IIT JAM 2024 NAT Model Questions
Subject - Mathematics (MA)

Q.1 The number of distinct subgroups of $\mathbb{Z}_{999}$ is _____.

Q.2 The number of elements of order 12 in the symmetric group S7 is equal to _____.

Q.3 Consider the region $G = \{(x, y, z) \in \mathbb{R}^3 : 0 < z < x^2 - y^2, x^2 + y^2 < 1\}$. Then the volume of G is equal to _____. (Rounded off to two decimal places)

Q.4 Let f(x, y) = e^x sin y, x = t^3 + 1 and y = t^4 + t. Then df / dt at t = 0 is . (rounded off to two decimal places)

Q.5 Let f(x, y) = 0 be a solution of the homogeneous differential equation
(2x + 5y)dx − (x + 3y)dy = 0. If f(x + α, y − 3) = 0
is a solution of the differential equation
(2x + 5y − 1)dx + (2 − x − 3y)dy = 0
then the value of α is .

Q.6 The sum of the series $1 / 2(2^2 - 1) + 1 / 3(3^2 - 1) + 1 / 4(4^2 - 1) + \cdots$ is .

Q.7 Consider the expansion of the function f(x) = 3 / (1 − x)(1 + 2x) in powers of x, that is valid in |x| < 1 2 . Then the coefficient of x^4 is .

Q.8 The minimum value of the function f(x, y) = x^2 + xy + y^2 − 3x − 6y + 11 is .

Q.9 Let f(x) = $\sqrt{x}$ + αx, x > 0 and g(x) = a0 + a1(x − 1) + a2(x − 1)2 be the sum of the first three terms of the Taylor series of f(x) around x = 1. If g(3) = 3, then α is .

Q.10 If x^2 + xy^2 = c, where c ∈ R, is the general solution of the exact differential equation M(x, y) dx + 2xy dy = 0, then M(1, 1) is .

Q.11 The volume of the solid of revolution of the loop of the curve $y^2 = x^4 (x + 2)$ about the x-axis (round off to 2 decimal places) is _____

Q.12 Let $G = \{n \in \mathbb{N} : n \le 55, \gcd(n, 55) = 1\}$ be the group under multiplication modulo 55. Let $x \in G$ be such that $x 2 = 26$ and $x > 30$. Then x is equal to_____

Q.13 The number of critical points of the function $f(x, y) = (x^2 + 3y^2)e^{-(x^2+y^2)}$ is _____

Q.14 The number of elements in the set $\{x \in S_3: x^4 = e\}$, where e is the identity element of the permutation group S_3, is _____

Q.15 Let M be a 3 × 3 matrix with real entries such that $M^2 = M + 2I$, where I denotes the 3 × 3 identity matrix. If α, β and γ are eigenvalues of M such that $\alpha\beta\gamma = -4$, then $\alpha + \beta + \gamma$ is equal to_____ .

ANSWER KEY

Question No.	Question Type (QT)	Subject Name (SN)	Key/Range (KY)	Mark (MK)
1	NAT	MA	8 to 8	1
2	NAT	MA	420 to 420	1
3	NAT	MA	0.49 to 0.51	1
4	NAT	MA	2.70 to 2.72	1
5	NAT	MA	7 to 7	1
6	NAT	MA	0.25 to 0.25	2
7	NAT	MA	33 to 33	2
8	NAT	MA	2 to 2	2
9	NAT	MA	0.5 to 0.5	2
10	NAT	MA	3 to 3	2
11	NAT	MA	6.60 to 6.80	2
12	NAT	MA	31 to 31 or 46 to 46	2
13	NAT	MA	5 to 5	2
14	NAT	MA	4 to 4	2
15	NAT	MA	3 TO 3	2