

JEE MAIN 2020

JANUARY 7, SHIFT-2

EE24BTECH11019 - Dwarak A

SECTION-A

- 1) If $3x + 4y = 12\sqrt{2}$ is a tangent to the ellipse $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{9}\right) = 1$ for some $a \in \mathbb{R}$, then the distance between the foci of the ellipse is:
 - a) $2\sqrt{5}$
 - b) $2\sqrt{7}$
 - c) $2\sqrt{2}$
 - d) 4
- 2) Let A, B, C and D be four non-empty sets. The Contrapositive statement of "If $A \not\subseteq B$ and $B \not\subseteq D$ then $A \not\subseteq C$ " is :
 - a) If $A \subseteq C$, then $B \subset A$ or $D \subset B$
 - b) If $A \not\subseteq C$, then $A \subseteq B$ and $B \subseteq D$
 - c) If $A \not\subseteq C$, then $A \not\subseteq B$ and $B \subseteq D$
 - d) If $A \not\subseteq C$, then $A \not\subseteq B$ or $B \not\subseteq D$
- 3) The coefficient of x^7 in the expression $(1+x)^{10} + x(1+x)^9 + x^2(1+x)^8 + \dots + x^{10}$ is :
 - a) 420
 - b) 330
 - c) 210
 - d) 120
- 4) 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) 4
 - c) $\frac{17}{4}$
 - d) $\frac{17}{8}$
- 5) The locus of mid points of the perpendiculars drawn from points on the line $x = 2y$ to the line $x = y$ is:
 - a) $2x - 3y = 0$
 - b) $3x - 2y = 0$
 - c) $5x - 7y = 0$
 - d) $7x - 5y = 0$
- 6) The value of α for which $4\alpha \int_{-1}^2 e^{-\alpha|x|} dx = 5$ is:
 - a) $\log_e 2$
 - b) $\log_e \sqrt{2}$
 - c) $\log_e \left(\frac{4}{3}\right)$
 - d) $\log_e \left(\frac{3}{2}\right)$
- 7) If the sum of the first 40 terms of the series, $3 + 4 + 8 + 9 + 13 + 14 + 18 + 19 + \dots$ is $(102)m$, then m is equal to :
 - a) 10
 - b) 25
 - c) 5
 - d) 20
- 8) If $\frac{3+i\sin\theta}{4-i\cos\theta}$, $\theta \in [0, 2\pi]$ is a real number, then the argument of $\sin\theta + i\cos\theta$ is :
 - a) $\pi - \tan^{-1}\left(\frac{4}{3}\right)$
 - b) $-\tan^{-1}\left(\frac{3}{4}\right)$
 - c) $\pi - \tan^{-1}\left(\frac{3}{4}\right)$
 - d) $\tan^{-1}\left(\frac{4}{3}\right)$
- 9) Let $A = [a_{ij}]$ and $B = [b_{ij}]$ 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) $\frac{1}{9}$
 - b) $\frac{1}{81}$
 - c) $\frac{1}{3}$
 - d) 3
- 10) Let $f(x)$ be a polynomial of degree 5 such that $x = \pm 1$ are its critical points. If $\lim_{x \rightarrow 0} \left(2 + \frac{f(x)}{x^3}\right) = 4$ then which of the following is not true ?
 - a) $f(1) - 4f(-1) = 4$
 - b) $x = 1$ is a point of maxima and $x = -1$ is a point of minima of f .
 - c) f is an odd function
 - d) $x = 1$ is a point of minima and $x = -1$ is a point of maxima of f .
- 11) The number of ordered pairs (r, k) for which

$6 \cdot {}^{35}C_r = (k^2 - 3) \cdot {}^{36}C_{r+1}$, where k is an integer,
is :

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

12) Let a_1, a_2, a_3, \dots 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 λ is equal to :

- a) 171
- b) $\frac{511}{3}$
- c) -171
- d) -513

13) Let $\mathbf{a}, \mathbf{b}, \mathbf{c}$ be three unit vectors such that $\mathbf{a} + \mathbf{b} + \mathbf{c} = 0$. If $\lambda = \mathbf{a} \cdot \mathbf{b} + \mathbf{b} \cdot \mathbf{c} + \mathbf{c} \cdot \mathbf{a}$ and
 $\mathbf{d} = \mathbf{a} \times \mathbf{b} + \mathbf{b} \times \mathbf{c} + \mathbf{c} \times \mathbf{a}$, then the ordered pair
 (λ, \mathbf{d}) is equal to:

- a) $\left(\frac{3}{2}, 3\mathbf{a} \times \mathbf{c}\right)$
- b) $\left(\frac{-3}{2}, 3\mathbf{c} \times \mathbf{b}\right)$
- c) $\left(\frac{-3}{2}, 3\mathbf{a} \times \mathbf{b}\right)$
- d) $\left(\frac{3}{2}, 3\mathbf{b} \times \mathbf{c}\right)$

14) Let $y = y(x)$ be the solution curve of the
differential equation $(y^2 - x) \left(\frac{dy}{dx}\right) = 1$ satisfying
 $y(0) = 1$ This curve intersects the x -axis at a
point whose abscissa is :

- a) $2 + e$
- b) 2
- c) $2 - e$
- d) $-e$

15) If θ_1 and θ_2 be respectively the smallest and
largest values of θ in $(0, 2\pi) - \{\pi\}$ which sat-
isfy the equation $2 \cot^2 \theta - \frac{5}{\sin \theta} + 4 = 0$ then
 $\int_{\theta_1}^{\theta_2} \cos^2 3\theta d\theta$ is equal to:

- a) $\frac{2\pi}{3}$
- b) $\frac{\pi}{3}$
- c) $\left(\frac{\pi}{3}\right) + \left(\frac{1}{6}\right)$
- d) $\frac{\pi}{9}$