138.	(c)	139.	(b)	140.	(d)	141.	(d)	142.	(a)	143.	(d)	144.	(d)
145.	(c)	146.	(c)	147.	(d)	148.	(a)	149.	(b)	150.	(c)				

* No option is matching

MATHEMATICS

1.	(d)	2.	(c)	3.	(a)	4.	(d)	5.	(a)	6.	(b)	7.	(a)	8.	(d)
9.	(b)	10.	(b)	11.	(b)	12.	(c)	13.	(d)	14.	(a)	15.	(d)	16.	(a)
17.	(a)	18.	(b)	19.	(b)	20.	(a)	21.	(d)	22.	(d)	23.	(a)	24.	(b)
25.	(d)	26.	(c)	27.	(b)	28.	(a)	29.	(c)	30.	(b)	31.	(c)	32.	(a,c)
33.	(b)	34.	(a)	35.	(b)	36.	(d)	37.	(c)	38.	(a)	39.	(a)	40.	(a)
41.	(c)	42.	(d)	43.	(a)	44.	(b)	45.	(c)	46.	(b)	47.	(b)	48.	(b)
49.	(c)	50.	(a)	51.	(a)	52.	(d)	53.	(a)	54.	(d)	55.	(c)	56.	(b)
57.	(c)	58.	(b)	59.	(a)	60.	(b)	61.	(a)	62.	(a)	63.	(d)	64.	(c)
65.	(c)	66.	(a)	67.	(c)	68.	(a)	69.	(b)	70.	(c)	71.	(d)	72.	(c)
73.	(c)	74.	(c)	75.	(a)										