2023-April Session-08-04-2023-shift-1-16-30

EE24BTECH11033 - KOLLURU SURAJ

1) The number of ways, in which 5 girls and 7 boys can be seated at a round table so that no two girls sit together, is (Apr-2023)

   a) $7(720)^2$ b) 720 c) $7(360)^2$ d) $126(5!)^2$

2) Let $f(x) = \frac{\sin x+\cos x-\sqrt{2}}{\sin x-\cos x}$, $x \in [0,\pi] - \left\{\frac{\pi}{4}\right\}$. Then $f\left(\frac{7\pi}{12}\right) f''\left(\frac{7\pi}{12}\right)$ is equal to (Apr-2023)

   a) $\frac{-2}{3}$ b) $\frac{2}{9}$ c) $\frac{-1}{3\sqrt{3}}$ d) $\frac{2}{3\sqrt{3}}$

3) If the equation of the plane containing the line $x + 2y + 3z - 4 = 0$, $2x + y - z + 5 = 0$ and perpendicular to the plane $\mathbf{r} = \left(\hat{i} - \hat{j}\right) + \lambda\left(\hat{i} + \mathbf{j} + \mathbf{k}\right) + \mu\left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$ is $ax + by + cz = 4$, then $(a - b + c)$ is equal to (Apr-2023)

   a) 22 b) 24 c) 20 d) 18

4) Let A = $\begin{pmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$. If $\left|\text{adj}\left|\text{adj}\left|\text{adj}\, 2A\right|\right|\right| = (16)^n$, then n is equal to (Apr-2023)

   a) 8 b) 9 c) 12 d) 10

5) Let $I(x) = \int \frac{(x+1)}{x(1+xe^x)^2}\,dx$, $x > 0$. If $\lim_{x\to\infty} I(x) = 0$, then $I(1)$ is equal to (Apr-2023)

   a) $\frac{e+1}{e+2} - \log_e(e+1)$ c) $\frac{e+2}{e+1} - \log_e(e+1)$
   b) $\frac{e+2}{e+1} + \log_e(e+1)$ d) $\frac{e+1}{e+2} + \log_e(e+1)$

6) Let $A = [0,3,4,6,7,8,9,10]$ and R be the relation defined on A such that $R = \{(x,y) \in A \times A : x - y$ is an odd positive integer or $x - y = 2\}$. The minimum number of elements that must be added to the relation R so that it is a symmetric relation is equal to (Apr-2023)
7) Let $[t]$ denote the greatest integer $\leq t$. If the constant term in the expansion of $\left(3x^2 - \frac{1}{2x^5}\right)^7$ is α, then $[\alpha]$ is equal to (Apr-2023)
8) Let λ_1, λ_2 be the values of λ for which the points $\left(\frac{5}{2}, -1, \lambda\right)$ and $(-2,0,1)$ are at equal distance from the plane $2x + 3y - 6z + 7 = 0$. If $\lambda_1 > \lambda_2$, then the distance of the point $(\lambda_1 - \lambda_2, \lambda_2, \lambda_1)$ from the line $\frac{x-5}{1} = \frac{y-1}{2} = \frac{z+7}{2}$ (Apr-2023)

9) If the solution curve of the differential equation $(y - 2\log_e x)\,dx + \left(x \log_e x^2\right) dy = 0$, $x > 1$ passes through the points $\left(e, \frac{4}{3}\right)$ and $\left(e^4, \alpha\right)$, then α is equal to (Apr-2023)

10) Let $\mathbf{a} = 6\hat{i} + 9\hat{j} + 12\hat{k}$, $\mathbf{b} = \alpha\hat{i} + 11\hat{j} - 2\hat{k}$ and $\hat{c}$ be vectors such that $\mathbf{a} \times \mathbf{c} = -\mathbf{a} \times \mathbf{b}$. If $\mathbf{a} \cdot \mathbf{c} = -12$, $\mathbf{c} \cdot (\hat{i} - 2\hat{j} + \hat{k}) = 5$, then $\mathbf{c} \cdot (\hat{i} + \hat{j} + \hat{k})$ is equal to (Apr-2023)

11) The largest natural number n such that 3^n divides 66! is (Apr-2023)

12) If a_a is the greatest term in the sequence $a_n = \frac{n^3}{n^4+147}$, n=1, 2, 3,..... then a is equal to (Apr-2023)

13) Let the mean and variance of 8 numbers x, y, 10, 12, 6, 12, 4, 8 be 9 and 9.25 respectively. If $x > y$, then $3x - 2y$ is equal to (Apr-2023)

14) Consider a circle $C_1 : x^2 + y^2 - 4x - 2y = \alpha - 5$. Let its mirror image in the line $y = 2x + 1$ be another circle $C_2 : 5x^2 + 5y^2 - 10fx - 10gy + 36 = 0$.Let r be the radius of C_2. Then $\alpha + r$ is equal to (Apr-2023)

15) Let $[t]$ denote the greatest integer $\leq t$. Then $\frac{2}{\pi}\int_{\pi/6}^{5\pi/6} (8\,[\operatorname{cosec} x] - 5\,[\cot x])\,dx$ is equal to (Apr-2023)