JEE Main 1 February 2024 Shift 1 Answer Key

Mathematics

Q.1: If 3, a, b, c are in A.P. and 3, (a - 1), (b + 1) are in G.P., then find the arithmetic mean of a, b and c.

A.1: 11

Q.2: If AP_1 = 3, 7, 11,..., 403 and AP_2 = 2, 5, 8,..., 401. Find the sum of common terms of AP_1 and AP_2.

A.2: 6699

Q.3: If $(t + 1)dx = (2x + (t + 1)^3)dt$ and x(0) = 2, then x(1) = ?

A.3: 12

Q.4: Five people are distributed in four identical rooms. A room can also contain zero people. Find the number of ways to distribute them.

A.4: 51

Q.5: If $5f(x) + 4f(1/x) = x^2 - 4$ and $y = 9f(x) * x^2$
If y is strictly increasing, then find the interval of x.

A.5: $(-\sqrt{\frac{2}{5}, 0})\ U\ \sqrt{\frac{2}{5}, \infty}$

Q.6: If the hyperbola $x^2 - y^2\text{cosec}^2\theta = 5$ and ellipse $x^2\text{cosec}^2\theta + y^2 = 5$ has eccentricity e_H and e_E respectively and $e_H = \sqrt{7}\ e_E$, then find the value of θ.

A.6: $\pi/3$

Q.7: Let S = {1,2,3,..., 20}
R_1 = {(a, b): a divide b},
R_2 = {(a, b): a is integral multiple of b} and a, b ∈ S.
n(R_1 - R_2) = ?

A.7: 46

Q.8: $\int_0^{\pi/4} \frac{x}{\sin^4(2x)+\cos^4(2x)} dx = ?$

A.8: $\frac{\pi^2}{16\sqrt{2}}$

Q.9: If $A = \begin{bmatrix} \sqrt{2} & 1 \\ -1 & \sqrt{2} \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, C = ABA^T$ and $X = AC^2A^T$, then find $|X|$.

A.9: 729

Q.10: $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{8\sqrt{2}cosx}{(1+e^{sinx})(1+\sin^4 x)} dx = a\pi + b\, log\left(3 + 2\sqrt{2}\right)$, then find $a + b$.

A.10: 4