PAPER – II

MATHEMATICS

1. R is the set of real numbers and $f : R \to R$ and $g : R \to R$ are defined by $f(x) = 3x^2 + 2$ and $g(x) = 3x - 1$ for all $x \in R$. Then

(a) $(fog)(x) = 27x^2 - 18x + 5$ (b) $(fog)(x) = 27x^2 + 18x - 5$

(c) $(gof)(x) = 9x^2 - 5$ (d) $(gof)(x) = 9x^2 + 6$

2. If the function $f(x) = (\cos x)^{1/x}$, $x \neq 0$

$= K$, $x = 0$,

is continuous at $x = 0$, then the value of K is

(a) 1 (b) –1 (c) 0 (d) e

3. $\int_4^5 (|x-4| + |x-5|)\,dx$ is equal to

(a) 1 (b) 2 (c) 0 (d) 4

4. The area of the figure bounded by the curves $y = \cos x$ and $y = \sin x$ and the ordinates $x = 0$ and $x = \frac{\pi}{4}$ is

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

5. Given that 'a' is a fixed complex number, and 'λ' is a scalar variable, the point z satisfying $z = a(1 + i\lambda)$ traces out

(a) a straight line through the point 'a'

(b) a circle with centre at the point 'a'

(c) a straight line through the point 'a' and perpendicular to the join of 0 and that point 'a'

(d) none of these

6. The value of a for which $2x^2 - 2(2a+1)x + a(a+1) = 0$ may have one root less than a and other root greater than a are given by

(a) $1 > a > 0$ (b) $-1 < a < 0$

(c) $a \geq 0$ (d) $a > 0$ or $a < -1$

7. If the quadratic equations $ax^2 + 2cx + b = 0$ and $ax^2 + 2bx + c = 0$ $(b \neq c)$ have a common root, then $a + 4b + 4c$ is equal to

(a) –2 (b) –1 (c) 0 (d) 1

8. The number of non-negative integral solutions of $x + y + z \leq n$, where $n \in N$ is

(a) ${}^{n+3}C_3$ (b) ${}^{n+4}C_4$ (c) ${}^{n+5}C_5$ (d) none of these

9. The straight line $x + y = k$ touches the parabola $y = x - x^2$, if k is equal to

(a) 0 (b) -1 (c) 1 (d) none of these

10. Maximum value of $\sin x \sin(60° - x)\sin(60° + x)$ is

(a) $-\dfrac{1}{4}$ (b) $\dfrac{1}{4}$ (c) $\dfrac{3}{4}$ (d) none of these

11. The straight line passing through the point of intersection of the straight lines $x - 3y + 1 = 0$ and $2x + 5y - 9 = 0$ and having infinite slope and at a distance 2 units form the origin has the equation

(a) $x = 2$ (b) $3x + 4y - 1 = 0$ (c) $y = 1$ (d) none of these

12. The equation of the circle which touches the axes of co-ordinates and the line $\dfrac{x}{3} + \dfrac{y}{4} = 1$ and whose centre lies in the Ist quadrant is $x^2 + y^2 - 2cx - 2cy + c^2 = 0$, where c is equal to

(a) 1 (b) 2 (c) 3 (d) none of these

13. A line is drawn through a fixed point $P(\alpha, \beta)$ to cut the circle $x^2 + y^2 = r^2$ at A and B. Then $PA.PB$ is equal to

(a) $(\alpha + \beta)^2 - r^2$ (b) $\alpha^2 + \beta^2 - r^2$ (c) $(\alpha - \beta)^2 + r^2$ (d) none of these

14. If $a^{1/x} = b^{1/y} = c^{1/z}$ and a, b, c are in G.P., then x, y, z are in

(a) A.P. (b) G.P. (c) H.P. (d) none of these

15. If $z = x + iy$ and $w = \dfrac{1 - iz}{z - i}$, then $|w| = 1$ implies that in the complex plane

(a) z lies on the imaginary axis (b) z lies on the real axis
(c) z lies on the unit circle (d) none of these

16. If $(1 + x)^n = c_0 + c_1x + c_2x^2 + \ldots.. + c_nx^n$, then for n odd, $c_1^2 + c_3^2 + c_5^2 + \ldots\ldots + c_n^2$ is equal to

(a) 2^{2n-2} (b) 2^n (c) $\dfrac{2n\,!}{2(n\,!)^2}$ (d) $\dfrac{2n\,!}{(n\,!)^2}$

17. $\lim\limits_{x \to 2} (-1)^{[x]}$, where $[x]$ is the greatest integer function, is equal to

(a) 1 (b) -1 (c) ± 1 (d) does not exist

138. Assuming that f is continuous everywhere $\dfrac{1}{c}\displaystyle\int_{ac}^{bc} f\left(\dfrac{x}{c}\right) dx$ is equal to

(a) $\dfrac{1}{c}\displaystyle\int_a^b f(x)\,dx$ (b) $\displaystyle\int_a^b f(x)\,dx$ (c) $c\displaystyle\int_a^b f(x)\,dx$ (d) $\displaystyle\int_{ac^2}^{bc^2} f(x)\,dx$

19. The value of the integral $\int_0^{\pi/2} \frac{\phi(x)}{\phi(x)+\phi\left(\frac{\pi}{2}-x\right)}\,dx$ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) π (d) none of these

20. If the roots α, β of the equation $\frac{x^2-bx}{ax-c}=\frac{\lambda-1}{\lambda+1}$ are such that $\alpha+\beta=0,$ then the value of λ is

(a) $\frac{1}{c}$ (b) 0 (c) $\frac{a-b}{a+b}$ (d) $\frac{a+b}{a-b}$

21. The value of $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ca \\ 1 & c & c^2-ab \end{vmatrix}$ is

(a) zero (b) abc (c) $4abc$ (d) 1

22. The equation of the directrix of the parabola $y^2+4y+4x+2=0$ is

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

23. The equation of the plane passing through the line $\frac{x-1}{5}=\frac{y+2}{6}=\frac{z-3}{4}$ and the point (4, 3, 7) is

(a) $4x+8y+7z=41$ (b) $4x-8y+7z=41$

(c) $4x-8y-7z=41$ (d) $4x-8y+7z=39$

24. The value of a so that the volume of parallelepiped formed by vectors $\hat{i}+a\hat{j}+\hat{k},\ \hat{j}+a\hat{k},\ a\hat{i}+\hat{k}$ becomes minimum is

(a) $\sqrt{3}$ (b) 2 (c) $\frac{1}{\sqrt{3}}$ (d) 3

25. If $x=a\left(t+\frac{1}{t}\right),\ y=a\left(t-\frac{1}{t}\right),$ then $\frac{dy}{dx}$ is equal to

(a) $\frac{t^2-1}{t^2+1}$ (b) $\frac{t^2+1}{t^2-1}$ (c) $\frac{t^2+1}{1-t^2}$ (d) none of these

26. If $x\{f(x)\}^3+x\{f(x)\}=6,\ f(3)=1$, then $f'(3)$ is equal to

(a) -1 (b) $-\frac{1}{2}$ (c) $-\frac{1}{4}$ (d) $-\frac{1}{6}$

27. A mapping is selected at random from all the mappings of the set $A = \{1, 2, ..., n\}$ into itself. The probability that the mapping selected is one-one is

(a) $\frac{1}{n^n}$ (b) $\frac{1}{n!}$ (c) $\frac{(n-1)!}{n^{n-1}}$ (d) $\frac{n!}{n^{n-1}}$

28. The equation of the plane parallel to the line $\frac{x+3}{-3} = \frac{y-3}{2} = \frac{z+2}{1}$ and passing through the point $(0, 7, -7)$ is

(a) $x + y + z = 1$ (b) $x - y - z = 0$

(c) $x + y + z = 0$ (d) $x + y - z = 14$

29. If in any ΔABC $\frac{r}{r_1} = \frac{r_2}{r_3}$, then (where r, r_1, r_2, r_3 have usual meaning)

(a) $A = 90°$ (b) $B = 90°$ (c) $C = 90°$ (d) none of these

30. If the ellipse $\frac{x^2}{k^2a^2} + \frac{y^2}{a^2} = 1$ and the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$ are confocal, then the value of k is

(a) ± 1 (b) $\pm \sqrt{2}$ (c) $\pm\sqrt{3}$ (d) none of these

31. The minimum value of $P = x + 3y$, subject to $2x + y \geq 6$, $x + y \geq 4$, $x \geq 0$, $y \geq 0$, is

(a) 8 (b) 7 (c) 6 (d) 5

32. The value of p such that the vectors $\hat{i} + 3\hat{j} - 2\hat{k}$, $2\hat{i} - \hat{j} + 4\hat{k}$ and $3\hat{i} + 2\hat{j} + p\hat{k}$ are coplanar is

(a) 4 (b) 2 (c) 8 (d) 10

33. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, then A^2 is equal to

(a) A (b) $2A$ (c) unit matrix (d) $3A$

34. The roots of the equation $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x-1 & 1 \\ 1 & 1 & x-1 \end{vmatrix} = 0$ are

(a) 1, 2 (b) –1, 2 (c) 1, –2 (d) –1, –2

35. The inverse of $\begin{bmatrix} 3 & -2 \\ -7 & 5 \end{bmatrix}$ is

(a) $\begin{bmatrix} 3 & -7 \\ -2 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 5 & -2 \\ -7 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 5 & 2 \\ 7 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} -3 & 7 \\ -2 & 5 \end{bmatrix}$

36. k is a scalar and A is a n-square matrix. Then $|kA|$ is equal to

(a) $k|A|^n$ (b) $k|A|$ (c) $k^n|A|^n$ (d) $k^n|A|$

37. Let $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$. Then A^n is equal to

(a) $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & n \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2^n \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & n \\ 0 & 2 \end{bmatrix}$

38. In a triangle ABC if $a = 2,\ B = 60^\circ$ and $C = 75^\circ$, then b is equal to

(a) $\sqrt{3}$ (b) $\sqrt{6}$ (c) $\sqrt{9}$ (d) $1+\sqrt{2}$

39. The value of $\cos^{-1}\frac{2}{\sqrt{5}} + \tan^{-1}\frac{1}{3}$ is equal to

(a) $\tan^{-1}\frac{2}{3\sqrt{5}}$ (b) $\frac{\pi}{4}$ (c) $\tan^{-1}\frac{1}{7}$ (d) $\frac{\pi}{3}$

40. The value of $(1+i)^5 + (1-i)^5$ is equal to

(a) –8 (b) $8i$ (c) 8 (d) 32

41. The value of $\cos[\tan^{-1}\{\sin(\cot^{-1} x)\}]$ is equal to

(a) $\left(\frac{x^2+2}{x^2+3}\right)^{\frac{1}{2}}$ (b) $\left(\frac{x^2+3}{x^2+4}\right)^{\frac{1}{2}}$ (c) $\left(\frac{x^2+1}{x^2+2}\right)^{\frac{1}{2}}$ (d) x

42. The angle between the pair of lines given by $3x^2 + 5xy - 2y^2 + x + 9y - 4 = 0$ is

(a) $\tan^{-1} 7$ (b) $\tan^{-1} 5$ (c) 90° (d) $\tan^{-1}\frac{1}{3}$

43. For the circles $x^2 + y^2 - 2x + 3y + k = 0$ and $x^2 + y^2 + 8x - 6y - 7 = 0$ to cut each other orthogonally the value of k must be

(a) –10 (b) 1 (c) 5 (d) –3

44. The equation to the parabola with focus (2, 0) and the directrix $x + 3 = 0$ is

(a) $y^2 - 10x + 5 = 0$ (b) $y^2 - 10x - 5 = 0$

(c) $x^2 - 10y + 5 = 0$ (d) $x^2 - 10y - 5 = 0$

45. If P is any point on the ellipse $9x^2 + 36y^2 = 324$ whose foci are S and S'. Then $SP + S'P$ is equal to

(a) 9 (b) 12 (c) 27 (d) 36

46. The value of $\int_0^{\pi/2} \frac{dx}{a^2\cos^2 x + b^2 \sin^2 x}$ is equal to

(a) $2\pi\, ab$ (b) $\pi\, a^2b^2$ (c) $\frac{\pi}{a^2b^2}$ (d) $\frac{\pi}{2ab}$

47. The value of $\int_0^{\pi/2} \log \sin x\, dx$ is equal to

(a) $\frac{\pi}{2}\log\frac{1}{2}$ (b) $\frac{\pi}{2}\log 2$ (c) $\pi \log 2$ (d) $-\pi\log 2$

48. $\lim_{n\to\infty}\left[\frac{1}{n+1}+\frac{1}{n+2}+\text{....to } n \text{ terms}\right]$ is equal to

(a) $\log 2$ (b) $\log 3$ (c) $\log\frac{1}{2}$ (d) $2\log 2$

49. The area enclosed within the curve $|x|+|y|=1$ is

(a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) 4

50. The area bounded by the curve $y = x^2 - 7x + 10$ and the x-axis is

(a) $\frac{5}{2}$ (b) $\frac{11}{3}$ (c) $\frac{9}{2}$ (d) $\frac{3}{2}$

51. If $\vec{a} = \hat{i} + \hat{j}, \vec{b} = \hat{j} + \hat{k}$ and $\vec{c} = \hat{k} + \hat{i}$, then a unit vector parallel to $\vec{a}+\vec{b}+\vec{c}$ is

(a) $2\hat{i}+2\hat{j}+2\hat{k}$ (b) $\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$ (c) $\frac{\hat{i}+\hat{j}+\hat{k}}{2\sqrt{3}}$ (d) $\frac{\vec{a}+\vec{b}+\vec{c}}{\sqrt{3}}$

52. $\lim_{n\to\infty}\left[1+\frac{2}{n}\right]^{2n}$ is equal to

(a) e (b) e^2 (c) e^4 (d) e^6

53. If $x^y = e^{x-y}$, then $\frac{dy}{dx}$ is equal to

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

54. The length of the sub-tangent to the curve $x^m y^n = a^{m+n}$ at any point (x_1, y_1) on it is

(a) $\left|\frac{mx_1}{n}\right|$ (b) $\left|\frac{ny_1}{m}\right|$ (c) $\left|\frac{my_1}{n}\right|$ (d) $\left|\frac{nx_1}{m}\right|$

55. The angle between the curves $xy = 2$ and $y^2 = 4x$ at their point of intersection is

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

56. The locus of the centre of a circle which touches externally two given circles is

(a) a hyperbola (b) an ellipse
(c) a parabola (d) circle

57. The eccentricity of the rectangular hyperbola is

(a) e (b) $\frac{1}{\sqrt{2}}$ (c) $\sqrt{2}$ (d) $\sqrt{3}$

58. 1.1! + 2.2! + 3.3!+…..+$n.n$! is equal to

(a) $(n+1)!$ (b) $(n+1)!+1$ (c) $(n+1)!-1$ (d) $n(n+1)!$

59. A parallelogram is cut by two sets of m lines parallel to the sides, the number of parallelograms thus formed is

(a) $\frac{m^2}{4}$ (b) $\frac{(m+1)^2}{4}$
(c) $\frac{(m+2)^2}{4}$ (d) $\frac{(m+1)^2(m+2)^2}{4}$

60. The last digit of the number 6^{500} is

(a) 8 (b) 2 (c) 6 (d) 0

61. Let t_r denote the r^{th} term of an A.P. If $t_m = \frac{1}{n}$ and $t_n = \frac{1}{m}$, then t_{mn} equal to

(a) $\frac{1}{mn}$ (b) $\frac{1}{m}+\frac{1}{n}$ (c) 1 (d) 0

62. If $4a^2 + 9b^2 + 16c^2 = 2(3ab + 6bc + 4ca)$, where a, b, c are non-zero numbers, then a, b, c are in

(a) A.P. (b) G.P. (c) H.P. (d) none of these

63. The minimum value of $4^x + 4^{1-x}, x \in R,$ is

(a) 2 (b) 4 (c) 1 (d) none of these

64. The sum of the real roots of the equation $x^2 + |x| - 6 = 0$ is

(a) 4 (b) 0 (c) – 1 (d) none of these

65. If $[x]^2 = [x+2]$, (where [.] denotes greatest integer function), then x must not be

(a) $x = 2, -1$ (b) $x \in [2, 3)$ (c) $x \in [-1, 0)$ (d) none of these

66. If one root of the equation $(k^2+1)x^2 + 13x + 4k = 0$ is reciprocal of the other, then k can be

(a) $-2+\sqrt{3}$ (b) $2-\sqrt{3}$ (c) 1 (d) none of these

67. The value of $(1+i)^3 + (1-i)^6$ is

(a) i (b) $2(-1+5i)$ (c) $1-5i$ (d) none of these

68. If $|z| = 1$, then $\dfrac{1+z}{1+\bar{z}}$ is equal to

(a) z (b) $\bar{z}$ (c) $z+\bar{z}$ (d) none of these

69. The number of 5-digit numbers in which no two consecutive digits are identical is

(a) $9^2 \times 8^3$ (b) 9×8^4 (c) 9^5 (d) none of these

70. In an examination of 9 papers a candidate has to pass in more papers than the number of papers in which he fails in order to be successful. The number of ways in which he can be unsuccessful is

(a) 255 (b) 256 (c) 193 (d) 319

71. The value of $\begin{vmatrix} x & x^2-yz & 1 \\ y & y^2-zx & 1 \\ z & z^2-xy & 1 \end{vmatrix}$ is

(a) 1 (b) -1 (c) 0 (d) $-xyz$

72. A value of c for which the system of equations $x+y=1$, $(c+2)x+(c+4)y=6$, $(c+2)^2x+(c+4)^2y=36$ is solvable (consistent) is

(a) 1 (b) -2 (c) 4 (d) none of these

73. In the expansion of $\left(x^3-\dfrac{1}{x^2}\right)^n, n \in N$, if the sum of the coefficients of x^5 and x^{10} is 0, then n is

(a) 25 (b) 20 (c) 15 (d) none of these

74. The middle term in the expansion of $\left(\dfrac{2x}{3}-\dfrac{3}{2x^2}\right)^{2n}$ is

(a) ${}^{2n}C_n$ (b) $(-1)^n \dfrac{(2n)!}{(n!)^2} \cdot x^{-n}$ (c) ${}^{2n}C_n \cdot \dfrac{1}{x^n}$ (d) none of these

75. If $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$ and $B=\begin{bmatrix}a^2 & ab & ac\\ ba & b^2 & bc\\ ca & cb & c^2\end{bmatrix}$, then AB is equal to

(a) O (b) I (c) $2I$ (d) none of these

76. If $\begin{bmatrix}x+y & y\\ 2x & x-y\end{bmatrix}\begin{bmatrix}2\\ -1\end{bmatrix}=\begin{bmatrix}3\\ 2\end{bmatrix}$, then xy is equal to

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

77. If $\cos(x-y)$, $\cos x$ and $\cos(x+y)$ are in H.P., then $\left|\cos x \sec\frac{y}{2}\right|$ equals

(a) 1 (b) 2 (c) $\sqrt{2}$ (d) none of these

78. If $\cos\alpha=\frac{1}{2}\left(x+\frac{1}{x}\right)$, $\cos\beta=\frac{1}{2}\left(y+\frac{1}{y}\right)$, then $\cos(\alpha-\beta)$ is equal to

(a) $\frac{x}{y}+\frac{y}{x}$ (b) $xy+\frac{1}{xy}$ (c) $\frac{1}{2}\left(\frac{x}{y}+\frac{y}{x}\right)$ (d) none of these

79. The number of solutions of $\sin^2\theta+3\cos\theta=3$ in $[-\pi, \pi]$ is

(a) 4 (b) 2 (c) 0 (d) none of these

80. The principal value of $\cos^{-1}\left\{\frac{1}{\sqrt{2}}\left(\cos\frac{9\pi}{10}-\sin\frac{9\pi}{10}\right)\right\}$ is

(a) $\frac{3\pi}{20}$ (b) $\frac{7\pi}{20}$ (c) $\frac{7\pi}{10}$ (d) none of these

81. The solution set of $\log_2|4-5x|>2$ is

(a) $\left(\frac{8}{5},\infty\right)$ (b) $\left(\frac{4}{5},\frac{8}{5}\right)$

(c) $(-\infty, 0)\cup\left(\frac{8}{5},\infty\right)$ (d) none of these

82. In a ΔABC, $(c+a+b)(a+b-c)=ab$, then the measure of $\angle C$ is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{6}$ (c) $\frac{2\pi}{3}$ (d) none of these

83. A vertical lamppost, 6 m high, stands at a distance of 2 m from a wall, 4 m high. A 1.5 m tall man starts to walk away from the wall on the other side of the wall, in line with the lamppost. The maximum distance to which the man can walk remaining in the shadow is

(a) $\frac{5}{2}$ m (b) $\frac{3}{2}$ m (c) 4 m (d) none of these

84. The equation of the straight line which bisects the intercepts made by the axes on the lines $x + y = 2$ and $2x + 3y = 6$ is

(a) $2x = 3$ (b) $y = 1$ (c) $2y = 3$ (d) $x = 1$

85. If the lines $y - x = 5$, $3x + 4y = 1$ and $y = mx + 3$ are concurrent, then the value of m is

(a) $\frac{19}{5}$ (b) 1 (c) $\frac{5}{19}$ (d) none of these

86. A point on the line $y = x$ whose perpendicular distance from the line $\frac{x}{4}+\frac{y}{3}=1$ is 4, has the co-ordinates

(a) $\left(\frac{8}{7},\frac{8}{7}\right)$ (b) $\left(\frac{32}{7},\frac{32}{7}\right)$ (c) $\left(\frac{3}{2},\frac{3}{2}\right)$ (d) none of these

87. If $2(x^2+y^2)+4\lambda x+\lambda^2=0$ represents a circle of meaningful radius then the range of real values of λ is

(a) R (b) $(0, \infty)$ (c) $(-\infty, 0)$ (d) none of these

88. If the line $\lambda x + \mu y = 1$ is a normal to the circle $2x^2+2y^2-5x+6y-1=0$, then

(a) $5\lambda - 6\mu = 2$ (b) $4 + 5\mu = 6\lambda$ (c) $4 + 6\mu = 5\lambda$ (d) none of these

89. If $(2, -8)$ is an end of a focal chord of the parabola $y^2=32x$, then the coordinates of other end of the chord is

(a) (32, 32) (b) (32, – 32) (c) (–2, 8) (d) none of these

90. The triangle formed by the tangents to a parabola $y^2=4ax$ at the ends of the latus rectum and the double ordinate through the focus is

(a) equilateral
(b) isosceles
(c) right-angled isosceles
(d) dependent on the value of a for its classification

91. If two foci of an ellipse be $(-2, 0)$ and $(2, 0)$ and its eccentricity is $\frac{2}{3}$, then the ellipse has the equation

(a) $5x^2+9y^2=45$ (b) $9x^2+5y^2=45$
(c) $5x^2+9y^2=90$ (d) $9x^2+5y^2=90$

92. The foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{b^2}=1$ and the hyperbola $\frac{x^2}{144}-\frac{y^2}{81}=\frac{1}{25}$ coincide, then the value of b^2 is

(a) 5 (b) 7 (c) 9 (d) 1

93. The domain of the function $f(x) = \sin^{-1}(x+[x])$, where [.] denotes the greatest integer function, is

(a) $[0, 1)$ (b) $[-1, 1]$ (c) $(-1, 0)$ (d) none of these

94. Let $f(x) = x + n - [x+n] + \tan\frac{\pi x}{2}$, where $[x]$ is the greatest integer $\leq x$ and $n \in N$, then $f(x)$ is

(a) a periodic function with period 1 (b) a periodic function with period 4
(c) not a periodic function (d) a periodic function with period 2

95. If the function $f : R \to R$ be such that $f(x) = x - [x]$, (where [.] denotes the greatest integer function), then $f^{-1}(x)$ is

(a) $\frac{1}{x-[x]}$ (b) $[x]-x$ (c) not defined (d) none of these

96. If $x = e^{y+e^{y+\ldots\ldots \text{ to } \infty}}$, then $\frac{dy}{dx}$ is

(a) $\frac{x}{1+x}$ (b) $\frac{1}{x}$ (c) $\frac{1-x}{x}$ (d) none of these

97. $\lim\limits_{x\to 0}\left\{\frac{\log_e(1+x)}{x^2}+\frac{x-1}{x}\right\}$ is equal to

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 1 (d) none of these

98. If $f(x) = |x-1| - [x]$, (where [.] denotes the greatest integer function), then

(a) $f(1+0) = -1, f(1-0) = 0$ (b) $f(1+0) = 0 = f(1-0)$
(c) $\lim\limits_{x\to 1} f(x)$ exists (d) none of these

99. Let $h(x) = \min\{x, x^2\}$ for every real number x. Then which of the following is false?

(a) h is continuous for all x (b) h is differentiable for all x
(c) $h'(x) = 1$ for all $x > 1$ (d) h is not differentiable at two values of x

100. The equation of a curve is given by $x = e^t \sin t, y = e^t \cos t$. The inclination of the tangent to the curve at the point $t = \frac{\pi}{4}$ is

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) 0