2024-April Session-06-04-2024 shift 2

EE24BTECH11009-Mokshith

16) If three letters can be posted to any one of the 5 different addresses, then the probability that the three are posted to exactly two addresses is:
    a) $\frac{12}{25}$
    b) $\frac{4}{25}$
    c) $\frac{6}{25}$
    d) $\frac{18}{25}$
17) If the locus of the point, whose distances from the point $(2, 1)$ and $(1, 3)$ are in the ratio $5 : 4$, is $ax^2 + by^2 + cxy + dx + ey + 170 = 0$, then the value of $a^2 + 2b + 3c + 4d + e$ is equal to:
    a) 5
    b) -27
    c) 437
    d) 37
18) A software company sets up m number of computer systems to finish an assignment in 17 days. If 4 computer systems crashed on the start of the second day, 4 more computer systems crashed on the start of the third day and so on, then it took 8 more days to finish the assignment. The value of m is equal to:
    a) 180
    b) 125
    c) 150
    d) 160
19) If $\int \frac{1}{a^2 \sin^2 x + b^2 \cos^2 x} dx = \frac{1}{12} \tan^{-1}(3 \tan x) +$ constant, then the maximum value of $a \sin x + b \cos x$, is:
    a) $\sqrt{42}$
    b) $\sqrt{39}$
    c) $\sqrt{41}$
    d) $\sqrt{40}$
20) Let $0 \le r \le n$. If ${}^{n+1}C_{r+1} : {}^{n}C_r : {}^{n-1}C_{r-1} = 55 : 35 : 21$, then $2n + 5r$ is equal to:
    a) 62
    b) 60
    c) 55
    d) 50
21) If the shortest distance between the lines $\frac{x-\lambda}{3} = \frac{y-2}{-1} = \frac{z-1}{1}$ and $\frac{x+2}{23} = \frac{y+5}{2} = \frac{z-4}{4}$ is $\frac{44}{\sqrt{30}}$, then the largest possible value of $|\lambda|$ is equal to:

22) Let $[t]$ denote the largest integer less than or equal to t. If $\int_0^3 \left(\left[x^2\right] + \left[\frac{x^2}{2}\right]\right) dx = a + b\sqrt{2} - \sqrt{3} - \sqrt{5} + c\sqrt{6} - \sqrt{7}$, where $a, b, c \in \mathbb{Z}$, then $a + b + c$ is equal to:
23) Let α, β be roots of $x^2 + \sqrt{2}x - 8 = 0$. If $U_n = \alpha^n + \beta^n$, then $\frac{U_{10} + \sqrt{2}U_9}{2U_8}$ is equal to:
24) In a triangle ABC, $BC = 7$, $AC = 8$, $AB = \alpha \in \mathbb{N}$ and $\cos A = \frac{2}{3}$. If $49\cos(3C) + 42 = \frac{m}{n}$, where $\gcd(m, n) = 1$, then $m + n$ is equal to:
25) The length of the latus rectum and directrices of a hyperbola with eccentricity e are 9 and $x = \pm\frac{4}{\sqrt{3}}$, respectively. Let the line $y - \sqrt{3}x + \sqrt{3} = 0$ touch this hyperbola at (x_0, y_0). If m is the product of the focal distances of the point (x_0, y_0), then $4e^2 + m$ is equal to:
26) If $S(x) = (1 + x) + 2(1 + x)^2 + 3(1 + x)^3 + \cdots + 60(1 + x)^{60}$ and $(60)^2 S(60) = a(b)^b + b$, where $a, b \in \mathbb{N}$, then $a + b$ is equal to:
27) If the system of equations

$$2x + 7y + \lambda z = 3$$

$$3x + 2y + 5z = 4$$

$$x + \mu y + 32z = -1$$

has infinitely many solutions, then $(\lambda - \mu)$ is equal to:
28) Let $[t]$ denote the greatest integer less than or equal to t. Let $f : [0, \infty) \to \mathbb{R}$ be a function defined by $f(x) = \left[\frac{x}{2} + 3\right] - \left[\sqrt{x}\right]$ Let S be the set of all points in the interval $[0, 8]$ at which f is not continuous. Then $\sum_{a \in S} a$ is equal to:
29) If the solution $y(x)$ of the given differential equation $(e^y + 1)\cos x dx + e^y \sin x dy = 0$ passes through the point $\left(\frac{\pi}{2}, 0\right)$, then the value of $e^{y\left(\frac{\pi}{6}\right)}$ is equal to:
30) From a lot of 12 items containing 3 defectives, a sample of 5 items is drawn at random. Let the random variable X denote the number of defective items in the sample. Let items in the sample be drawn one by one without replacement. If variance of X is $\frac{m}{n}$, where $\gcd(m, n) = 1$, then $n - m$ is equal to: