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

EE24BTECH11026
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1) Let $A = \left\{\theta \in (0, 2\pi) : \frac{1+2\iota \sin\theta}{1-\iota \sin\theta} \text{ is purely imaginary } \right\}$.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 t0 (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 $\mathbf{A}(2, 1, 1)$, $\mathbf{B}(1, 2, 5)$, $\mathbf{C}(-2, -3, 5)$ and $\mathbf{D}(1, -6, -7)$ is equal to

   a) 54
   b) $9\sqrt{38}$
   c) 48
   d) $8\sqrt{38}$

5) $25^{190} - 19^{180} - 8^{190} + 2^{190}$is divisble by (2023-April)

   a) 34 but not by 14
   c) Both 14 and 34
   b) 14 but not by 34
   d) Neither 14 nor 34

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 $5 + 8 + 14 + 23 + 35 + 50 + ...$ 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

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

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

$$x + y + \sqrt{7}z = 0 \tag{10.1}$$

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

$$x + y + (\tan\theta)\, z = 0 \tag{10.3}$$

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 $a, b \in Z$ and $|a - b| \leq 10$,let the angle between the plane P:$ax + y - z = b$ and the line1:$x - 1 = a - y = z + 1$ 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 $P(X = x) = k(x + 1)3^{-x}, x = 0, 1, 2, 3, ...,$ 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) $\frac{20}{27}$