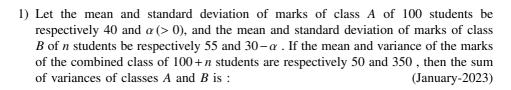
## 31-01-2023- shift-2

## EE24BTECH11010 - Balaji B



a) 450

c) 650

b) 900

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)

1

a) 336

c) 339

b) 449

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)  $\bar{3}$ 

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

c)  $2\sqrt{2}$  d)  $\sqrt{2}$ 

b) 2

5) The complex number  $z = \frac{i-1}{\cos \frac{\pi}{2} + i \sin \frac{\pi}{2}}$  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  $\{(x,y): |2x-1| \le y \le |x^2-x|, 0 \le x \le 1\}$  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  $\left(\frac{x^{\frac{5}{2}}}{2} - \frac{4}{x^{l}}\right)^{9}$  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<sup>2</sup>, 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  $A = [a_{ij}], a_{ij} \in \mathbb{Z} \cap [0,4], 1 \le i, j \le 2$ . 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  $\operatorname{Adj}\left(2 \cdot \operatorname{Adj}\left(2A^{-1}\right)\right)$  is  $2^{84}$ , then n is equal to

(January-2023)