

2021-August Session-31-08-2021 shift 1

EE24BTECH11009-Mokshith

- 16) $96 \cos \frac{\pi}{33} \cos \frac{2\pi}{33} \cos \frac{4\pi}{33} \cos \frac{8\pi}{33} \cos \frac{16\pi}{33}$ is equal to:
- 4
 - 2
 - 3
 - 1
- 17) Let the complex number $z = x + iy$ be such that $\frac{2z-3i}{2z+i}$ is purely imaginary. If $x + y^2 = 0$, then $y^4 + y^2 - y$ is equal to:
- $\frac{3}{2}$
 - $\frac{3}{4}$
 - $\frac{1}{4}$
 - $\frac{1}{2}$
- 18) If $f(x) = \frac{(\tan 1^\circ)x + \log_e(123)}{x \log_e(1234) - (\tan 1^\circ)}$ and $x > 0$, then the least value of $f(f(x)) + f\left(f\left(\frac{4}{x}\right)\right)$ is:
- 2
 - 4
 - 8
 - 0
- 19) The slope of the tangent at any point (x, y) on a curve $y = y(x)$ is $\frac{x^2 + y^2}{2xy}$, $x > 0$. If $y(2) = 0$, then a value of $y(8)$ is:
- $4\sqrt{3}$
 - $-4\sqrt{2}$
 - $-2\sqrt{3}$
 - $2\sqrt{3}$
- 20) Let the ellipse $E : x^2 + 9y^2 = 9$ intersect the positive x and y -axes at the points **A** and **B** respectively. Let the major axis of E be a diameter of the circle C . Let the line passing through **A** and **B** meet the circle C at the point **P**. If the area of the triangle with vertices **A**, **P**, and the origin **O** is $\frac{m}{n}$, where m and n are coprime, then $m - n$ is equal to:
- 16
 - 15
 - 18
 - 17

SECTION B

- 21) Some couples participated in a mixed doubles badminton tournament. If the number of matches played, so that no couple plays in a match, is 840, then the total number of persons, who participated in the tournament, is _____.
- 22) The number of elements in the set $\{n \in \mathbb{Z} : |n^2 - 10n + 19| < 6\}$ is _____.
- 23) The number of permutations of the digits $1, 2, 3, \dots, 7$ without repetition, which neither contain the string 153 nor the string 2467, is _____.
- 24) Let $f : (-2, 2) \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} x[x] & , -2 < x < 0 \\ (x-1)[x] & , 0 \leq x < 2 \end{cases}$ where $[x]$ denotes the greatest integer function. If m and n respectively are the number of points in $(-2, 2)$ at which $y = |f(x)|$ is not continuous and not differentiable, then $m + n$ is equal to _____.
- 25) Let a common tangent to the curves $y^2 = 4x$ and $(x-4)^2 + y^2 = 16$ touch the curves at the points **P** and **Q**. Then $(PQ)^2$ is equal to _____.
- 26) If the mean of the frequency distribution is 28, then its variance is _____.

Class:	0-10	10-20	20-30	30-40	40-50
Frequency:	2	3	x	5	4

- 27) The coefficient of x^7 in $(1 - x + 2x^3)^{10}$ is _____.
- 28) Let $y = p(x)$ be the parabola passing through the points $(-1, 0)$, $(0, 1)$ and $(1, 0)$. If the area of the region $\{(x, y) : (x+1)^2 + (y-1)^2 \leq 1, y \leq p(x)\}$ is A , then $12(\pi - 4A)$ is equal to _____.
- 29) Let a, b, c be three distinct positive real numbers such that $(2a)^{\log_e a} = (bc)^{\log_e b}$ and $(b)^{\log_e 2} = (a)^{\log_e c}$. Then $6a + 5bc$ is equal to _____.
- 30) The sum of all those terms, of the arithmetic progression $3, 8, 13, \dots, 373$, which are not divisible by 3, is equal to _____.