

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  $\alpha$  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  $2^a\beta$ , 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  $16 \text{ unit}^2$ , 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)