MATHEMATICS(SET-23)

Date :   TIME : 2 ½$hrs(1030 - 1300hrs)$ MAX MARK : 300

General Instruction :

(i)All 120 questions carry 2.5 mark each.

(ii)There will be penalty of ¹/₃ of mark assigned to that question (i.e. 0.83) for each wrong answer marked by the candidates.

(iii)You have to mark your response by completely blackening with black ball pen to indicate your response.

1. If p and q are the roots of the equation $x^2 - 30x + 221 = 0$,

   what is the value of $p^3 + q^3$?   (2019-II)

   (a)   7010   (b)   7110   (c)   7210   (d)   7240

2. The mean of 5 observations is 4.4 and variance is 8.24. If three of the five observations are $1, 2 \& 6$ then what are the other two observations ?
   (2019-II)   (a)   9,16   (b)   9,4   (c)   81,16   (d)   81,4

3. If the range of a set of observations on a variable 'x' is known to be 25 and if $Y = 40 + 3x$, then what is the range of the set of corresponding observations on 'Y'?
   (a)   25   (b)   40   (c)   75   (d)   115   (2019-II)

4. If the angles of a triangle ABC are in the ratio $1 : 2 : 3$, then the corresponding sides are in the ratio   (2019-II)
   (a) $1 : 2 : 3$ (b) $3 : 2 : 1$ (c) $1 : \sqrt{3} : 2$ (d) $1 : \sqrt{3} : \sqrt{2}$

For the next two questions that follow :
The equation formed by multiplying each root of $ax^2 + bx + c = 0$ by 2 is $x^2 + 36x + 24 = 0$.

5. What is $b : c$ equal to ?
   (a) $3 : 1$ (b) $1 : 2$ (c) $1 : 3$ (d) $3 : 2$

6. Which one of the following is correct ?
   (a) $bc = a^2$ (b) $bc = 36a^2$ (c) $bc = 72a^2$ (d) $bc = 108a^2$

7. The domain of the function $f(x) = \sqrt{(2 - x)(x - 3)}$ is   (2019-I)
   (a) $(0, \infty)$ (b) $[0, \infty)$ (c) $[2,3]$ (d) $(2,3)$

8. If $\theta = \frac{\pi}{8}$, then what is the value of

$(2cos\theta + 1)^{10} (2cos2\theta - 1)^{10}(2cos\theta - 1)^{10} (2cos4\theta - 1)^{10}$? (2018-II)

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

9. If $4x - 5y + 33 = 0$ and $20x - 9y = 107$ are two lines of regression, then what

are the values of $\bar{x}$ & $\bar{y}$ respectively ? (2018-I)

(a) 12 & 18 (b) 18 & 12 (c) 13 & 17 (d) 17 & 13

10. The points $(a, b), (0,0), (-a, -b)$ and (ab, b^2) are (2017-II)
    (a) The vertices of a parallelogram (b) The vertices of a rectangle
    (c) The vertices of a square (d) Collinear

11. If $1.3 + 2.3^2 + 3.3^3 + - - - - + n.3^n = \frac{(2n-1)3^a+b}{4}$, then a and b are respectively
    (a) $n, 2$ (b) $n, 3$ (c) $n + 1,2$ (d) $n + 1,3$ (2017-II)

12. It is given that the roots of the equation $x^2 - 4x - \log_3 p = 0$ are real.

    For this, the minimum value of 'p' is
    (2017-II) (a) $\frac{1}{27}$ (b) $\frac{1}{64}$ (c) $\frac{1}{81}$ (d) 1

13. The area bounded by the curve $|x| + |y| = 1$ is (2017-II)
    (a) 1 square unit (b) $2\sqrt{2}$ square unit
    (c) 2 square unit (d) $2\sqrt{3}$ square unit

14. Which one of the following is correct in respect of the function $f(x) = x(x - 1)(x + 1)$?
    (a) The local maximum value is larger than local minimum value
    (b) The local maximum value is smaller than local minimum value
    (c) The function has no local maximum (2017-II)
    (d) The function has no local minimum

15. The sum of the first 'n' term of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + - - -$ is equal to (2017-I)
    (a) $2^n - n - 1$ (b) $1 - 2^{-n}$ (c) $2^{-n} + n - 1$ (d) $2^n - 1$

16. The two circles $x^2 + y^2 = r^2$ and $x^2 + y^2 - 10x + 16 = 0$ intersect at two distinct points.
    Then which one of the following is correct ? (2017-I)
    (a) $2 < r < 8$ (b) $r = 2 \, or \, r = 8$ (c) $r < 2$ (d) $r > 2$

17. $(0,0,0), (a, 0,0), (0, b, 0) \, and \, (0,0, c)$are four distinct points. What are the co-ordinates

    of the point which is equidistant from the four points ? (2017-I)

(a) $(\frac{a+b+c}{b}, \frac{a+b+c}{5}, \frac{a+b+c}{5})$　　　(b) (a, b, c)　(c)　$(\frac{a}{2}, \frac{b}{2}, \frac{c}{2})$　　　(d)　$(\frac{a}{3}, \frac{b}{3}, \frac{c}{3})$

18. The function $f : X \to Y$ defined by $f(x) = cosx$ where $x \in X$, is one-one and onto,

if X & Y are respectively equal to　　　　　　　　　　　　　(2017-I)
   (a)　$[o, \pi]$ & $[-1, 1]$　　(b)　$[-\frac{\pi}{2}, \frac{\pi}{2}]$ & $[-1, 1]$
   (c)　$[o, \pi]$ & $(-1, 1)$　　(d)　$[o, \pi]$ & $[o, 1]$

19. What is the maximum area of a triangle that can be inscribed in a circle of radius 'a'?

(a)　$\frac{3}{4}a^2$　(b)　$\frac{1}{2}a^2$　(c)　$\frac{3\sqrt{3}}{4}a^2$　(d)　$\frac{\sqrt{3}}{4}a^2$　　　(2017-I)

20. If (a, b) is at unit distance from the line $8x + 6y + 1 = 0$, then which of the

   following conditions are correct ?

1)　$3a - 4b - 4 = 0$　　2)　$8a + 6b + 11 = 0$　　　　3)　$8a + 6b - 9 = 0$.

Select the correct answer using the code given below :　　　　　　(2016-II)

(a)　$1\ and\ 2\ only$　　　(b)　$2\ and\ 3\ only$

(c)　$1\ and\ 3\ only$　　　(d)　$1, 2\ \&\ 3$

21. If $sin\theta = 3sin(\theta + 2\alpha)$, then the value of $tan(\theta + \alpha) + 2tan\alpha$ is equal to
   (a)　-1　(b)　0　(c)　1　(d)　2　　　　　　　　　(2017-I)
   For the next 3 items that follow :
Consider the expansion of $(1 + x)^{2n+1}$　　　　　　　　(2015-II)

22. If the coefficients of x^r and x^{r+1} are equal in the expansion, then r is equal to
   (a)　n　　(b)　$\frac{2n-1}{2}$　　　(c)　$\frac{2n+1}{2}$　　　(d)　$n + 1$

23. The average of the coefficients of the two middle terms in the expansion is

   (a)　$^{2n+1}C_{n+2}$　　(b)　$^{2n+1}C_n$　　(c)　$^{2n+1}C_{n-1}$　　(d)　$^{2n}C_{n+1}$

24. The sum of the coefficients of all the terms in the expansion is
   (a)　2^{2n-1}　　　(b)　4^{n-1}　　　(c)　2×4^n　　(d)　none

25. An unbiased coin is tossed until the first head appears or until four tosses

are completed, whichever happens earlier. (2015-II)
Which of the following statements is/are correct ?

1. The probability that no head is observed is $\frac{1}{16}$.

2. The probability that the experiment ends with three tosses is $\frac{1}{8}$

Select the correct answer using the code given below :

(a) 1 $only$ (b) 2 $only$ (c) $both$ 1 & 2 (d) $neither$ 1 nor 2

For the next two items that follow : (2014-II)
Let S_n denote the sum of first 'n' terms of an $A.P.$ and $3S_n = S_{2n}$

26. What is $S_{3n} : S_n$ equal to ?

(a) 4 : 1 (b) 6 : 1 (c) 8 : 1 (d) 10 : 1

27. What is $S_{3n} : S_{2n}$ equal to ?
(a) 2 : 1 (b) 3 : 1 (c) 4 : 1 (d) 5 : 1

28. *Consider the following* statements : (2014-I)

(i) The function $f(x) = \sqrt[3]{x}$ is continuous at all 'x' except at $x = 0$.

(ii) The function $f(x) = [x]$ is continuous at $x = 2.99$
which of the above statements is / are correct ?

(a) 1$only$ (b) 2$only$ (c) $both$1&2 (d) $neither$1nor2

For the next two items that follow : (2014-I)
Consider the integrals, $I_1 = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{tanx}}$ and $I_2 = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{sinx}}{\sqrt{\sin x}+\sqrt{\cos x}} dx$

29. What is $I_1 - I_2$ equal to ?
(a) 0 (b) $2I_1$ (c) π (d) none

30. What is I_1 equal to ?
(a) $\frac{\pi}{24}$ (b) $\frac{\pi}{18}$ (c) $\frac{\pi}{12}$ (d) $\frac{\pi}{6}$

31. If the straight line $\frac{x-xo}{l} = \frac{y-yo}{m} = \frac{z-zo}{n}$ is parallel to the plane $ax + by + cz + d = 0$

then which one of the following is correct ? (2013-I)

(a) $l + m + n = 0$ (b) $a + b + c = 0$

(c) $\frac{a}{b} + \frac{b}{m} + \frac{c}{n} = 0$ (d) $al + bm + cn = 0$

32. A fair coin is tossed repeatedly. The probability of getting a result in the fifth toss

different from those obtained in the first four tosses is (2013-I)

(a) $^1/_2$ (b) $^1/_{32}$ (c) $^{31}/_{32}$ (d) $^1/_{16}$

33. If $f(x) = x^2 - 6x + 8$ and there exists a point c in the interval [2,4] such that
$f'(c) = 0$, then what is the value of 'c' ? (2012-I)
(a) 2.5 (b) 2.8 (c) 3 (d) 3.5

34. What is the minimum value of $a^2x + b^2y$ when $xy = c^2$? (2019-I)
(a) abc (b) $2abc$ (c) $3abc$ (d) $4abc$

35. If $\vec{a} = \hat{i} - 2\hat{j} + 5\hat{k}$ and $\vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$ then what is $(\vec{b} - \vec{a}) \cdot (3\vec{a} + \vec{b})$ equal to ?

(a) 106 (b) -106 (c) 53 (d) -53 (2019-I)

36. What is the value of $\log_7 \ \log_7 \ \sqrt{7\sqrt{7\sqrt{7}}}$ equal to ? (2018-II)

(a) $3\log_2 7$ (b) $1 - 3\log_2 7$ (c) $1 - 3\log_7 2$ (d) $^7/_8$

37. Let $A = \{x \in R/-1 \le x \le 1\}$, $B = \{y \in R/-1 \le y \le 1\}$

and 'S' be the subset of $A \times B$ defined by $S = \{(x, y) \in A \times B/x^2 + y^2 = 1\}$

which one of the following is correct ?

(a) S is one-one function from A to B (b) S is a bijective mapping from A to B

(c) S is many one function from A to B (d) S is not a function (2018-II)

38. The second degree equation $x^2 + 4y^2 - 2x - 4y + 2 = 0$ represents (2018-II)

(a) a point (b) an ellipse of semi-major axis 1

(c) an ellipse with eccentricity $\frac{\sqrt{3}}{2}$ (d) none of the above

39. Consider the function $f(x) = \begin{cases} \frac{sin2x}{5x}, & x \ne 0 \\ \frac{2}{15}, & x = 0 \end{cases}$

5

Which one of the following is correct in respect of the function ?   (2018-II)
(a)   it is not continuous at $x = 0$ (b)   it is continuous at every x
(c)   it is not continuous at $x = \pi$ (d)   it is continuous at $x = 0$

40.   8 Coins are tossed simultaneously. The probability of getting at least 6 heads is
   (a) $\frac{7}{64}$ (b) $\frac{57}{64}$ (c) $\frac{37}{256}$ (d) $\frac{229}{256}$ (2018-II)

For the next two items that follow:

Consider the integrals: (2015-II)

$$A = \int_0^\pi \frac{sinx}{sinx+cosx} dx \text{ and } B = \int_0^\pi \frac{sinx}{sinx-cosx} dx$$

41.   Which one of the following is correct ?   (2015-II)
   (a) $A = 2B$ (b) $B = 2A$ (c) $A = B$ (d) $A = 3B$

42.   What is the value of B ?
   (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$ (c) $\frac{3\pi}{4}$ (d) π

43.   The value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ is   (2015-I)
   (a) $x + y$ (b) $x - y$ (c) xy (d) $1 + x + y$
   For the next two items that follow:
   Given a function $f(x) = \begin{cases} -1 & , \ x \leq 0 \\ ax + b, & 0 < x < 1 \\ 1, & x \geq 1 \end{cases}$ (2015-I)

Where a, b are constants. The function is continuous everywhere.

44.   What is the value of 'a' ?
   (a) -1 (b)   0   (c)   1   (d)   2

45.   What is the value of 'b' ?
   (a) -1 (b)   1   (c)   0   (d)   2

46.   The correlation coefficient between two variables X and Y is found to be 0.6.

   All the observations on X and Y are transformed using the transformation $U = 2 - 3x$

   and $V = 4y + 1$. The correlation coefficient between the transformed variables

   U and V will be   (2015-I)

   (a) -0.5 (b) $+0.5$ (c) -0.6 (d) $+0.6$

47. The relation S is defined on the set of integers Z as xSy if integer x divides integer y. then (2014-II)

(a) S is an equivalence relation   (b) S is only reflexive and symmetric

(c) S is only reflexive and transitive   (d) S is only symmetric and transitive

48. What is $\left(\frac{\sqrt{3}+i}{\sqrt{3}-i}\right)^6$ equal to where $i = \sqrt{-1}$ (2014-II)

   (a) 1   (b) $1/6$ (c) 6   (d) 2

49. If α, β are the roots of $ax^2 + bx + c = 0$ and $\alpha + h, \beta + h$ are the roots of $px^2 + qx + r = 0$, then what is 'h' equal to ? (2014-II)

(a) $\frac{1}{2}\left(\frac{b}{a} - \frac{q}{p}\right)$ (b) $\frac{1}{2}\left(-\frac{b}{a} + \frac{q}{p}\right)$

(c) $\frac{1}{2}\left(\frac{b}{p} + \frac{q}{a}\right)$ (d) $\frac{1}{2}\left(-\frac{b}{p} + \frac{q}{a}\right)$

50. If the matrix A is such that $\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix} A = \begin{pmatrix} 1 & 1 \\ 0 & -1 \end{pmatrix}$ then what is A equal to ?(2014-II)

(a) $\begin{pmatrix} 1 & 4 \\ 0 & -1 \end{pmatrix}$ (b) $\begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} -1 & 4 \\ 0 & -1 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & -4 \\ 0 & -1 \end{pmatrix}$

51. The equation of the plane passing through the line of intersection of the planes

$x + y + z = 1, 2x + 3y + 4z = 7$ and perpendicular to the plane $x - 5y + 3z = 5$ is given by (2017-II)

(a) $x + 2y + 3z - 6 = 0$ (b) $x+2y + 3z + 6 = 0$

(c) $3x + 4y + 5z - 8 = 0$ (d) $3x + 4y + 5z + 8 = 0$

52. The number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is (2017-II)

(a) 202   (b) 101   (c) 51   (d) 50

53. The value of is $\frac{1}{\log_3 e} + \frac{1}{\log_3 e^2} + \frac{1}{\log_3 e^4} + \cdots \ldots \infty$ is (2017-II)

(a) $\log_e 9$ (b) 0   (c) 1   (d) $\log_e 3$

54. If 'E' is the universal set and $A = B \cup C$, then the set $E - (E - (E - (E - (E - A))))$

   is   same as the set (2017-II)

(a) $B' \cup C'$ (b) $B \cup C$ (c) $B' \cap C'$ (d) $B \cap C$

55. What is the area bounded by the lines $x = 0, y = 0$ and $x + y + 2 = 0$?(2013-II)

(a) $1/2$ square unit   (b)1 square unit   (c)2 square units   (d)4 square units

56. Which one of the following may be the parameter of a binomial distribution ?
   (a) $np = 2, npq = 4$ (b) $n = 4, p = {}^3/_2$
   (c) $n = 8, p = 1$ (d) $np = 10, npq = 8$ (2013-II)

57. The sum of the focal distances of a point on the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$ is (2012-II)

(a) 4 units   (b) 6 units   (c) 8 units   (d) 10 units

58. What is the angle between the lines $\frac{x-2}{1} = \frac{y+1}{-2} = \frac{z+2}{1}$ and $\frac{x-1}{1} = \frac{2y+3}{3} = \frac{z+5}{2}$? (2012-II)

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

59. Consider the following statements.   (2012-II)

1. The value of $\cos 46° - \sin 46°$ is positive.

2. The value of $\cos 44° - \sin 44°$ is negative.

Which of the above statements is/are correct ?

(a) 1 only   (b) 2 only   (c) both 1 & 2   (d) neither 1 nor 2

60. The algebraic sum of the deviations of 20 observations measured from 30 is 2.

 What would be the mean of the observations.   (2012-II)

(a) 30   (b) 32   (c) 30.2   (d) 30.1

61. The differential equation $y\frac{dy}{dx} + x = a$ where 'a' is any constant, represents :
   (a) a set of straight lines   (b) a set of ellipses   (2012-II)
   (c) a set of circles   (d) none

62. Let $A = \{x \in R/x \geq 0\}$, A function $f : A \to A$ is defined by $f(x) = x^2$.

   Which one of the following is correct ?   (2012-II)
   (a) the function does not have inverse   (b) 'f' is its own inverse
   (c) the function has an inverse but 'f' is not its own inverse   (d) none

63. Let α, β be the roots of the equation $(x - a)(x - b) + c = 0, c \neq 0$.

   Then the roots of the equation $(x - \alpha)(x - \beta) + c = 0$ are
            (a) a, c (b) b, c (c) a, b (d) $a + b, a + c$

64. If $|\vec{a}| = 4$ and $-3 \leq \lambda \leq 2$, then $|\lambda\vec{a}|$ lies in   (CBSE-2020)
   (a) [0,12]   (b) [2,3]   (c) [8,12]   (d) [−12,8]

65. If 'A' is a non-singular square matrix of order 3 such that $A^2 = 3A$,

then value of $|A|$ is   (CBSE-2020)

(a) -3 (b)   3   (c)   9   (d)   27

66.   The co-ordinates of the foot of the perpendicular drawn from the point $(2, -3, 4)$

on   the $y - axis$ is   (CBSE-2020)

(a) $(2,3,4)$ (b) $(-2, -3, -4)$ (c) $(0, -3, 0)$ (d) $(2, 0, 4)$

67.   The interval in which the function 'f' given by $f(x) = x^2 e^{-x}$ is strictly increasing is

(CBSE-2020)

(a) $(-\infty, \infty)$ (b) $(-\infty, 0)$ (c) $(2, \infty)$ (d) $(0, 2)$

68.   The function $f(x) = \frac{x-1}{x(x^2-1)}$ is discontinuous at
(a)   exactly one point   (b)   exactly two points
(c)   exactly three points   (d)   no point

69.   The function $f : R \to [-1, 1]$ defined by $f(x) = cosx$ is   (CBSE-2020)
(a)   both one-one and onto   (b)   not one-one but onto
(c)   one-one but not onto   (d)   neither one-one nor onto

70.   The relation R in the set $\{1,2,3\}$ given by $R = \{(1,2), (2,1), (1,1)\}$ is   (CBSE-2020)
(a)   symmetric and transitive but not reflexive
(b)   reflexive and symmetric but not transitive
(c)   symmetric but neither reflexive nor transitive
(d)   an equivalence relation.

71.   If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{a} \times \vec{b}| = 6$, then the value of $\vec{a} \cdot \vec{b}$ is (CBSE-2020)

(a)   12   (b)   6   (c) $3\sqrt{3}$ (d) $6\sqrt{3}$

72.   The function $f : R \to R$ given by $f(x) = -|x - 1|$ is   (CBSE-2020)
(a)   Continuous as well as differentiable at $x = 1$
(b)   not continuous but differentiable at $x = 1$
(c)   Continuous but not differentiable $x = 1$
(d)   neither continuous nor differentiable at $x = 1$

73.   The vectors $3\hat{\imath} - \hat{\jmath} + 2\hat{k}$, $2\hat{\imath} + \hat{\jmath} + 3\hat{k}$ and $\hat{\imath} + \lambda\hat{\jmath} - k$ are coplaner if value of 'λ' is
(a) -2 (b)   0   (c)   2   (d)   any real number   (CBSE-2020)

74.   If $p = cosec\theta - cot\theta$ and $q = (cosec\theta + cot\theta)^{-1}$ then which one of the

following is correct ?   (2019-I)
(a) $pq = 1$ (b) $p = q$ (c) $p + q = 1$ (d) $p + q = 0$

75.   The length of the perpendicular from the origin to a line is 5 units and the line

makes an angle 120° with the positive direction of x-axis. The equation of line is (2015-I)

(a) $x + \sqrt{3}y = 5$ (b) $\sqrt{3}x + y = 10$ (c) $\sqrt{3}x - y = 10$ (d) *none*

76. If $A \subseteq B$, then which one of the following is not correct ? (2015-I)

(a) $P(A \cap \overline{B}) = 0$ (b)$P(A/B) = \frac{P(A)}{P(B)}$ (c)$P(B/A) = \frac{P(B)}{P(A)}$ (d)$P(A/(A \cup B)) = \frac{P(A)}{P(B)}$

For the next four items that follow :
Consider the integral $I_m = \int_0^\pi \frac{\sin 2mx}{\sin x} dx$ where 'm' is a positive integer. *(2015-I)*

77. What is I_1 equal to ?

(a) 4 (b) $1/2$ (c) 1 (d) 2

78. What is $I_2 + I_3$ equal to ?
    (a) 4 (b) 2 (c) 1 (d) 0

79. What is I_m equal to ?
    (a) 0 (b) 1 (c) m (d) $2m$

80. Consider the following :-

1) $I_m - I_{m-1}$ is equal to 0

2) $I_{2m} > I_m$

Which of the above is / correct ?

(a) $1 only$ (b) $2 only$ (c) $both 1 \& 2$ (d) $neither 1 nor 2$

81. If $\frac{1}{b-a} + \frac{1}{b-c} = \frac{1}{a} + \frac{1}{c}$ then a, b, c are in (2011-I)
    (a) $A.P$ (b) $G.P$ (c) $H.P$ (d) *none*

82. One of the roots of the equation $ax^2 + bx + c = 0, a \neq 0$ is positive and the other

    root is negative. The condition for this to happen is (2011-I)
    (a) $a > 0, b > 0, c > 0$ (b) $a > 0, b < 0, c > 0$
    (c) $a < 0, b > 0, c < 0$ (d) $a < 0, c > 0$

83. If A and B are events such that $P(A \cup B) = 0.5, P(\overline{B}) = 0.8$ and $P(A/B) = 0.4$,

    then what is $P(A \cap B)$ equal to ?
        (a) 0.08 (b) 0.02 (c) 0.8 (d) 0.2

84. What are the points of intersection of the curve $4x^2 - 9y^2 = 1$

with the conjugate axis ? (2011-I)

(a) $(1/2, 0)$ and $(-1/2, 0)$ (b) $(0,2)$ & $(0,-2)$

(c) $(0,3)$ & $(0,-3)$ (d) no such points exist

85. If $z = 1 + \cos\frac{\pi}{5} + i\sin\frac{\pi}{5}$ then what is $|z|$ equal to ? (2011-I)

(a) $2\cos\frac{\pi}{5}$ (b) $2\sin\frac{\pi}{5}$ (c) $2\cos\frac{\pi}{10}$ (d) $2\sin\frac{\pi}{10}$

86. Let 'M' be the set of men and R is a relation 'is son of' defined on M. Then R is

(a) an equivalence relation (b) a symmetric relation only

(c) a transitive relation only (d) none of the above (2011-I)

87. What is the value of $\sqrt{3}\csc 20° - \sec 20°$? (2010-I)

(a) ¼ (b) 4 (c) 2 (d) 1

88. Let 'A' be a $n \times n$ matrix. If $det(\lambda A) = \lambda^s det(A)$ What is the value of s ?

(a) 0 (b) 1 (c) -1 (d) n (2010-I)

89. What is the number of ways of arranging the letters of the word $BANANA$

so that no two Ns appear together ?

(a) 40 (b) 60 (c) 80 (d) 100

90. What is the number of three-digit odd numbers formed by using the digits

1,2,3,4,5,6 if repetition of digits is allowed ? (2010-I)

(a) 60 (b) 108 (c) 120 (d) 216

91. If $x^2 + y^2 = 1$, then what is $\frac{1+x+iy}{1+x-iy}$ equal to ? (2010-I)

(a) $x - iy$ (b) $x + iy$ (c) $2x$ (d) $-2iy$

92. If $2x = 3 + 5i$, then what is the value of $2x^3 + 2x^2 - 7x + 72$? (2009-I)

(a) 4 (b) -4 (c) 8 (d) -8

93. In how many ways can the letters of the word $GARDEN$ be arranged so that

in each word the vowels should appear in alphabetical order ? (2009-I)

(a) 120 (b) 240 (c) 360 (d) 480

94. Consider the following in respect of a non-singular matrix of order 3 :(2020-I&II)

1) $A(adjA) = (adjA)A$

2) $|adjA| = |A|$

Which of the above statements is / are correct ?

(a)   1only   (b)   2 only   (c)   both 1& 2   (d)   neither 1 nor 2

95.   If p^2, q^2 and r^2 (where $p, q, r > 0$) are in $G.P$, then which of the following is/are correct ?   (2020-I&II)

   1) p, q and r are in $G.P$ 2) lnp, lnq and lnr are in $A.P$
   Select the correct answer using the code given below :
   (a)   1 only   (b)   2 only
   (c)   both 1 and 2   (d)   neither 1 nor 2

96.   The roots α and β of a quadratic equation, satisfy the relation   (2020-I&II)
   $\alpha + \beta = \alpha^2 + \beta^2$ and $\alpha\beta = \alpha^2\beta^2$.What is the number of such quadratic equations

(a)   0   (b)   2   (c)   3   (d)   4

97.   Let p, q and r be three distinct positive real numbers. If $D = \begin{vmatrix} p & q & r \\ q & r & p \\ r & p & q \end{vmatrix}$

   then which one of the following is correct ?   (2020-I&II)

(a) $D < 0$ (b) $D \leq 0$ (c) $D > 0$ (d) $D \geq 0$

   Direction for the following two items :
       Read the following information and answer the two items that follow :
   (2020-I&II)   Let $\frac{tan3A}{tanA} = k$, where $tanA \neq 0$ and $K \neq \frac{1}{3}$

98.   What is tan^2A equal to ?
   (a) $\frac{K+3}{3K-1}$ (b) $\frac{K-3}{3K-1}$ (c) $\frac{3K-3}{K-3}$ (d) $\frac{K+3}{3K+1}$

99.   For real values of $tanA$, K can't lie between
   (a) $\frac{1}{3}$ and 3   (b) $\frac{1}{2}$ and 2   (c) $\frac{1}{5}$ and 5   (d) $\frac{1}{7}$ and 7

100.Which one of the following is correct in respect of the graph of $y = \frac{1}{x-1}$?(2020-I&II)

(a)   The domain is $\{x \epsilon R / x \neq 1\}$ and the range is the set of reals.

(b)   The domain is $\{x \epsilon R / x \neq 1\}$ and the range is $\{y \epsilon R / y \neq 0\}$ and the graph
       intersects y-axis at $(0, -1)$

(c)   The domain is the set of reals and the range is the singleton set $\{0\}$

 (d) The domain is $\{x \in R / x \neq 1\}$ and the range is the set of points on the y-axis

101. If three dice are rolled under the condition that no two dice shown the same face then what is the probability that one of the faces is having the number 6 ?
(a) $5/6$ (b) $5/9$ (c) $1/2$ (d) $5/12$ (2020-I & II)

102. A husband and wife appear in an interview for two vacancies for the same post.

The probability of the husband's selection is $\frac{1}{7}$ and that of the wife's selection is $\frac{1}{5}$.

If the events are independent, then the probability of which one of the following is $\frac{11}{35}$?

(a) At least one of them will be selected (2020-I&II)
(b) Only one of them will be selected
(c) None of them will be selected
(d) Both of them will be selected.

103. The circle $x^2 + y^2 + 4x - 7y + 12 = 0$, cuts an intercept on y-axis equal to (2019-I)
(a) 1 (b) 3 (c) 4 (d) 7

104. What is the least value of $25cosec^2x + 36sec^2x$? (2019-I)

(a) 1 (b) 11 (c) 120 (d) 121

105. From a deck of cards, cards are taken out with replacement. What is the probability that the fourteenth card taken out is an ace ? (2019-I)

(a) $\frac{1}{51}$ (b) $\frac{4}{51}$ (c) $\frac{1}{52}$ (d) $\frac{1}{13}$

106. What is $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ equal to ? (2012-I)
(a) $4abc$ (b) $4a^2bc$ (c) $4a^2b^2c^2$ (d) $-4a^2b^2c^2$

107. If $|z + \bar{z}| = |z - \bar{z}|$, then the locus of z is (2014-I)
(a) a pair of straight lines (b) a line
(c) a set of four straight lines (d) a circle

108. The solution of $\frac{dy}{dx} = |x|$ is (2014-I)

(a) $y = \frac{x|x|}{2} + c$ (b) $y = \frac{|x|}{2} + c$ (c) $y = \frac{x^2}{2} + c$ (d) $y = \frac{x^3}{2} + c$

109. Consider the following statements : (2016-I)

1. $tan^{-1}x + tan^{-1}\left(\frac{1}{x}\right) = \pi$

2. There exist $x, y \in [-1,1]$ when $x \neq y$ such that $sin^{-1}x + cos^{-1}y = \frac{\pi}{2}$

Which of the above statements is / are correct ?

(a)   1 only   (b)   2 only   (c)   both 1 and 2   (d) neither 1 nor 2

110.   The line passing through the points $(1,2,-1)$ and $(3,-1,2)$ meets the yz-plane at which one of the following points ?   (2017-I)

(a) $(0,-\frac{7}{2},\frac{5}{2})$ (b) $(0,\frac{7}{2},\frac{1}{2})$ (c) $(0,-\frac{7}{2},-\frac{5}{2})$ (d) $(0,\frac{7}{2},-\frac{5}{2})$

111.   If the regression coefficient of x on y and y on x are $-\frac{1}{2}$ and $-\frac{1}{8}$ respectively, then   what   is the correlation coefficient between x and y ?   (2017-I)

(a) $-\frac{1}{4}$ (b) $-\frac{1}{16}$ (c) $\frac{1}{16}$ (d) $\frac{1}{4}$

112.   If the graph of a quadratic polynomial lies entirely above x-axis, then which one of the   following is correct ?   (2017-I)
(a)   both the roots are real   (b) one root is real and the other root is complex
(c)   both the roots are complex   (d)   cannot say

113.   Let $A = \{1,2,3,4,5,6,7,8,9,10\}$, then the number of subsets of A containing two or three   elements is   (2017-I)
(a)   45   (b)   120   (c)   165   (d)   330

114.   Consider the following statements :   (2018-I)

1.   Mean is independent of change in scale and change in origin

2.   Variance is independent of change in scale but not in origin   Which of the above statements is / are correct ?

(a)   1only   (b)   2 only   (c)   both 1 and 2   (d) neither 1 nor 2

115.   The differential equation of the system of circles touching the y-axis at the origin   is   (2019-I)

(a) $x^2 + y^2 - 2xy\frac{dy}{dx} = 0$ (b) $x^2 + y^2 + 2xy\frac{dy}{dx} = 0$

(c) $x^2 - y^2 + 2xy\frac{dy}{dx} = 0$ (d) $x^2 - y^2 - 2xy\frac{dy}{dx} = 0$

116.   If $\int_a^b x^3 dx = 0$ and $\int_a^b x^2 dx = \frac{2}{3}$ then what are the values of a and b respectively ?
(a) $-1,1$ (b)   1,1   (c)   0,0   (d) $2,-2$ (2018-I)

117. Consider the following statements :   (2015-I)

1.   The general solution of $\frac{dy}{dx} = f(x) + x$ is of the form $y = g(x) + c$, where c is an arbitrary constant.

2.   The degree of $\left(\frac{dy}{dx}\right)^2 = f(x)$ is 2

Which of the above statement is/are correct ?

(a)   1only   (b)   2 only   (c)   both 1 and 2   (d)   neither 1 nor 2

118. What is the differential equation of all parabolas whose axes are parallel to y-axis?
                                                                                   (2011-I)

(a) $\frac{d^3y}{dx^3} = 0$ (b) $\frac{d^2x}{dy^2} = c$ (c) $\frac{d^3x}{dy^3} = 1$ (d) $\frac{d^3y}{dx^3} = c$

119. What is the order of the differential equation $\frac{dx}{dy} + \int y\,dx = x^3$?   (2016-II)
     (a)   1   (b)   2   (c)   3   (d)   can't be determined

120. Equation of the curve passing through (1,1) and satisfying the differential equation

     $\frac{dy}{dx} = \frac{2y}{x}$, $(x > 0, y > 0)$ is given by

(a) $x^2 = y$ (b) $x = y^2$ (c) $x = 2y$ (d) $y = 2x$

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