# JEE-MAIN EXAM APRIL, 2025

**Date: - 07-04-2025 (SHIFT-1)**

## MATHEMATICS

### SECTION-A

**1.** If the area of the region bounded by the curves $y=4-\frac{x^2}{4}$ and $y=\frac{x-4}{2}$ is equal to $\alpha$, then $6\alpha$ equals

(1) 250 (2) 220 (3) 240 (4) 210

**2.** Among the statements

(S1) : The set $\left\{z \in \mathbb{C}-\{-i\} : |z|=1 \text{ and } \frac{z-i}{z+i} \text{ is purely real }\right\}$ contains exactly two elements, and

(S2) : The set $\left\{z \in \mathbb{C}-\{-1\} : |z|=1 \text{ and } \frac{z-1}{z+1} \text{ is purely imaginary }\right\}$ contains infinitely many elements.

(1) both are correct (2) only (S2) is correct

(3) only (S1) is correct (4) both are incorrect

**3.** If for $\theta \in\left[-\frac{\pi}{3}, 0\right]$, the points $(x, y)=\left(3 \tan\left(\theta+\frac{\pi}{3}\right), 2 \tan\left(\theta+\frac{\pi}{6}\right)\right)$ lie on $xy+\alpha x+\beta y+\gamma=0$, then $\alpha^2+\beta^2+\gamma^2$ is equal to

(1) 72 (2) 80 (3) 75 (4) 96

**4.** Let the set of all values of $p \in \mathbb{R}$, for which both the roots of the equation $x^2-(p+2)x+(2p+9)=0$ are negative real numbers, be the interval $(\alpha, \beta]$. Then $\beta-2\alpha$ is equal to

(1) 9 (2) 0 (3) 5 (4) 20

**5.** Let $y=y(x)$ be the solution curve of the differential equation $x\left(x^2+e^x\right)dy+\left(e^x(x-2)y-x^3\right)dx=0, x>0$, passing through the point $(1,0)$. Then $y$ (2) is equal to

(1) $\frac{4}{4+e^2}$ (2) $\frac{2}{2+e^2}$ (3) $\frac{2}{2-e^2}$ (4) $\frac{4}{4-e^2}$

**6.** Let $C_1$ be the circle in the third quadrant of radius 3, that touches both coordinate axes. Let $C_2$ be the circle with centre (1,3) that touches $C_1$ externally at the point $(\alpha,\beta)$. If $(\beta-\alpha)^2=\frac{m}{n}$, $\gcd(m,n)=1$, then $m+n$ is equal to

(1) 13 (2) 22 (3) 9 (4) 31

**7.** Let $x_1,x_2,x_3,x_4$ be in a geometric progression. If 2,7,9,5 are subtracted respectively from $x_1,x_2,x_3,x_4$, then the resulting numbers are in an arithmetic progression. Then the value of $\frac{1}{24}\left(x_1x_2x_3x_4\right)$ is:

(1) 18 (2) 36 (3) 216 (4) 72

**8.** From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

(1) 135 (2) 145 (3) 155 (4) 165

**9.** The mean and standard deviation of 100 observations are 40 and 5.1, respectively. By mistake one observation is taken as 50 instead of 40. If the correct mean and the correct standard deviation are u and $\sigma$ respectively, then 10(u + σ) is equal to

(1) 445 (2) 451 (3) 449 (4) 447

**10.** Let ABC be the triangle such that the equations of lines AB and AC be 3y – x = 2 and x + y = 2, respectively, and the points B and C lie on $x$-axis. If P is the orthocentre of the triangle ABC, then the area of the triangle PBC is equal to

(1) 8 (2) 4 (3) 10 (4) 6

**11.** Let the line L pass through (1,1,1) and intersect the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-3}{1}=\frac{y-4}{2}=\frac{z}{1}$. Then, which of the following points lies on the line L ?

(1) (5, 4, 3) (2) (7, 15, 13) (3) (4, 22, 7) (4) (10, –29, –50)

**12.** Let $x=-1$ and $x=2$ be the critical points of the function $f(x)=x^3+ax^2+b\log_e|x|+1, x\neq 0$. Let $m$ and M respectively be the absolute minimum and the absolute maximum values of $f$ in the interval $\left[-2,-\frac{1}{2}\right]$. Then $|\mathbf{M}+m|$ is equal to_____. (Take $\log_e 2=0.7$) :

(1) 21.1 (2) 22.1 (3) 19.8 (4) 20.9

**13.** The remainder when $\left((64)^{(64)}\right)^{(64)}$ is divided by 7 is equal to

(1) 4 (2) 6 (3) 3 (4) 1

**14.** Let P be the parabola, whose focus is (–2, 1) and directrix is $2x+y+2=0$. Then the sum of the ordinates of the points on P, whose abscissa is -2, is

(1) $\frac{3}{4}$ (2) $\frac{3}{2}$ (3) $\frac{1}{4}$ (4) $\frac{5}{2}$

**15.** The integral $\int_0^{\pi} \frac{(x+3)\sin x}{1+3\cos^2 x}dx$ is equal to

(1) $\frac{\pi}{2\sqrt{3}}(\pi+4)$ (2) $\frac{\pi}{\sqrt{3}}(\pi+1)$ (3) $\frac{\pi}{\sqrt{3}}(\pi+2)$ (4) $\frac{\pi}{3\sqrt{3}}(\pi+6)$

**16.** $\lim\limits_{x\to 0^+} \frac{\tan\left(5(x)^{\frac{1}{3}}\right)\log_e\left(1+3x^2\right)}{\left(\tan^{-1}3\sqrt{x}\right)^2\left(e^{5(x)^{\frac{4}{3}}}-1\right)}$ is equal to

(1) $\frac{5}{3}$ (2) $\frac{1}{15}$ (3) 1 (4) $\frac{1}{3}$

**17.** Let the angle $\theta, 0<\theta<\frac{\pi}{2}$ between two-unit vectors $\hat{a}$ and $\hat{b}$ be $\sin^{-1}\left(\frac{\sqrt{65}}{9}\right)$. If the vector $\vec{c}=3\hat{a}+6\hat{b}+9(\hat{a}\times\hat{b})$, then the value of $9(\vec{c}\cdot\hat{a})-3(\vec{c}\cdot\hat{b})$ is

(1) 29 (2) 24 (3) 27 (4) 31

**18.** Let $A$ be a $3\times 3$ matrix such that $|\operatorname{adj}(\operatorname{adj}(\operatorname{adj} A))|=81$.

If $S=\left\{n\in\mathbb{Z}:(|\operatorname{adj}(\operatorname{adj} A)|)^{\frac{(n-1)^2}{2}}=|A|^{\left(3n^2-5n-4\right)}\right\}$, then $\sum\limits_{n\in S}\left|A^{\left(n^2+n\right)}\right|$ is equal to

(1) 732 (2) 750 (3) 820 (4) 866

**19.** Let the system of equations :

$2x+3y+5z=9$

$7x+3y-2z=8$

$12x+3y-(4+\lambda)z=16-\mu$

have infinitely many solutions. Then the radius of the circle centred at $(\lambda,\mu)$ and touching the line $4x=3y$ is

(1) $\frac{17}{5}$ (2) 7 (3) $\frac{7}{5}$ (4) $\frac{21}{5}$

**20.** If the shortest distance between the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x}{1}=\frac{y}{\alpha}=\frac{z-5}{1}$ is $\frac{5}{\sqrt{6}}$, then the sum of all possible values of $\alpha$ is

(1) $\frac{3}{2}$ (2) –3 (3) $-\frac{3}{2}$ (4) 3

## SECTION-B

**21.** The number of relations on the set A = {1, 2, 3}, containing at most 6 elements including (1, 2), which are reflexive and transitive but not symmetric, is _____.

**22.** Consider the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ having one of its focus at P(–3, 0). If the latus ractum through its other focus subtends a right angle at P and $a^2b^2=\alpha\sqrt{2}-\beta,\alpha,\beta\in\mathbb{N}$, then $\alpha+\beta$ is ____ .

**23.** The number of singular matrices of order 2, whose elements are from the set $\{2,3,6,9\}$, is _____.

**24.** The number of points of discontinuity of the function $f(x)=\left[\frac{x^2}{2}\right]-[\sqrt{x}], x\in[0,4]$, where $[\cdot]$ denotes the greatest integer function, is _____.

**25.** For $n\geq 2$, let $S_n$ denote the set of all subsets of $\{1,2,\ldots,n\}$ with no two consecutive numbers. For example $\{1,3,5\}\in S_6$, but $\{1,2,4\}\notin S_6$. Then $n(S_5)$ is equal to ____.

## NTA ANSWERS

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | (1) | 2. | (2) | 3. | (3) | 4. | (3) | 5. | (1) | 6. | (2) | 7. | (3) |
| 8. | (3) | 9. | (3) | 10. | (4) | 11. | (2) | 12. | (1) | 13. | (4) | 14. | (2) |
| 15. | (4) | 16. | (4) | 17. | (1) | 18. | (1) | 19. | (3) | 20. | (2) | 21. | (5) |
| 22. | (1944) | 23. | (36) | 24. | (8) | 25. | (13) | | | | | | |