29/07/2022-Shift 2

EE24BTECH11021 - Eshan Ray

16) Bag I contains 3 *red*, 4 *black* and 3 *white* balls and Bag II contains 2 *red*, 5 *black* and 2 *white* balls. One ball is transferred from Bag I to Bag II and then a ball is draw from Bag II. The ball so drawn is found to be *black* in color. Then the probability, that the transferred ball is *red*, is :

a) $\frac{4}{9}$
b) $\frac{5}{18}$
c) $\frac{1}{6}$
d) $\frac{3}{10}$

17) Let $S = \{z = x + iy : |z - 1 + i| \geq |z|, |z| < 2, |z + i| = |z + 1|\}$. Then the set of all values of x, for which $w = 2x + iy \in S$ for some $y \in R$, is

a) $\left(-\sqrt{2}, \frac{1}{2\sqrt{2}}\right]$
b) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{4}\right]$
c) $\left(-\sqrt{2}, \frac{1}{2}\right]$
d) $\left(-\frac{1}{\sqrt{2}}, \frac{1}{2\sqrt{2}}\right]$

18) Let $\overrightarrow{a}, \overrightarrow{b}, \overrightarrow{c}$ be three coplanar concurrent vectors such that angles between two of them is same. If the product of their magnitudes is 14 and $\left(\overrightarrow{a} \times \overrightarrow{b}\right) \cdot \left(\overrightarrow{b} \times \overrightarrow{c}\right) + \left(\overrightarrow{b} \times \overrightarrow{c}\right) \cdot \left(\overrightarrow{c} \times \overrightarrow{a}\right) + \left(\overrightarrow{c} \times \overrightarrow{a}\right) \cdot \left(\overrightarrow{a} \times \overrightarrow{b}\right) = 168$ then $\left|\overrightarrow{a}\right| + \left|\overrightarrow{b}\right| + \left|\overrightarrow{c}\right|$ is equal to :

a) 10
b) 14
c) 16
d) 18

19) The domain of the function $f(x) = \sin^{-1}\left(\frac{x^2-3x+2}{x^2+2x+7}\right)$ is :

a) $[1, \infty)$
b) $(-1, 2]$
c) $[-1, \infty)$
d) $(-\infty, 2]$

20) The statement $(p \implies q) \vee (p \implies r)$ is NOT equivalent to :

a) $(p \wedge (\sim r)) \implies q$
b) $(\sim q) \implies ((\sim r) \vee p)$
c) $p \implies (q \vee r)$
d) $(p \wedge (\sim q)) \implies r$

21) The sum and product of mean and variance of a binomial distribution are 82.5 and 1350 respectively. They the number of trials in the binomial distribution is :

22) Let α, β ($\alpha > \beta$) be the roots of the quadratic equation $x^2 - x - 4 = 0$. If $P_n = \alpha^n - \beta^n, n \in N$, then $\frac{P_{15}P_{16} - P_{14}P_{16} - P_{15}^2 + P_{14}P_{15}}{P_{13}P_{14}}$ is equal to ...

23) Let $x = \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ and $A = \begin{pmatrix} -1 & 2 & 3 \\ 0 & 1 & 6 \\ 0 & 0 & -1 \end{pmatrix}$. For $k \in N$, if $x^\top A^k x = 33$, then k is equal to :

24) The number of natural numbers lying between 1012 and 23421 that can be formed using the digits $2, 3, 4, 5, 6$ (*repetition of digits is not allowed*) and divisible by 55 is...

25) If $\sum_{K=1}^{10} K^2 \left(\binom{10}{K}\right)^2 = 22000L$, then L is equal to ...

26) If $[t]$ denotes the greatest integer $\leq t$, then the number of points, at which the function $f(x) = 4|2x + 3| + 8\left[x + \frac{1}{2}\right] - 12[x + 20]$ is not differentiable in the open interval $(-20, 20)$, is...

27) If the tangent to the curve $x^3 - x^2 + x$ at the point (a, b) is also tangent to the curve $y = 5x^2 + 2x - 25$ at the point $(2, -1)$ then $|2a + 9b|$ is equal to ...

28) Let AB be a chord of length 12 of the circle

$$(x - 2)^2 + (y + 1)^2 = \frac{169}{4}$$

If the tangents drawn to the circle at points A and B intersect at point P, then five times the distance of point P from chord AB is equal to ...

29) Let $\vec{a}$ and $\vec{b}$ be two vectors such that $\left|\vec{a} + \vec{b}\right|^2 = \left|\vec{a}\right|^2 + 2\left|\vec{b}\right|^2, \vec{a} \cdot \vec{b} = 3$ and $\left|\vec{a} \times \vec{b}\right|^2 = 75$. Then $\left|\vec{a}\right|^2$ is equal to ...

30) Let $S = \left\{(x, y) \in N \times N : 9(x - 3)^2 + 16(y - 4)^2 \leq 144\right\}$
and $T = \left\{(x, y) \in R \times R : (x - 7)^2 + (y - 4)^2 \leq 36\right\}$.
The $n(S \cap T)$ is equal to ...