

2023-April

Session-04-08-2023-Shift:2-1-15

EE24BTECH11026

G.Srihaas

- 1) Let $A = \{\theta \in (0, 2\pi) : \frac{1+2i \sin \theta}{1-i \sin \theta} \text{ is purely imaginary}\}$. Then sum of elements in A is.
(2023-April)
- a) π b) 3π c) 4π d) 2π
- 2) Let P be the plane passing through the line $\frac{x-1}{1} = \frac{y-2}{-3} = \frac{z+5}{7}$ and the point (2, 4, 3). If the image of the point (-1, 3, 4) in the plane P is (α, β, γ) then $\alpha + \beta + \gamma$ is equal to
(2023-April)
- a) 12 b) 9 c) 10 d) 11
- 3) If $A = \begin{pmatrix} 1 & 5 \\ \lambda & 10 \end{pmatrix}$, $A^{-1} = \alpha A + \beta I$ and $\alpha + \beta = -2$, then $4\alpha^2 + \beta^2 + \lambda^2$ is equal to
(2023-April)
- a) 14 b) 12 c) 19 d) 10
- 4) The area of the quadrilateral ABCD with the vertices **A**(2, 1, 1), **B**(1, 2, 5), **C**(-2, -3, 5) and **D**(1, -6, -7) is equal to
(2023-April)
- a) 54 b) $9\sqrt{38}$ c) 48 d) $8\sqrt{38}$
- 5) $25^{190} - 19^{180} - 8^{190} + 2^{190}$ is divisible by
(2023-April)
- a) 34 but not by 14 c) Both 14 and 34 34
b) 14 but not by 34 d) Neither 14 nor
- 6) Let O be the origin and OP and OQ be the tangents to the circle $x^2 + y^2 - 6x + 4y + 8 = 0$ at the points P and Q on it. If the circumcircle of the triangle OPQ passes through the point $(\alpha, 1/2)$
(2023-April)
- a) $-1/2$ b) $5/2$ c) 1 d) $3/2$
- 7) Let a_n be the n^{th} term of the series $5 + 8 + 14 + 23 + 35 + 50 + \dots$ and the $S_n = \sum a_k$. Then $S_{30} - a_{40}$ is equal to
(2023-April)

- a) 11260 b) 11280 c) 11290 d) 11310

8) If $\alpha > \beta > 0$ are the roots of the equation $ax^2 + bx + 1 = 0$, and

$$\lim_{x \rightarrow \frac{1}{\alpha}} \left(\frac{1 - \cos(x^2 + bx + a)}{2(1 - \alpha x)^2} \right)^{\frac{1}{2}} = \frac{1}{k} \left(\frac{1}{\beta} - \frac{1}{\alpha} \right)$$

then k is equal to

(2023-April)

- a) β b) 2α c) 2β d) α

9) If the number of words, with or without meaning, which can be made using all the letters of the word MATHEMATICS in which C and S do not come together, is $(6!)k$, is equal to
(2023-April)

- a) 1890 b) 945 c) 2835 d) 5670

10) Let S be the set of all values of $\theta \in [-\pi, \pi]$ for which the system of linear equations

$$x + y + \sqrt{7}z = 0 \quad (10.1)$$

$$-x + (\tan \theta)y + \sqrt{3}z = 0 \quad (10.2)$$

$$x + y + (\tan \theta)z = 0 \quad (10.3)$$

has non-trivial solution. Then $\frac{120}{\pi} \sum \theta$ is equal to
(2023-April)

- a) 20 b) 40 c) 30 d) 10

11) For $a, b \in \mathbb{Z}$ and $|a - b| \leq 10$, let the angle between the plane $P: ax + y - z = b$ and the line $l: x - 1 = a - y = z + 1$ be $\cos^{-1}\left(\frac{1}{3}\right)$. If the distance of the point $(6, -6, 4)$ from the plane P is $3\sqrt{6}$, the $a^4 + b^2$ is equal to
(2023-April)

- a) 85 b) 48 c) 25 d) 32

12) Let the vectors $\overline{u_1} = \hat{i} + \hat{j} + a\hat{k}$, $\overline{u_2} = \hat{i} + b\hat{j} + \hat{k}$ and $\overline{u_3} = c\hat{i} + \hat{j} + \hat{k}$ be coplanar. If the vectors $\overline{v_1} = (a + b)\hat{i} + c\hat{j} + c\hat{k}$, $\overline{v_2} = a\hat{i} + (b + c)\hat{j} + a\hat{k}$ and $\overline{v_3} = b\hat{i} + b\hat{j} + (c + a)\hat{k}$ are also coplanar, then $6(a + b + c)$ is
(2023-April)

- a) 4 b) 12 c) 6 d) 0

13) The absolute difference of the coefficients of x^{10} and x^7 in the expansion of $\left(2x^2 + \frac{1}{2x}\right)^{11}$
(2023-April)

- a) $10^3 - 10$ b) $11^3 - 11$ c) $12^3 - 12$ d) $13^3 - 13$

14) Let $A = \{1, 2, 3, 4, 5, 6, 7\}$. Then the relation $R = \{(x, y) \in A \times A : x + y = 7\}$ is (2023-April)

- a) Symmetric but neither reflexive nor transitive
b) Transitive but neither symmetric nor reflexive
c) An equivalence relation
d) Reflexive but neither symmetric nor transitive
- 15) If the probability that the random variable X takes values x is given by $P(X = x) = k(x + 1)3^{-x}$, $x = 0, 1, 2, 3, \dots$, where k is a constant, then $P(X \geq 2)$ is equal to (2023-April)

- a) $\frac{7}{27}$ b) $\frac{11}{18}$ c) $\frac{7}{18}$ d) $\frac{20}{27}$