## CBT - 04

**1.** In a workshop there are five machines and the probability of any one of them to be out of service on a day is $\frac{1}{4}$. If the probability that at most two machines will be out of service on the same day is $\left(\frac{3}{4}\right)^3 k$, then k is equal to:

(a) $\frac{17}{2}$ (b) $\frac{17}{4}$ (c) $\frac{17}{8}$ (d) 4

**2.** Let α and β be the roots of the equation $x^2 - x - 1 = 0$. If $P_K = (\alpha)^K + (\beta)^k$, $k \geq 1$, then which of the following statements is not true?

(a) $p_5 = p_2.p_3$

(b) $(p_1 + p_2 + p_3 + p_4 + p_5) = 26$

(c) $p_3 = p_5 - p_4$

(d) $p_5 = 11$

**3.** The locus of the mid-point of the perpendiculars drawn from points on the line, x = 2y to the line x = y is:

(a) 3x – 2y = 0 (b) 3x – 3y = 0

(c) 5x – 7y = 0 (d) 7x – 5y = 0

**4.** If $\frac{3+i\sin\theta}{4-i\cos\theta}, \theta \in [0, 2\pi]$, is a real number, then an argument of $\sin\theta + i\cos\theta$ is

(a) $\pi - \tan^{-1}\left(\frac{3}{4}\right)$ (b) $\tan^{-1}\left(\frac{4}{3}\right)$

(c) $\pi - \tan^{-1}\left(\frac{4}{3}\right)$ (d) $-\tan^{-1}\left(\frac{3}{4}\right)$

**5.** If $\theta_1$ and $\theta_2$ be respectively the smallest and the largest values of θ in (0, 2π) – (π) which satisfy the equation, $2\cot^2\theta - \frac{5}{\sin\theta} + 4 = 0$, then $\int_{\theta_1}^{\theta} \cos^2 3\theta\, d\theta$ is equal to:

(a) $\frac{\pi}{9}$ (b) $\frac{\pi}{3} + \frac{1}{6}$

(c) $\frac{2\pi}{3}$ (d) $\frac{\pi}{3}$

**6.** The area (in sq. units) of the region $\{(x,y) \in R^2 | 4x^2 \leq y \leq 8x + 12\}$ is:

(a) $\frac{127}{3}$ (b) $\frac{125}{3}$

(c) $\frac{128}{3}$ (d) $\frac{124}{3}$

**7.** The number of ordered pairs (r, k) for which $6.\,{}^{35}C_r = (k^2 - 3).\,{}^{36}C_{r+1}$, where k is an integer, is:

(a)3 (b) 6 (c) 4 (d) 2

**8.** The coefficient of $x^7$ in the expression $(1 + x)^{10} + x(1 + x)^9 + x^2(1 + x)^8 + \ldots\ldots + x^{10}$ is:

(a) 210 (b) 330

(c) 420 (d) 120

**9.** Let the tangents drawn from the origin to the circle, $x^2 + y^2 - 8x - 4y + 16 = 0$ touch it at the point A and B. The $(AB)^2$ is equal to:

(a) $\frac{52}{5}$ (b) $\frac{32}{5}$

(c) $\frac{56}{5}$ (d) $\frac{64}{5}$

**10.** Let y = y(x) be a function of x satisfying $y\sqrt{1-x^2} = k - x\sqrt{1-y^2}$ where k is a constant and $y\left(\frac{1}{2}\right) = -\frac{1}{4}$. Then $\frac{dy}{dx}$ at $x = \frac{1}{2}$, is equal to:

(a) $\frac{\sqrt{5}}{2}$ (b) $-\frac{\sqrt{5}}{2}$

(c) $\frac{2}{\sqrt{5}}$ (d) $-\frac{\sqrt{5}}{4}$

**11.** The value of c in the Lagrange's mean value theorem for the function $f(x) = x^3 - 4x^2 + 8x + 11$, when $x \in [0, 1]$ is:

(a) $\frac{4-\sqrt{5}}{3}$ (b) $\frac{\sqrt{7}-2}{3}$

(c) $\frac{2}{3}$ (d) $\frac{4-\sqrt{7}}{3}$

**12.** If the sum of the first 40 terms of the series, 3 + 4 + 8 + 9 + 13 + 14 + 18 + 19 +……..is (102)m, then m is equal to:

(a) 25 (b) 20

(c) 10 (d) 5

**13.** The value of α for which $4\alpha\int_{-1}^{2} e^{-\alpha|x|}\, dx = 5$ is

(a) $\log_e\left(\frac{3}{2}\right)$ (b) $\log_e\left(\frac{4}{3}\right)$

(c) $\log_e\sqrt{2}$ (d) $\log_e 2$

**14.** Let A = [aij] and B = [bij] be two 3 × 3 real matrices such that $b_{ij} = (3)^{(i + j - 2)} a_{ji}$, where i, j = 1, 2, 3. If the determinant of B is 81, then the determinant of A is:
(a) 1/9 (b) 1/81 (c) 3 (d) 1/3

**15.** Let A, B, C and D be four non-empty sets. The contrapositive statement of " If $A \subseteq B$ and $B \subseteq D$, then $A \subseteq C$" is:
(a) if $A \not\subseteq C$ then $A \subseteq B$ and $B \subseteq D$
(b) if $A \not\subseteq C$ then $A \not\subseteq B$ and $B \subseteq D$
(c) if $A \subseteq C$ then $B \subset A$ and $D \subset B$
(d) if $A \not\subseteq C$ then $A \not\subseteq B$ and $B \not\subseteq D$

**16.** If $3x + 4y = 12\sqrt{2}$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{9} = 1$ for some $a \in R$, then the distance between the foci of the ellipse is:
(a) $2\sqrt{2}$ (b) $2\sqrt{7}$ (c) 4 (d) $2\sqrt{5}$

**17.** Let $a_1, a_2, a_3, \ldots$ be a G.P. such that $a_1 < 0$, $a_1 + a_2 = 4$ and $a_3 + a_4 = 16$. If $\sum_{i=1}^{9} a_i = 4\lambda$, then $\lambda$ is equal to:
(a) 171 (b) –513
(c) $\frac{511}{3}$ (d) –171

**18.** Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three unit vectros such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$. If $\lambda = \vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a}$ and $\vec{d} = \vec{a}\times\vec{b} + \vec{b}\times\vec{c} + \vec{c}\times\vec{a}$, then the ordered pair, $(\lambda, \vec{d})$ is equal to:
(a) $\left(\frac{3}{2}, 3\vec{a}\times\vec{c}\right)$ (b) $\left(-\frac{3}{2}, 3\vec{c}\times\vec{b}\right)$
(c) $\left(\frac{3}{2}, 3\vec{b}\times\vec{c}\right)$ (d) $\left(-\frac{3}{2}, 3\vec{a}\times\vec{b}\right)$

**19.** Let y = y(x) be the solution curve of the differential equation, $(y^2 - x)\frac{dy}{dx} = 1$, satisfying y(0) = 1. This curve intersects the x-axis at a point whose abscissa is:
(a) 2 – e (b) 2 + e
(c) – e (d) 2

**20.** Let f(x) be a polynomial of degree 5 such that x = ±1 are its critical points. If $\lim_{x\to 0}\left(2 + \frac{f(x)}{x^3}\right) = 4$, then which one of the following is not true?
(a) x = 1 is a point of minima and x = –1 is a point of maxima of f.
(b) f(1) –4f(–1) = 4.
(c) x = 1 is a point of maxima and x = –1 is a point of minimum of f.
(d) f is an odd function.

**21.** If the mean and variance of eight numbers 3, 7, 9, 12, 13, 20, x and y be 10 and 25 respectively, then x.y is equal to____________.
(a) 53 (b) 52
(c) 50 (d) 54

**22.** If the function *f* defined on $\left(-\frac{1}{3}, \frac{1}{3}\right)$ by $f(x) = \begin{cases} \frac{1}{x}\log_e\left(\frac{1+3x}{1-2x}\right) & \text{when } x \neq 0 \\ k & \text{when } x = 0 \end{cases}$ is continuous, then k is equal to________.
(a)1 (b) 3
(c)2 (d) 5

**23.** Let X = {n ∈ N: 1 ≤ n ≤ 50}. If A = {n ∈ X: n is a multiple of 2}; B = {n ∈ X: n is a multiple of 7}, then the number of elements in the smallest subset of X containing both A and B is__________.
(a)25 (b)26
(c) 29 (d) 30

**24.** If the foot of the perpendicular drawn from the point (1, 0, 3) on a line passing through (α, 7, 1) is $\left(\frac{5}{3}, \frac{7}{3}, \frac{17}{3}\right)$, then α is equal to_______.
(a) 4 (b) 2
(c)1 (d) 5

**25.** If the system of linear equations,
x + y + z = 6
x + 2y + 3z = 10
3x + 2y + λz = μ
has more than two solutions, then $\mu - \lambda^2$ is equal to_________.
(a)10 (b) 13
(c)12 (d) 11

## ANSWER KEY

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| **1.** (c) | **2.** (a) | **3.** (c) | **4.** (c) | **5.** (d) | **6.** (c) | **7.** (c) | **8.** (b) | **9.** (d) | **10.** (b) |
| **11.** (d) | **12.** (b) | **13.** (d) | **14.** (a) | **15.** (d) | **16.** (b) | **17.** (d | **18.** (d) | **19.** (a) | **20.** (a) |
| **21.** (d) | **22.** (d) | **23.** (c) | **24.** (a) | **25.** (b) | | | | | |