

# 2023-April

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

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16) 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 [April – 2023]

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

17) 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 [April – 2023]

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

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

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

19) Let  $A = \begin{pmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$ . If  $|\text{adj } A| |\text{adj } 2A| = (16)^n$ , then  $n$  is equal to [April – 2023]

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

20) Let  $I(x) = \int \frac{(x+1)}{x(1+xe^x)^2} dx$ ,  $x > 0$ . If  $\lim_{x \rightarrow \infty} I(x) = 0$ , then  $I(1)$  is equal to [April – 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)  $\frac{e+1}{e+2} + \log_e(e+1)$

21) Let  $A = [0, 3, 4, 6, 7, 8, 9, 10]$  and  $R$  be the relation defined on  $A$  such that  $R = \{(x, y) \in A \times A : x - y \text{ is an odd positive integer or } x - y = 2\}$ . The minimum number of elements that must be added to the relation  $R$  so that it is a symmetric relation is equal to [April – 2023]

22) Let  $[t]$  denote the greatest integer  $\leq t$ . If the constant term in the expansion of  $\left(3x^2 - \frac{1}{2x^3}\right)^7$  is  $\alpha$ , then  $[\alpha]$  is equal to [April – 2023]

23) Let  $\lambda_1, \lambda_2$  be the values of  $\lambda$  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  $\frac{x-5}{1} = \frac{y-1}{2} = \frac{z+7}{2}$  [April – 2023]

- 24) If the solution curve of the differential equation  $(y - 2 \log_e x) dx + (x \log_e x^2) dy = 0$ ,  $x > 1$  passes through the points  $(e, \frac{4}{3})$  and  $(e^4, \alpha)$ , then  $\alpha$  is equal to [April – 2023]
- 25) Let  $\mathbf{a} = 6\mathbf{i} + 9\mathbf{j} + 12\mathbf{k}$ ,  $\mathbf{b} = \alpha\mathbf{i} + 11\mathbf{j} - 2\mathbf{k}$  and  $\mathbf{c}$  be vectors such that  $\mathbf{a} \times \mathbf{c} = -\mathbf{a} \times \mathbf{b}$ . If  $\mathbf{a} \cdot \mathbf{c} = -12$ ,  $\mathbf{c} \cdot (\mathbf{i} - 2\mathbf{j} + \mathbf{k}) = 5$ , then  $\mathbf{c} \cdot (\mathbf{i} + \mathbf{j} + \mathbf{k})$  is equal to [April – 2023]
- 26) The largest natural number  $n$  such that  $3^n$  divides  $66!$  is [April – 2023]
- 27) If  $a_n$  is the greatest term in the sequence  $a_n = \frac{n^3}{n^4 + 147}$ ,  $n=1,2,3,\dots$ , then  $a$  is equal to [April – 2023]
- 28) 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 [April – 2023]
- 29) 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 [April – 2023]
- 30) Let  $[t]$  denote the greatest integer  $\leq t$ . The  $\frac{2}{\pi} \int_{\pi/6}^{5\pi/6} (8 [\operatorname{cosec} x] - 5 [\cot x]) dx$  is equal to [April – 2023]