

EE24BTECH11010 - Balaji B

- 1) Let the mean and standard deviation of marks of class A of 100 students be respectively 40 and $\alpha (> 0)$, and the mean and standard deviation of marks of class B of n students be respectively 55 and $30 - \alpha$. If the mean and variance of the marks of the combined class of $100 + n$ students are respectively 50 and 350, then the sum of variances of classes A and B is : (January-2023)

- a) 450
b) 900
c) 650
d) 500

- 2) Let $\mathbf{a} = \hat{i} + 2\hat{j} + 3\hat{k}$, $\mathbf{b} = \hat{i} - \hat{j} + 2\hat{k}$ and $\mathbf{c} = 5\hat{i} - 3\hat{j} + 3\hat{k}$ be three vectors. If \mathbf{r} is a vector such that, $\mathbf{r} \times \mathbf{b} = \mathbf{c} \times \mathbf{b}$ and $\mathbf{r} \cdot \mathbf{a} = 0$, then $25|\mathbf{r}|^2$ is equal to : (January-2023)

- a) 336
b) 449
c) 339
d) 560

- 3) Let H be the hyperbola, whose foci are $(1 \pm \sqrt{2}, 0)$ and eccentricity is $\sqrt{2}$. Then the length of its latus rectum is : (January-2023)

- a) $\frac{5}{2}$
b) 3
c) 2
d) $\frac{3}{2}$

- 4) Let $\alpha > 0$. If $\int_0^\alpha \frac{x}{\sqrt{x+\alpha}-\sqrt{x}} dx = \frac{16+20\sqrt{2}}{15}$, then α is equal to: (January-2023)

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

- 5) The complex number $z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$ is equal to: (January-2023)

- a) $\sqrt{2} \left(\cos \frac{5\pi}{12} + i \sin \frac{5\pi}{12} \right)$
b) $\cos \frac{\pi}{12} - i \sin \frac{\pi}{12}$
c) $\sqrt{2} \left(\cos \frac{\pi}{12} + i \sin \frac{\pi}{12} \right)$
d) $\sqrt{2}i \left(\cos \frac{5\pi}{12} - i \sin \frac{5\pi}{12} \right)$

- 6) The coefficient of x^{-6} , in the expansion of $\left(\frac{4x}{5} + \frac{5}{2x^2} \right)^9$, is (January-2023)

- 7) Let the area of the region $\{(x, y) : |2x - 1| \leq y \leq |x^2 - x|, 0 \leq x \leq 1\}$ be A . Then $(6A + 11)^2$ is equal to (January-2023)

- 8) If ${}^{2n+1}P_{n-1} : {}^{2n-1}P_n = 11 : 21$, then $n^2 + n + 15$ is equal to:

(January-2023)

- 9) If the constant term in the binomial expansion of $\left(\frac{x^{\frac{5}{2}}}{2} - \frac{4}{x}\right)^9$ is -84 and the coefficient of x^{-3l} is $2^{\alpha}\beta$, where $\beta < 0$ is an odd number, then $|\alpha l - \beta|$ is equal to

(January-2023)

- 10) Let $\mathbf{a}, \mathbf{b}, \mathbf{c}$ be three vectors such that $|\mathbf{a}| = \sqrt{31}$, $4|\mathbf{b}| = |\mathbf{c}| = 2$ and $2(\mathbf{a} \times \mathbf{b}) = 3(\mathbf{c} \times \mathbf{a})$. If the angle between \mathbf{b} and \mathbf{c} is $\frac{2\pi}{3}$, then $\left(\frac{\mathbf{a} \times \mathbf{c}}{\mathbf{a} \cdot \mathbf{b}}\right)^2$ is equal to

(January-2023)

- 11) Let S be the set of all $a \in \mathbb{N}$ such that the area of the triangle formed by the tangent at the point $P(b, c)$, $b, c \in \mathbb{N}$, on the parabola $y^2 = 2ax$ and the lines $x = b, y = 0$ is 16 unit^2 , then $\sum_{a \in S} a$ is equal to

(January-2023)

- 12) The sum $1^2 - 2 \cdot 3^2 + 3 \cdot 5^2 - 4 \cdot 7^2 + 5 \cdot 9^2 - \dots + 15 \cdot 29^2$ is

(January-2023)

- 13) Let A be the event that the absolute difference between two randomly choosen real numbers in the sample space $[0, 60]$ is less than or equal to a . If $P(A) = \frac{11}{36}$, then a is equal to

(January-2023)

- 14) Let $A = [a_{ij}]$, $a_{ij} \in \mathbb{Z} \cap [0, 4]$, $1 \leq i, j \leq 2$. The number of matrices A such that the sum of all entries is a prime number $p \in (2, 13)$ is

(January-2023)

- 15) Let A be a $n \times n$ matrix such that $|A| = 2$. If the determinant of the matrix $\text{Adj}(2 \cdot \text{Adj}(2A^{-1}))$ is 2^{84} , then n is equal to

(January-2023)