

JEE Questions 6

EE24BTECH11012 - Bhavanisankar G S

1) A plane P is parallel to two lines whose direction ratios are $(-2, 1, 3)$ and $(-1, 2, -2)$ and it contains the point $(2, 2, -2)$. Let P intersect the co-ordinate axes at the points A, B, C making the intercepts α, β, γ . If V is the volume of the tetrahedron OABC, where O is the origin and $p = \alpha + \beta + \gamma$, then the ordered pair (V, p) is equal to : [July 2022]

- a) $(48, -13)$ b) $(24, -13)$ c) $(48, 11)$ d) $(24, -5)$

2) Let S be the set of all $a \in \mathbf{R}$ for which the angle between the vectors $\mathbf{u} = a(\log_e b)\mathbf{i} - 6\mathbf{j} + 3\mathbf{k}$ and $\mathbf{v} = \log_e b\mathbf{i} + 2\mathbf{j} + 2a\log_e b\mathbf{k}$, ($b > 1$) is acute. Then S is equal to [July 2022]

- a) $(-\infty, -\frac{4}{3})$ b) ϕ c) $(-\frac{4}{3}, 0)$ d) $(\frac{12}{7}, \infty)$

3) A horizontal park is in the shape of a triangle OAB with $AB = 16$. A vertical lamp post OP is erected at the point O such that $\angle PAO = \angle PBO = 15^\circ$ and $\angle PCO = 45^\circ$, where C is the mid-point of AB. Then $(OP)^2$ is equal to [July 2022]

- a) $\frac{32}{\sqrt{3}}(\sqrt{3} - 1)$ b) $\frac{32}{\sqrt{3}}(2 - \sqrt{3})$ c) $\frac{16}{\sqrt{3}}(\sqrt{3} - 1)$ d) $\frac{16}{\sqrt{3}}(2 - \sqrt{3})$

4) Let A and B be two events such that $P(B|A) = \frac{2}{5}$, $P(A|B) = \frac{1}{7}$ and $P(A \cap B) = \frac{1}{9}$. Consider

$$\begin{aligned} \text{S1 : } P(A' \cup B) &= \frac{5}{6} \\ \text{S2 : } P(A' \cap B') &= \frac{1}{18} \end{aligned}$$

[July 2022]

- a) Both S1 and S2 are true .
b) Both S1 and S2 are false.
c) S1 is true, but S2 is false.
d) S1 is false, but S1 is true.

5) Let

p : Ramesh listens to music.

q : Ramesh is out of his village.

r : It is Sunday.

s : It is Saturday.

Then the statement "Ramesh listens to music only if he is in his village and it is Sunday or Saturday" can be expressed as [July 2022]

- a) $((\neg q) \wedge (r \vee s)) \implies p$ c) $p \implies (q \wedge (r \vee s))$
b) $(q \wedge (r \vee s)) \implies p$ d) $p \implies ((\neg q) \wedge (r \vee s))$

I. INTEGER-TYPE QUESTIONS

1) Let the coefficients of the middle terms in the expansion of $(\frac{1}{\sqrt{6}} + \beta x)^4$, $(1 - 3\beta x)^2$ and $(1 - \frac{\beta}{2}x)^6$, ($\beta \geq 0$), respectively form the first three terms of an A.P. If d is the common difference of this A.P., then the value of $50 - \frac{2d}{\beta^2}$ is equal to : [July 2022]

2) A class contains b boys and g girls. If the number of ways of selecting 3 boys and 2 girls from the class is 168, then $b + 3g$ is equal to : [July 2022]

3) Let the tangents at the points P and Q on the ellipse $\frac{x^2}{2} + \frac{y^2}{4} = 1$ meet at the point $\mathbf{R}(\sqrt{2}, 2\sqrt{2} - 2)$. If S is the focus of the ellipse on its negative major axis, then $(SP)^2 + (SQ)^2$ is equal to : [July 2022]

4) If $1 + (2 + {}^{49}C_1 + {}^{49}C_2 + \dots + {}^{49}C_{49})({}^{50}C_2 + {}^{50}C_4 + \dots + {}^{50}C_{50})$ is equal to $2^n m$, where m is odd, then $n + m$ is equal to : [July 2022]

5) Two tangent lines l1 and l2 are drawn from the point $(2, 0)$ to the parabola $2y^2 = x$. If the lines l1 and l2 are also tangent to the circle $(x - 5)^2 + y^2 = r$, then $17r$ is equal to : [July 2022]

6) If $\frac{6}{3^{12}} + \frac{10}{3^{11}} + \frac{20}{3^{10}} + \frac{40}{3^9} + \dots + \frac{10240}{3} = 2^n m$, where m is odd, then $m \cdot n$ is equal to : [July 2022]

7) Let $S = \left[-\pi, \frac{\pi}{2}\right) - \left\{\frac{-\pi}{2}, \frac{-\pi}{4}, \frac{-3\pi}{4}, \frac{\pi}{4}\right\}$. Then the number of elements in the set

$$A = \left\{\theta \in S : \tan \theta (1 + \sqrt{5} \tan 2\theta) = \sqrt{5} - \tan 2\theta\right\}$$

is :

[July 2022]

8) Let $z = a + ib, b \neq 0$ be complex numbers satisfying $z^2 = \bar{z}2^{1-|z|}$. Then the least value of $n \in \mathbf{N}$ such that $z^n = (z + 1)^n$ is equal to :

[July 2022]

9) A bag contains white and 6 black balls. Three balls are drawn at random from the bag. Let X be the number of white balls, among the drawn balls. If σ^2 is the variance of X , then $100 \sigma^2$ is equal to

[July 2022]

10) The value of the integral $\int_0^{\frac{\pi}{2}} 60 \frac{\sin 6x}{\sin x} dx$ is equal to :

[July 2022]