JEE MAIN 22 JANUARY 2025 SHIFT 1

MATHEMATICS QUESTION PAPER WITH ANSWER KEY

Q.No.	Questions	Answers
1	The shortest distance between the lines (x - 1)/2 = (y - 2)/3 = (z - 1)/4 and (x + 2)/7 = (y - 2)/8 = (z + 1)/2	88/√1277
2	In a bag, there are 6 white and 4 black balls two balls are drawn at random, then the probability that both balls are white are	1/3
3	If A be a 3 x 3 square matrix such that det(A) = -2. If det(3 adj(-6 adj(3A))) = 2^n x 3^m, where m ≥ n, then 4m + 2n is equal to	104
4	If a_1, a_2, a_3..., a_n are in geometric progression such that a_1a_5 = 28, a_2 + a_4 = 29, then the value of a_6 is	784
5	Let A = {1, 2, 3}. Then number of non-empty equivalence relations from A to A are	5
6	If f(x) = 16$(\sec^{-1}x)^2$ + $(\text{cosec}^{-1}x)^2$. Then the maximum and minimum value of f(x) is respectively	$1105\pi^2/68$ and $4\pi^2/17$
7	If 8 = 3 + (1/4)*(3+p) + $(1/4^2)$*(3+p^2)+ ... ∞, then the value of p is	16/5
8	If dx/dy + x/y^2 = 1/y^3 and x(1) = 1. Then find the value of x (1/2).	3 - e
9	Let T_r = [(2r - 1) (2r + 1) (2r +3) (2r + 5) / 64], then find the value of lim (n→∞)$\sum_{r=1}^{n}$ $(1/r_r)$	32/45
10	Coefficient of x^{2012} in the expansion of $(1-x)^{2008}$ $(1 + x + x^2)^{2007}$	0
11	If the mirror images of the points A(1, 3), B(3, 1) and C(2, 4) in the line x + 2y = 4 are D, E and F respectively, then the centroid of the triangle DEF is	(2/5, -1/5)
12	If A = {1, 2, 3, ..., 10} and B = {m/n. m,n∈ A, m<n and gcd of (m, n) = 1}. Then find the total number of elements in set B.	31
13	How many ways are there to select 5 letters from English alphabets such that M is in the middle of the letters if repetition is not allowed.	$^{25}C_4$

14	Let $\|z_i\| = 1 \forall i = 1, 2, 3$ satisfying $\| \bar{z}_1z_2 + \bar{z}_2z_3 + \bar{z}_3z_1 \|^2 = a + b\sqrt{2}$, where a, b are rational numbers such that $\arg(z_1) = \pi/4$, $\arg(z_2) = 0$ and $\arg(z_3)=-\pi/4$, then ordered pair (a, b) is	(5, -2)
15	Let a coin is tossed thrice. Let the random variable X is tail follows a head and the mean of X is μ and variance is σ^2 respectively. Then 64 $(\mu + \sigma^2)$ is	48
16	Let $g(x) = 3 f(x/3) + f(3 - x) \forall x \in (0,3)$ and $f''(x) > 0 \forall x \in (0,3)$, then g(x) decreases in interval $(0, \alpha)$, then α is	9/4
17	Let $b = \lambda\hat{i} + 4k$, $a > 0$ and the projection vector of b on $a = 2\hat{i} + 2j - k$ is c. If $\| a + c \| = 7$, then the area of the parallelogram formed by vectors b and c is (in square units)	32
18	Let the parabola y = x2 + Px - 3 cuts the coordinate axes at P, Q and R. A circle with centre (-1,-1) passes through P, Q and R, then the area of triangle PQR is (in square units)	3/2
19	If the circle $(x - 2\sqrt{3})3 + y2 = 12$ and parabola $y2 = 2\sqrt{3}x$ intersects at P, Q and R. Then the area of triangle PQR is	12 sq. units
20	A hyperbola with foci (1, 14) and (1, -12) passes through the point (1, 6). The length of the latus rectum of the hyperbola is	288/5