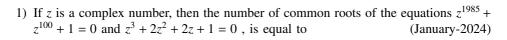
EE24BTECH11010 - Balaji B



a) 0

c) 1

b) 2

a) Suppose 2-p, p, $2-\alpha$, α are the coefficients of four consecutive terms in the expansion of $(1+x)^n$. Then the value of $p^2 - \alpha^2 + 6\alpha + 2p$ equals (January-2024)

a) 8

c) 6

b) 4

d) 10

3) If the domain of the function $f(x) = \log_e\left(\frac{2x+3}{4x^2+x-3}\right) + \cos^{-1}\left(\frac{2x-1}{x+2}\right)$ is (α,β) , then the value of $5\beta - 4\alpha$ is equal to

a) 9

c) 11

b) 12

d) 10

4) Let $f: \mathbb{R} \to \mathbb{R}$ be a function defined by $f(x) = \frac{x}{(1+x^4)^{\frac{1}{4}}}$ and g(x) = f(f(f(x))).

Then, $18 \int_0^{\sqrt{2\sqrt{5}}} x^2 g(x) dx$ is equal to

(January-2024)

1

a) 36

c) 39

b) 33

d) 42

5) Let $R = \begin{pmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{pmatrix}$ be a non-zero 3×3 matrix, where $x \sin \theta = y \sin \left(\theta + \frac{2\pi}{3}\right) = z \sin \left(\theta + \frac{4\pi}{3}\right) \neq 0, \theta \in (0, 2\pi)$. For a square matrix M, let trace (M) denote the sum

 $z\sin\left(\theta + \frac{4\pi}{3}\right) \neq 0, \theta \in (0, 2\pi)$. For a square matrix M, let trace (M) denote the sum of all diagonal entries of M. Then among the statements:

(I) Trace (R) = 0

(II) If trace (adj(adj(R))) = 0, then R has exactly one non-zero entry. (January-2024)

a) Only (I) is true

c) Both (I) and (II) are true

b) Only (II) is true

d) Neither (I) nor (II) is true

6) Let Y = Y(X) be a curve lying in the first quadrant such that the area enclosed by the line Y - y = Y'(X - x) and the co-ordinate axes, where (x, y) is any point on the curve, is always $\frac{-y^2}{2Y'(x)} + 1$, $Y'(x) \neq 0$. If Y(1) = 1, then 12Y(2) equals

(January-2024)

- 7) Let a line passing through the point (-1,2,3) intersect the lines $L_1: \frac{x-1}{3} = \frac{y-2}{2} = \frac{z+1}{-2}$ at $M(\alpha,\beta,\gamma)$ and $L_2: \frac{x+2}{-3} + \frac{y-2}{-2} + \frac{z-1}{4}$ at N(a,b,c). Then, the value of $\frac{(\alpha+\beta+\gamma)^2}{(a+b+c)^2}$ equals
- 8) Consider two circles $C_1: x^2 + y^2 = 25$ and $C_2: (x \alpha) + y^2 = 16$, where $\alpha \in (5, 9)$. Let the angle between the two radii (one to each circle) drawn from one of the intersection points of C_1 and C_2 be $\sin^{-1}\left(\frac{\sqrt{63}}{8}\right)$. If the length of common chord of C_1 and C_2 is β , then the value of $(\alpha\beta)^2$ equals

(January-2024)

- 9) Let $\alpha = \sum_{k=0}^{n} \left(\frac{\binom{n}{C_k}^2}{k+1} \right)$ and $\beta = \sum_{k=0}^{n-1} \left(\frac{\binom{n}{C_k} \binom{n}{C_{k+1}}}{k+2} \right)$. If $5\alpha = 6\beta$, then *n* equals (January-2024)
- 10) Let S_n be the sum to *n*-terms of an arithmetic progression 3,7,11, If 40 < $\left(\frac{6}{n(n+1)}\sum_{k=1}^{n}S_k\right)$ < 42, then *n* equals

(January-2024)

11) In an examination of Mathematics paper, there are 20 questions of equal marks and the question paper is divided into three sections: A, B and C. A student is required to attempt total 15 questions taking at least 4 questions from each section. If section A has 8 questions, section B has 6 questions and section C has 6 questions, then the total number of ways a student can select 15 questions is

(January-2024)

12) The number of symmetric relations defined on the set {1, 2, 3, 4} which are not reflexive is

13) The number of real solutions of the equation $x(x^2 + 3|x| + 5|x - 1| + 6|x - 2|) = 0$ is

(January-2024)

14) The area of the region enclosed by the parabola $(y-2)^2 = x-1$, the line x-2y+4=0and the positive coordinate axes is

(January-2024)

15) The variance σ^2 of the data

x_i	0	1	5	6	10	12	17
f_i	3	2	3	2	6	3	3

Is

(January-2024)