

Assignment-5

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I. SECTION-A:JEE MAIN 2021

- 16) $\lim_{n \rightarrow \infty} \left(1 + \frac{1 + \frac{1}{2} + \dots + \frac{1}{n}}{n^2}\right)^n$ is equal to:
- $\frac{1}{2}$
 - $\frac{1}{e}$
 - 1
 - 0
- 17) The total number of positive integral solutions (x, y, z) such that $xyz = 24$ is :
- 36
 - 45
 - 24
 - 30
- 18) If a curve passes through the origin and the slope of tangent to it at any point (x, y) is $\frac{x^2 - 4x + y + 8}{x - 2}$, then this curve also passes through the point:
- (4, 5)
 - (5, 4)
 - (4, 4)
 - (5, 5)
- 19) The value of $\int_{-1}^1 x^2 e^{[x^3]} dx$, where $[t]$ denotes the greatest integer $\leq t$, is:
- $\frac{(e+1)}{3}$
 - $\frac{e-1}{3e}$
 - $\frac{e+1}{3e}$
 - $\frac{1}{3e}$
- 20) When a missile is fired from a ship, the probability that it is intercepted is $\frac{1}{3}$ and the probability that the missile hits the target, given that it is not intercepted, is $\frac{3}{4}$. If three missiles are fired independently from the ship, then the probability that all three hit the target, is:
- $\frac{1}{8}$

- b) $\frac{1}{27}$
 c) $\frac{3}{4}$
 d) $\frac{3}{8}$

II. SECTION-B

- 1) Let A_1, A_2, A_3, \dots be squares such that for each $n \geq 1$, the length of the side of A_n equals the length of diagonal of A_{n+1} . If the length of A_1 is 12 cm, then the smallest value of n for which area of A_n is less than one is .
- 2) The graphs of sine and cosine functions, intersect each other at a number of points and between two consecutive points of intersection, the two graphs enclose the same area A . then A^4 is equal to
- 3) The locus of the point of intersection of lines $(\sqrt{3})kx + ky - 4\sqrt{3} = 0$ and $\sqrt{3}x - y - 4(\sqrt{3})k = 0$ is a conic, whose eccentricity is
- 4) $A = \begin{bmatrix} 0 & -\tan\left(\frac{\theta}{2}\right) \\ \tan\left(\frac{\theta}{2}\right) & 0 \end{bmatrix}$ and $(I_2 + A)(I_2 - A)^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $13(a^2 + b^2)$ is equal to
- 5) Let $f(x)$ be a polynomial of degree 6 in x , in which the coefficient of x^6 is unity and it has extrema at $x = -1$ and $x = 1$. If $\lim_{x \rightarrow 0} \frac{f(x)}{x^3} = 1$, then $5 \cdot f(2)$ is equal to
- 6) The number of points at which the function $f(x) = |2x + 1| - 3|x + 2| + |x^2 + x - 2|$, $x \in \mathbb{R}$ is not differentiable, is .
- 7) If the system of equations

$$\begin{aligned} kx + y + 2z &= 1 \\ 3x - y - 2z &= 2 \\ -2x - 2y - 4z &= 3 \end{aligned}$$
 has infinitely many solutions, then k is equal to
- 8) $\mathbf{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\mathbf{b} = \hat{i} - \hat{j}$ and $\mathbf{c} = \hat{i} - \hat{j} - \hat{k}$ be three given vectors. If \mathbf{r} is a vector such that $\mathbf{r} \times \mathbf{a} = \mathbf{c} \times \mathbf{a}$ and $\mathbf{r} \cdot \mathbf{b} = 0$, then $\mathbf{r} \cdot \mathbf{a}$ is equal to
- 9) Let $A = \begin{bmatrix} x & y & z \\ y & z & x \\ z & x & y \end{bmatrix}$, where x, y and z are real numbers such that $x + y + z > 0$ and $xyz = 2$. If $A^2 = I_3$, then the value of $x^3 + y^3 + z^3$ is .
- 10) The total number of numbers, lying between 100 and 1000 that can be formed with the digits 1, 2, 3, 4, 5, if the repetition of digits is not allowed and numbers are divisible by either 3 or 5 is .