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

EE24BTECH11009-Mokshith

16) $\cos\left(\frac{\pi}{33}\right)\cos\left((\frac{2\pi}{33}\right)\cos\left(\frac{4\pi}{33}\right)\cos\left(\frac{8\pi}{33}\right)\cos\left(\frac{16\pi}{33}\right)$ is equal to:

a) 4

b) 2

c) 3

d) 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:

a) $\frac{3}{2}$

b) $\frac{2}{3}$

c) $\frac{4}{3}$

d) $\frac{3}{4}$

18) If $f(x) = \frac{(\tan 1°)x + \log_e(123)}{x \log_e(1234) - (\tan 1°)}$ and $x > 0$, then the least value of $f(f(x)) + f\left(f\left(\frac{4}{x}\right)\right)$ is:

a) 2

b) 4

c) 8

d) 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:

a) $4\sqrt{3}$

b) $-4\sqrt{2}$

c) $-2\sqrt{3}$

d) $2\sqrt{3}$

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:

a) 16

b) 15

c) 18

d) 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 $\{n \in Z : |n^2 - 10n + 19| < 6\}$ is _____.

23) The number of permutations of the digits $1, 2, 3, \ldots, 7$ without repetition, which neither contain the string 153 nor the string 2467, is _____.

24) Let $f : (-2, 2) \to R$ be defined by $f(x) = \begin{cases} x\,[x] & \text{if } -2 < x < 0 \\ (x-1)\,[x] & \text{if } 0 \le x < 2 \end{cases}$ 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 $\mathbf{P}$ and $\mathbf{Q}$. 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 $\left(1 - x + 2x^3\right)^{10}$ 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 $\{(x, y) : (x+1)^2 + (y-1)^2 \le 1, y \le p(x)\}$ 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 $3, 8, 13, \ldots, 373$, which are not divisible by 3, is equal to _____.