JEE MAIN 22 JANUARY 2025 SHIFT 2

MATHEMATICS QUESTION PAPER WITH ANSWER KEY

Q.No.	Questions	Answers
1	If $2x^2 + (\cos\theta)x - 1 = 0$, $\theta \in (0, 2\pi)$ has roots α and β. Then the sum of maximum and minimum value of $\alpha^4 + \beta^4$ is	25/16
2	If $\theta \in [0, 2\pi]$ satisfying the system of equations $2\sin 2\theta = \cos 2\theta$ and $2\cos 2\theta = 3\cos\theta$. Then the sum of all real values of θ.	π
3	Let A = {1, 2, 3, 4) and B = {1, 4, 9, 16). If f: A→B, then number of many-one functions from A to B are	232
4	4 boys and 3 girls are to be seated in a row such that all girls seat together and two particular boys B_1 and B_2 are not adjacent to each other. Then the number of ways in which this arrangement can be done.	432
5	If the sum $\sum_{r=0}^{30} [(r^2 \, (^{30}C_r)^2) / (^{30}C_{r-1}) = \alpha.2^{29}$, then find the value of α.	465
6	Let a and b be two unit vectors such that angle between a and b is $\pi/3$. If $\lambda a + 3b$ and $2a + \lambda b$ are perpendicular to each other, then the product of all possible values of λ is	6
7	Consider a function $f(x) = \int_0^{x^2} [(t^2 - 8t + 15) / e^t] \, dt$. The number of points of exterma are:	5
8	Let A and B are two events such that $P(A \cap B) = 1/10$, then $P(A \cup B)$ $P(A \cap B) =$ and $P(A/B)$ and $P(B/A)$ are the roots of the equation 10 is equal to $12x^2 - 7x + 1 = 0$ then P(Abar U Bbar)/P(Abar $\cap$ Bbar) = ?	9/4
9	Number of terms in an arithmetic progression is 2n. Sum of terms occurring at even places is 40 and sum of terms occurring at odd places is 55. If the first term exceeds the last term by 27, then n equals to	5
10	If A is the 3 x 3 matrix of order 3 x 3, such that det(A) = 1/2, tr(A) = 10 and B be another matrix of order 3 x 3 and defined as B = adj(adj(2A)) then det(B) + tr(B) is equal to (where tr(A) denotes trace of matrix A)	336

11	The perpendicular distance of point P(3, 4, 5) from the line $\vec{r} = 2\hat{i} - \hat{j} + \hat{k} + \lambda(4\hat{i} - \hat{j} + 5\hat{k})$ is	$(19/42)^{1/2}$
12	In the expansion of $(x + \sqrt{x^3-1})^5 + (x - \sqrt{x^3-1})^5$, where α, β, γ and δ are the coefficients of x x^3, x^5 and x^7 respectively. If $\alpha u - \beta v = 18$ and $\gamma u + \delta v = 20$, then $u + v$ is equal to	-14/15
13	Let A(6, 8), B(10 cosα - 10sinα) and C(-10sinα, -10cosα) be 3 points and if orthocenter of the triangle ABC is (0, 9), then $100\sin^2\alpha$ is equal to	25/4
14	If z be a complex number such that $|z - 3| <= 1$, then the equation of line with the largest slope passing through origin and z	x - 2√2y = 0
15	A relation R is defined on set A, A = (1, 2, 3) and R = {(1, 2), (2, 3)). Elements are added such that R becomes reflexive and transitive but not symmetric. Find the number of such relations.	3
16	Consider two curves E_1: $x^2/a^2 + y^2/b^2 = 1$ with eccentricity e1 and E_2: $x^2/A^2 + y^2/B^2 = 1$ with eccentricity e_2. If $e_1/e_2 = 1/3$ and distance between foci of both curves is $2\sqrt{3}$ and a - A = 4, then the sum of lengths of latus rectum of both curves is	12
17	The number of maximum number of common tangents to the curves $y = (x - 2)^2$ and $y^2 = 16 - 8x$ is	1
18	Let P(10, -2, -1) and Q be the point of perpendicular drawn from point R(1, 7, 6) on the line joining the points (2,-5, 11) and (-6, 7, -5). Then the length PQ is	13