

2021-August Session-31-08-2021

shift 2

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AI24BTECH11016

1 16-30(MATH)

- 1) Let \mathbf{A} be the set of all points (α, β) such that the area of triangle formed by the points $(5, 6)$, $(3, 2)$ and (α, β) is 12 square units. Then the least possible length of a line segment joining the origin to a point in \mathbf{A} , is [August 2021]
- a) $\frac{4}{\sqrt{5}}$
b) $\frac{16}{\sqrt{5}}$
c) $\frac{8}{\sqrt{5}}$
d) $\frac{12}{\sqrt{12}}$
- 2) The number of solutions of the equation $32^{\tan^2 x} + 32^{\sec^2 x} = 81$, $0 \leq x \leq \frac{\pi}{4}$ is: [August 2021]
- a) 3
b) 1
c) 0
d) 2
- 3) Let f be any continuous function on $[0, 2]$ and twice differentiable on $(0, 2)$. If $f(0) = 0$, $f(1) = 1$ and $f(2) = 2$, then [August 2021]
- a) $f''(x) = 0$ for all $x \in (0, 2)$
b) $f''(x) = 0$ for some $x \in (0, 2)$
c) $f'(x) = 0$ for some $x \in [0, 2]$
d) $f''(x) > 0$ for all $x \in (0, 2)$
- 4) If $[x]$ is the greatest integer $\leq x$, then $\pi^2 \int_0^2 \sin \frac{\pi x}{2} (x - [x])^{[x]} dx$ is equal to: [August 2021]
- a) $2(\pi - 1)$
b) $4(\pi - 1)$
c) $4(\pi + 1)$
d) $2(\pi + 1)$
- 5) The mean and variance of 7 observations are 8 and 16 respectively. If two observations are 6 and 8, then the variance of the remaining 5 observations is: [August 2021]
- a) $\frac{92}{5}$
b) $\frac{134}{5}$
c) $\frac{536}{25}$
d) $\frac{112}{5}$

- 6) If the coefficient of a^7b^8 in the expansion of $(a + 2b + 4ab)^{10}$ is $K \cdot 2^{16}$, then K is equal to [August 2021]
- 7) Suppose the line $\frac{x-2}{\alpha} = \frac{y-2}{-5} = \frac{z+2}{2}$ lies on the plane $x + 3y - 2z + \beta = 0$. Then the value of $\alpha + \beta$ is equal to [August 2021]
- 8) The number of 4-digit numbers which are neither multiple of 7 nor multiple of 3 is [August 2021]
- 9) $\int \frac{\sin x}{\sin^3 x + \cos^3 x} dx = C$ when C is a constant of integration, then the value of $18(\alpha + \beta + \gamma^2)$ is [August 2021]
- 10) A tangent line **L** is drawn at the point $(2, 4)$ on the parabola $y^2 = 8x$. If the line **L** is also tangent to the circle $x^2 + y^2 = a$, then ' a ' is equal to [August 2021]
- 11) If $S = \frac{7}{5} + \frac{9}{5^2} + \frac{13}{5^3} + \frac{19}{5^4} + \dots$ then $160S$ is equal to [August 2021]
- 12) The number of elements in the set

$$\left\{ A = \begin{pmatrix} a & b \\ 0 & d \end{pmatrix} : a, b, d \in \{-1, 0, 1\} \text{ and } (I - A)^3 = I - A^3 \right\} \quad [\text{August 2021}]$$

- 13) If the line $y = mx$ bisects the area enclosed by the lines $x = 0$, $y = 0$, $x = \frac{3}{2}$ and the curve $y = 1 + 4x - x^2$, then $12m$ is equal to [August 2021]
- 14) Let **B** be the centre of the circle $x^2 + y^2 - 2x + 4y + 1 = 0$. Let the tangents at two points **P** and **Q** on the circle intersect at the point **A** $(3, 1)$. Then $\frac{\text{Area of } \triangle APQ}{\text{Area of } \triangle BPQ}$ is equal to [August 2021]
- 15) Let $f(x)$ be a cubic polynomial with $f(1) = -10$, $f(-1) = 6$, and has a local minima at $x = 1$, and $f'(x)$ has a local minima at $x = -1$. Then $f(3)$ is equal to [August 2021]