27-08-2021- shift-2

EE24BTECH11010 - Balaji B

1) If $y(x) = \cot^{-1}\left(\frac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)$, $x \in \left(\frac{\pi}{2}, \pi\right)$, then $\frac{dy}{dx}$ at $x = \frac{5\pi}{6}$ is: (August-2021)

   a) $-\frac{1}{2}$ b) -1 c) $\frac{1}{2}$ d) 0

2) Two poles, AB of length a meters and CD of length $a+b$ $(b \neq a)$ meters are erected at same horizontal level with bases at B and D. If $BD = x$ and $\tan(\angle ABC) = \frac{1}{2}$, then: (August-2021)

   a) $x^2 + 2(a+2b)x - b(a+b) = 0$
   b) $x^2 + 2(a+2b)x + a(a+b) = 0$
   c) $x^2 - 2ax - b(a+b) = 0$
   d) $x^2 - 2ax + a(a+b) = 0$

3) If $0 < x < 1$ and $y = \frac{1}{2}x^2 + \frac{2}{3}x^3 + \frac{3}{4}x^4 + ...$, then the value of e^{1+y} at $x = \frac{1}{2}$ is : (August-2021)

   a) $\frac{1}{2}e^2$
   b) $2e$
   c) $\frac{1}{2}\sqrt{e}$
   d) $2e^2$

4) The value of the integral $\int_0^1 \frac{\sqrt{x}dx}{(1+x)(1+3x)(3+x)}$ is: (August-2021)

   a) $\frac{\pi}{8}\left(1 - \frac{\sqrt{3}}{2}\right)$ b) $\frac{\pi}{4}\left(1 - \frac{\sqrt{3}}{6}\right)$ c) $\frac{\pi}{8}\left(1 - \frac{\sqrt{3}}{6}\right)$ d) $\frac{\pi}{4}\left(1 - \frac{\sqrt{3}}{2}\right)$

5) If $\lim_{x\to\infty}\left(\sqrt{x^2 - x + 1} - ax\right) = b$ then the ordered pair (a, b) is: (August-2021)

   a) $\left(1, \frac{1}{2}\right)$
   b) $\left(1, -\frac{1}{2}\right)$
   c) $\left(-1, \frac{1}{2}\right)$
   d) $\left(-1, -\frac{1}{2}\right)$

6) Let S be the sum of all solutions (in radians) of the equation $\sin^4\theta + \cos^4\theta - \sin\theta\cos\theta = 0$ in $[0, 4\pi]$. Then $\frac{8S}{\pi}$ is equal to (August-2021)

7) Let S be the mirror image of the point $Q(1, 3, 4)$ with respect to the plane $2x - y + z + 3 = 0$ and let $R(3, 5, \gamma)$ be point of this plane. Then the square of the length of the segment SR is (August-2021)

8) The probability distribution of random variable X is given by:

X	1	2	3	4	5
$P(X)$	K	$2K$	$2K$	$3K$	K

   Let $p = P(1 < X < 4 | X < 3)$. If $5p = \lambda K$, then λ equal to (August-2021)

9) Let z_1 and z_2 be two complex numbers such that $\arg(z_1 - z_2) = \frac{\pi}{4}$ and z_1, z_2 satisfy the equation $|z-3| = Re(z)$. Then the imaginary part of $z_1 + z_2$ is equal to

(August-2021)

10) Let $S = \{1, 2, 3, 4, 5, 6, 9\}$. Then the number of elements in the set $T = \{A \subseteq S : A \neq \phi$ and the sum of all the elements of A is not a multiple of $3\}$ is

(August-2021)

11) Let $A(\sec\theta, 2\tan\theta)$ and $B(\sec\phi, 2\tan\phi)$, where $\theta + \phi = \frac{\pi}{2}$, be two points on the hyperbola $2x^3 - y^2 = 2$. If (α, β) is the point of intersection of the normals to the hyperbola at A and B, then $(2\beta)^2$ is equal to

(August-2021)

12) Two circles each of radius 5 units touch each other at the point $(1, 2)$. If the equation of their common tangent is $4x + 3y = 10$ and $C_1(\alpha, \beta)$ and $C_2(\gamma, \delta)$, $C_1 \neq C_2$ are their centres, then $|(\alpha + \beta)(\gamma + \delta)|$ is equal to

(August-2021)

13) $3 \times 7^{22} + 2 \times 10^{22} - 44$ when divided by 18 leaves the remainder

(August-2021)

14) An online exam is attempted by 50 candidates out of which 20 are boys. The average marks obtained by boys is 12 with a variance 2. The variance of marks obtained by 30 girls is also 2. The average marks of all 50 candidates is 15. If μ is the average marks of girls and σ^2 is the variance of marks of 50 candidates, then $\mu + \sigma^2$ is equal to

(August-2021)

15) If $\int \frac{2e^x + 3e^{-x}}{4e^x + 7e^{-x}} dx = \frac{1}{14}\left(ux + v\log_e\left(4e^x + 7e^{-x}\right)\right) + C$, where C is a constant of integration then $u + v$ is equal to

(August-2021)