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PG-EE-2019

SUBJECT : Mathematics Hons. (Five Year)-(SET-X)

D

Sr. No. 10760

Time : 1¼ **Hours (75 minutes)** Total Questions : **100** Max. Marks : **100**

Roll No. (in figures) ____________ (in words) ____________

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SAMPLE

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1. The value of K for which one of the roots of $x^2 - 3x + 2K = 0$ is double of one of the roots of $x^2 - x + K = 0$, is :
(1) 2 (2) –2 (3) –1 (4) 1

2. The interior angles of a regular polygon measure 160° each. The number of diagonals of the polygon are :
(1) 105 (2) 135 (3) 145 (4) 147

3. The number of ways in which 9 identical balls can be placed in three identical boxes, is :
(1) 9 (2) 12 (3) 55 (4) 27

4. In the expansion of $\left(x^2 - \frac{1}{3x}\right)^9$, the term independent of x is :
(1) 5th (2) 6th (3) 7th (4) 4th

5. If the coefficients of rth and $(r + 1)$th terms in the expansion of $(3 + 7x)^{29}$ are equal, then $r =$
(1) 14 (2) 15 (3) 18 (4) 21

6. Three numbers forms an increasing G.P. If the middle number is doubled, then the new numbers are in A. P. The common ratio of the G. P. is :
(1) $2 + \sqrt{3}$ (2) $3 + \sqrt{2}$
(3) $\sqrt{3} + 1$ (4) $3 - \sqrt{2}$

7. If $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots\ldots$ to $\infty = \frac{\pi^2}{6}$, then $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots\ldots =$
(1) $\frac{\pi^2}{3}$ (2) $\frac{\pi^2}{4}$ (3) $\frac{\pi^2}{8}$ (4) $\frac{\pi^2}{12}$

8. If a, b, c are in A.P. as well as G.P., then which of the following is ***true*** ?
(1) $a = b = c$ (2) $a = b \neq c$ (3) $a \neq b = c$ (4) $a \neq b \neq c$

9. If the AM of the roots of a quadratic equation in x is A and their GM is G, then the quadratic equation is :
(1) $x^2 - Ax + G^2 = 0$ (2) $x^2 - Ax + G = 0$
(3) $x^2 - 2Ax + G = 0$ (4) $x^2 - 2Ax + G^2 = 0$

10. A line passes through the point (2, 2) and is perpendicular to the line $3x + y = 3$, then its y-intercept is :

(1) 2/3 (2) 4/3 (3) 4/5 (4) 3/4

11. The unit vector perpendicular to the vectors $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$ is/are :

(1) $\pm\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} - \hat{k})$ (2) $\frac{1}{\sqrt{3}}(\hat{i} + \hat{j} - \hat{k})$

(3) $\pm\frac{1}{\sqrt{3}}(\hat{i} - \hat{j} + \hat{k})$ (4) $\frac{1}{\sqrt{2}}(\hat{i} + \hat{k})$

12. The vector $\hat{i} + x\hat{j} + 3\hat{k}$ is rotated through an angle θ and doubled in magnitude, then it becomes $4\hat{i} + (4x - 2)\hat{j} + 2\hat{k}$. The value of x is :

(1) $\frac{1}{3}$ (2) -3 (3) $\frac{2}{3}$ (4) $-\frac{2}{3}$

13. The vectors $\overrightarrow{AB} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\overrightarrow{BC} = -\hat{i} - 2\hat{k}$ are the adjacent sides of a parallelogram. The angle between its diagonals is :

(1) π/6 (2) π/3 (3) π/2 (4) π/4

14. Consider a LPP : min $Z = 6x + 10y$
subjected to $x \geq 6, y \geq 2, 2x + y \geq 10; x, y \geq 0$.
Redundand constraints in this LPP are :

(1) $x \geq 0, y \geq 0$ (2) $2x + y \geq 10$

(3) $x \geq 6, 2x + y \geq 10$ (4) None of these

15. The angle between the lines having direction ratios 4, –3, 5 and 3, 4, 5 is :

(1) π/3 (2) π/4 (3) π/6 (4) 2π/3

16. If a plane meets the coordinate axes at A, B and C in such a way that the centroid of triangle ABC it at the point (1, 2, 3), then the equation of the plane is :

(1) $\frac{x}{1} + \frac{y}{2} + \frac{z}{3} = 1$ (2) $\frac{x}{3} + \frac{y}{6} + \frac{z}{9} = 1$ (3) $\frac{x}{1} + \frac{y}{2} + \frac{z}{3} = \frac{1}{3}$ (4) $\frac{x}{3} + \frac{y}{6} + \frac{z}{9} = 3$

17. The image of the point (1, 3, 4) in the plane $2x - y + z + 3 = 0$ is :

(1) (3, 5, 2) (2) (3, 5, –2)

(3) (–3, 5, 2) (4) (3, –5, 2)

18. The lines $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ and $\frac{x-1}{-2}=\frac{y-2}{-4}=\frac{z-3}{-6}$ are :

(1) intersecting (2) parallel (3) coincidental (4) skew

19. 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 $\vec{r}.(\hat{i}+5\hat{j}+\hat{k})=5$ is :

(1) $\frac{10}{3\sqrt{3}}$ (2) $\frac{10}{\sqrt{3}}$ (3) $\frac{10}{3}$ (4) $\frac{5}{3\sqrt{3}}$

20. The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{z-4}{-k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{1}$ are coplanar if $k=$

(1) 4 (2) 3 (3) –1 (4) –3

21. $\int x^x(1+\log x)\,dx=$

(1) x^x+c (2) $x^x\log x+c$ (3) $x\log x+c$ (4) none of these

22. $\int \sin\sqrt{x}dx=$

(1) $(\cos\sqrt{x}-\sin\sqrt{x})+c$ (2) $(\sqrt{x}\cos\sqrt{x}-\sin\sqrt{x})+c$

(3) $-2(\sqrt{x}\cos\sqrt{x}-\sin\sqrt{x})+c$ (4) $2(\sqrt{x}\cos\sqrt{x}-\sin\sqrt{x})+c$

23. $\int\frac{1}{\sqrt{\sin^3 x\cos x}}dx=$

(1) $2(\tan x)^{-½}+c$ (2) $(\tan x)^{½}+c$ (3) $(\tan x)^{-½}+c$ (4) $2(\tan x)^{½}+c$

24. If $I_n=\int_0^1 x^n e^{-x}dx$ for $n\in N$, then $I_n-n\,I_{n-1}=$

(1) $1/e$ (2) $-1/e$ (3) e (4) $-2/e$

25. If $\int_{\pi/2}^{0}\sin x\,dx=\sin 2\theta$, then the value of θ satisfying $0<\theta<\pi$, is :

(1) $\pi/6$ (2) $\pi/4$ (3) $\pi/2$ (4) $5\pi/6$

26. $\int_0^{[x]}(x-[x])\,dx=$

(1) $\frac{1}{2}[x]$ (2) $[x]$ (3) $2[x]$ (4) $-2[x]$

27. $\int_0^{\pi/4} \log(1+\tan x)dx =$

(1) $\frac{\pi}{4}\log 2$ (2) $\frac{\pi}{8}\log 2$ (3) $\frac{\pi}{2}\log 2$ (4) $\pi \log 2$

28. The area bounded by the curve $y = x \sin x$ and x-axis between $x = 0$ and $x = 2\pi$, is :

(1) π sq. units (2) $\frac{\pi}{2}$ sq. units (3) 2π sq. units (4) 4π sq. units

29. If the area bounded by the curves $y^2 = 4ax$ and $y = mx$ is $a^2/3$ sq. units, then the value of m is :

(1) 2 (2) –2 (3) 1/2 (4) 3/2

30. Solution of $\frac{dy}{dx} = \cos(x+y)$ is :

(1) $\sin(x+y) = x + c$ (2) $\tan\left(\frac{x+y}{2}\right) + x = c$

(3) $\cot\left(\frac{x+y}{2}\right) = x + c$ (4) $\tan\left(\frac{x+y}{2}\right) = x + c$

31. If A an orthogonal matrix, then which of the following is ***true*** ?

(1) $|A| = 0$ (2) $|A| = \pm 1$ (3) $|A| = \pm 2$ (4) $|A| = \pi/2$

32. If $A(\alpha) = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then $A(\alpha)\,A(\beta) =$

(1) $A(\alpha) + A(\beta)$ (2) $A(\alpha) - A(\beta)$

(3) $A(\alpha + \beta)$ (4) $A(\alpha - \beta)$

33. If A and B are two matrices such that $AB = B$ and $BA = A$, then $A^2 + B^2 =$

(1) $A + B$ (2) AB (3) $2AB$ (4) I

34. If K is a real cube root of –2, then the value of $\begin{vmatrix} 1 & 2K & 1 \\ K^2 & 1 & 3K^2 \\ 2 & 2K & 1 \end{vmatrix}$ is equal to :

(1) –10 (2) –12 (3) –13 (4) –15

35. The equations $Kx - y = 2$, $2x - 3y = -K$, $3x - 2y = -1$ are consistent if $K =$

(1) 2, –3 (2) –2, 3 (3) 1, –4 (4) –1, 4

36. If $f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$, then $f(2x) - f(x) =$

(1) $ax(3a + 2x)$ (2) $ax(2a + 3x)$ (3) $a(2a + 3x)$ (4) $x(3a + 2x)$

37. Let $f(x) = \dfrac{1 - \tan x}{4x - \pi}, x \neq \pi/4$ and $x \in [0, \pi/2] = a, x = \pi/4$

If $f(x)$ is continuous in $[0, \pi/2]$, then $a =$

(1) 1/2 (2) –1/2 (3) 1 (4) 0

38. Let $f(x) = 1 + x (\sin x) [\cos x]$, $0 < x \leq \pi/2$, where [.] denotes the greatest integer function. Then which of the following is ***true*** ?

(1) $f(x)$ is continuous in $(0, \pi/2)$ (2) $f(x)$ is strictly increasing in $(0, \pi/2)$

(3) $f(x)$ is strictly decreasing in $(0, \pi/2)$ (4) $f(x)$ has global maximum value 2

39. If $y = \tan^{-1} \sqrt{\dfrac{1 + \sin x}{1 - \sin x}}$, $\pi/2 < x < \pi$, then $\dfrac{dy}{dx} =$

(1) –1 (2) 1 (3) 1/2 (4) –1/2

40. If $x = e^{y + e^{y + e^{y + \ldots\ldots\ldots\infty}}}$, then $\dfrac{dy}{dx} =$

(1) $\dfrac{1-x}{x}$ (2) $\dfrac{x}{1-x}$ (3) $\dfrac{1+x}{x}$ (4) $\dfrac{x}{1+x}$

41. $\lim\limits_{x \to 1} (1 - x) \tan\left(\dfrac{\pi x}{2}\right) =$

(1) $\dfrac{\pi}{2}$ (2) $\dfrac{2}{\pi}$ (3) $\dfrac{\pi}{4}$ (4) 1

42. $\lim\limits_{n \to \infty} \dfrac{(1 - 2 + 3 - 4 + 5 - 6 \ldots\ldots\ldots\ldots - 2n)}{\sqrt{n^2 + 1} + \sqrt{4n^2 - 1}} =$

(1) –2 (2) $\dfrac{1}{2}$ (3) $\dfrac{1}{3}$ (4) $-\dfrac{1}{3}$

43. $\lim_{x \to 0} \frac{\sin(\pi \cos^2 x)}{x^2} =$

(1) π (2) $\pi/2$ (3) $-\pi$ (4) 1

44. If $f(x) = \begin{cases} \frac{x-1}{2x^2 - 7x + 5}, & x \neq 1 \\ -\frac{1}{3}, & x = 1 \end{cases}$

then the derivative of $f(x)$ at $x = 1$, is :

(1) $\frac{9}{2}$ (2) $\frac{-9}{2}$ (3) $\frac{-2}{9}$ (4) $\frac{2}{9}$

45. The mean of n terms is $\bar{x}$. If the first term is increased by 1, second by 2 and so on, then the new mean is :

(1) $\bar{x} + \frac{n+1}{2}$ (2) $\bar{x} + \frac{n}{2}$ (3) $\bar{x} + n$ (4) $\bar{x} + \frac{n-1}{2}$

46. The standard deviation of 25 numbers is 40. If each of the numbers which is greater than the standard deviation, is increased by 5, then the new standard deviation will be :

(1) 45 (2) 40 (3) 65 (4) 40.75

47. The sum of 10 items is 12 and the sum of their squares is 18, then the standard deviation is :

(1) 3/5 (2) 4/5 (3) 3/10 (4) 2/5

48. There are n persons sitting in a row. Two of them are selected at random. The probability that two selected persons are not sitting together, is :

(1) $\frac{2}{n-2}$ (2) $\frac{n}{n+2}$ (3) $\frac{2}{n}$ (4) $1 - \frac{2}{n}$

49. Seven digits from the digits 1, 2, 3, 4, 5, 6, 7, 8, 9 are written in a random order. The probability that this seven digit number is divisible by 9, is :

(1) $\frac{1}{3}$ (2) $\frac{2}{7}$ (3) $\frac{1}{9}$ (4) $\frac{2}{9}$

50. The coefficients of a quadratic equation $ax^2 + bx + c = 0$ $(a \neq b \neq c)$ are chosen from first three prime numbers, the probability that roots of the equation are real, is :

(1) 2/3 (2) 1/3 (3) 1/4 (4) 3/4

51. The line $x + y = 4$ divides the line joining $(-1, 1)$ and $(5, 7)$ in the ratio $K : 1$, then the value of K is :

(1) 1/4 (2) 4/3 (3) 1/2 (4) 2

52. If the foot of the perpendicular from the origin to a straight line is at the point $(3, -4)$. Then the equation of the line is :

(1) $3x - 4y = 25$ (2) $4x - 3y = 25$

(3) $4x + 3y = 25$ (4) $3x + 4y = 25$

53. The distance between the parallel lines $6x - 3y - 5 = 0$ and $2x - y + 4 = 0$ is :

(1) $3/\sqrt{5}$ (2) $\sqrt{5}/3$

(3) $17/3\sqrt{5}$ (4) $17/\sqrt{3}$

54. The points $(K + 1, 1)$, $(2K + 1, 3)$ and $(2K + 2, 2K)$ are collinear, then $K =$

(1) -1 (2) $\frac{1}{3}$ (3) $\frac{1}{2}$ (4) $-\frac{1}{2}$

55. The equation of the circle of radius 5 whose centre lies on x-axis and passing through $(2, 3)$ is :

(1) $x^2 + y^2 - 4x - 21 = 0$ (2) $x^2 + y^2 + 4x - 21 = 0$

(3) $x^2 + y^2 + 4x - 17 = 0$ (4) $x^2 + y^2 - 4x + 21 = 0$

56. If the parabola $y^2 = 4ax$ passes through $(3, 2)$, then the length of its latus-rectum is :

(1) 2/3 (2) 3/4 (3) 4 (4) 4/3

57. The eccentricity of the hyperbola $16x^2 - 3y^2 - 32x + 12y - 44 = 0$ is :

(1) $\sqrt{13}$ (2) $\sqrt{7}$ (3) $\sqrt{\frac{17}{3}}$ (4) $\sqrt{\frac{19}{3}}$

58. The eccentricity of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ whose latus-rectum is half of its major axis, is :

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{\sqrt{3}}{4}$ (3) $\frac{1}{\sqrt{2}}$ (4) $\frac{1}{2}$

59. The ratio in which the yz-plane divides the segment joining the points $(-2, 4, 7)$ and $(3, -5, 8)$ is :

(1) $7 : 8$ (2) $-7 : 8$ (3) $2 : 3$ (4) $-3 : 2$

60. If α, β, γ are the angles which a directed line makes with the positive directions of the co-ordinate axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$

(1) 0 (2) 1 (3) 2 (4) 3

61. The graph of the function $y = f(x)$ is symmetrical about the line $x = a$, then which of the following is ***true*** ?

(1) $f(x+a) = f(x-a)$ (2) $f(x) = f(-x)$

(3) $f(a+x) = f(a-x)$ (4) $f(x) = -f(-x)$

62. Let $f : R \to R$ be a function defined by $f(x) = \dfrac{x^2+2x+5}{x^2+x+1}$, then f is :

(1) one-one and onto (2) one-one and into

(3) many one and onto (4) many one and into

63. $\sin\lambda x + \cos\lambda x$ and $|\sin x| + |\cos x|$ are periodic of same fundamental period, if $\lambda =$

(1) 4 (2) 0 (3) 2 (4) 1

64. Let R be a relation on the set N of natural numbers defined by $nRm \Leftrightarrow n$ is a factor of m (i.e. n/m). Then R is :

(1) equivalence (2) transitive and symmetric

(3) reflexive and symmetric (4) reflexive, transitive but not symmetric

65. If $\sin^{-1}\left(\dfrac{x}{5}\right) + \text{cosec}^{-1}\left(\dfrac{5}{4}\right) = \dfrac{\pi}{2}$, then $x =$

(1) 4 (2) 3 (3) 5 (4) 2

66. A solution of the equation :

$\tan^{-1}(1+x) + \tan^{-1}(1-x) = \dfrac{\pi}{2}$, is :

(1) $x = 0$ (2) $x = 1$ (3) $x = -1$ (4) $x = \pi$

67. The value of $\tan\left(\dfrac{1}{2}\cos^{-1}\left(\dfrac{\sqrt{5}}{3}\right)\right)$ is :

(1) $3+\sqrt{5}$ (2) $3-\sqrt{5}$ (3) $\dfrac{1}{2}(3-\sqrt{5})$ (4) $\dfrac{1}{2}(\sqrt{5}+3)$

68. Solution of $\sin^{-1} x - \cos^{-1} x = \cos^{-1} \frac{\sqrt{3}}{2}$ is :

(1) $x = \frac{1}{2}$ (2) $x = \frac{1}{\sqrt{3}}$ (3) $x = \frac{\sqrt{3}}{2}$ (4) $x = 1$

69. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $A^2 = 8A + KI_2$, then the value of K is :

(1) –1 (2) 1 (3) 7 (4) –7

70. If 1, w, w^2 are cube roots of unity, inverse of which of the following matrices exists ?

(1) $\begin{bmatrix} w & w^2 \\ w^2 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} 1 & w \\ w & w^2 \end{bmatrix}$

(3) $\begin{bmatrix} w^2 & 1 \\ 1 & w \end{bmatrix}$ (4) None of these

71. If $x = a \cos^3 \theta$, $y = a \sin^3 \theta$, then $\sqrt{1+\left(\frac{dy}{dx}\right)^2} =$

(1) $\sec^2\theta$ (2) $\tan^2\theta$ (3) $|\sec \theta|$ (4) $|\cot \theta|$

72. If $e^y + xy = e$, then the value of $\frac{d^2y}{dx^2}$ for $x = 0$, is :

(1) e^2 (2) $\frac{1}{e^2}$ (3) $\frac{1}{e}$ (4) $\frac{1}{e^3}$

73. If $x^y . y^x = 16$, then $\frac{dy}{dx}$ at (2, 2) is :

(1) 0 (2) 1 (3) –1 (4) –4

74. The approximate value of square root of 25.2 is :

(1) 5.01 (2) 5.02 (3) 5.03 (4) 5.04

75. The tangent at (1, 1) on the curve $y^2 = x(2 - x)^2$ meets it again at the point :

(1) (–3, 7) (2) (4, 4)

(3) $\left(\frac{3}{8}, \frac{9}{4}\right)$ (4) $\left(\frac{9}{4}, \frac{3}{8}\right)$

76. The distance between the origin and the normal to the curve $y = e^{2x} + x^2$ at $x = 0$ is :

(1) $4/\sqrt{5}$ (2) $3/\sqrt{5}$ (3) $2/\sqrt{5}$ (4) $2/\sqrt{7}$

77. The length of longest interval in which Rolle's theorem can be applied for the function $f(x) = |x^2 - a^2|, (a > 0)$, is :

(1) $2a$ (2) $3a$ (3) $4a$ (4) $a\sqrt{2}$

78. If the function $f(x) = \sqrt{3}\ \sin x - \cos x - 2ax + b$ decreases for all real values of x, then the value of a is given by :

(1) $a < 1$ (2) $a < \sqrt{2}$ (3) $a \geq \sqrt{2}$ (4) $a \geq 1$

79. The condition that $x^3 + ax^2 + bx + c$ may have no extremum, is :

(1) $a^2 > 3b$ (2) $a^2 < 3b$ (3) $a^2 > 2b$ (4) $a^2 < 2b$

80. $\int \frac{3 + 2\cos x}{(2 + 3\cos x)^2} dx =$

(1) $\frac{\sin x}{2 + 3\cos x} + c$ (2) $\frac{\cos x}{2 + 3\cos x} + c$ (3) $\frac{2\sin x}{2 + 3\cos x} + c$ (4) $\frac{2\cos x}{2 + 3\cos x} + c$

81. The set A has 3 elements and the Set B has 7 elements. The minimum number of elements in the set $A \cup B$ is :

(1) 21 (2) 10 (3) 7 (4) Can not say

82. If A and B are two sets, then $A \cap (A \cup B)^C$ (where 'C' denotes complement) is equal to :

(1) ϕ (2) A (3) B (4) $A - B$

83. Let $A = \{0, 1, 2, 3, 4, 5\}$ and a relation R is defined by xRy such that $2x + y = 10$. Then R^{-1} is :

(1) $\{(4, 3), (2, 4), (5, 0)\}$ (2) $\{(4, 3), (2, 4), (0, 5)\}$
(3) $\{(3, 4), (4, 2), (5, 0)\}$ (4) $\{(3, 4), (4, 2), (0, 5)\}$

84. If $A + C = B$, then $\tan A \tan B \tan C =$

(1) $\tan A + \tan B + \tan C$ (2) $\tan A + \tan B - \tan C$
(3) $\tan B - \tan C - \tan A$ (4) $\tan B + \tan C - \tan A$

85. If $\sin x + \sin^2 x = 1$, then $\cos^8 x + 2\cos^6 x + \cos^4 x =$

(1) 0 (2) 1 (3) -1 (4) 2

86. If 4 $\sin^2 x = 1$, then the values of x are :

(1) $n\pi \pm \frac{\pi}{3}$ (2) $n\pi \pm \frac{\pi}{4}$

(3) $2n\pi \pm \frac{\pi}{6}$ (4) $n\pi \pm \frac{\pi}{6}$

87. If $n \in N$, then $3^{3n} - 26n - 1$ is divisible by :

(1) 4 (2) 3 (3) 9 (4) 15

88. If $z = (K + 3) + i\ \sqrt{5 - k^2}$, then the locus of z is :

(1) a straight line (2) a parabola

(3) an ellipse (4) a circle

89. If 1, w and w^2 are the three cube roots of unity, then the roots of the equation $(x - 1)^3 - 8 = 0$ are :

(1) 2, $2w$, $2w^2$ (2) 3, $2w$, $2w^2$

(3) 3, $1 + 2w$, $1 + 2w^2$ (4) 2, $1 - 2w$, $1 - 2w^2$

90. The smallest positive integer n for which $\left(\frac{1+i}{1-i}\right)^n = 1$, is :

(1) 4 (2) 3 (3) 2 (4) 1

91. Solution of $ydx + (x - y^3)\, dy = 0$ is :

(1) $xy + \frac{y^2}{2} = c$ (2) $xy = \frac{y^2}{2} + c$

(3) $xy = \frac{y^2}{4} + c$ (4) $xy = \frac{x^2}{4} + c$

92. The differential equation $y\frac{dy}{dx} = x + a$ (a being constant) represents a set of :

(1) circles having centre on the x-axis (2) circles having centre on the y-axis

(3) ellipses (4) hyperbolas

93. From a bag containing 2 white, 3 red and 4 black balls, two balls are drawn one by one without replacement. The probability that at least ones ball is red, is :

(1) $\frac{5}{12}$ (2) $\frac{7}{12}$ (3) $\frac{5}{8}$ (4) $\frac{3}{7}$

94. A box contains 15 items in which 4 items are defective. The items are selected at random, one by one, and examined. The ones examined are not put back. The probability that 9th one examined is the last defective, is :

(1) $\frac{7}{195}$ (2) $\frac{8}{195}$ (3) $\frac{16}{255}$ (4) $\frac{14}{255}$

95. A person is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. The probability that it is actually a six, is :

(1) $\frac{7}{36}$ (2) $\frac{11}{36}$ (3) $\frac{3}{8}$ (4) $\frac{5}{8}$

96. Four numbers are multiplied together. The probability that the product will be divisible by 5 or 10, is :

(1) $\frac{123}{625}$ (2) $\frac{133}{625}$ (3) $\frac{357}{625}$ (4) $\frac{369}{625}$

97. The least number of times a fair coin must be tossed so that the probability of getting at least one head is at lest 0.8, is :

(1) 3 (2) 5 (3) 6 (4) 8

98. If $P(A \cup B) = \frac{3}{4}$ and $P(\overline{A}) = 2/3$, then $P(\overline{A} \cap B) =$

(1) $\frac{7}{12}$ (2) $\frac{5}{12}$ (3) $\frac{1}{12}$ (4) $\frac{1}{6}$

99. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}, |\vec{a}| = 3, |\vec{b}| = 5, |\vec{c}| = 7$, then the angle between $\vec{a}$ and $\vec{b}$ is :

(1) $\pi/3$ (2) $2\pi/3$ (3) $\pi/6$ (4) $5\pi/3$

100. Let $\vec{a}$ and $\vec{b}$ be two unit vectors and α be the angle between them, then $\vec{a} + \vec{b}$ is a unit vector if $\alpha =$

(1) $\pi/2$ (2) $\pi/3$ (3) $2\pi/3$ (4) $\pi/4$