# JEE Main 2026 April 2 Shift 2 Mathematics

## Question Paper

Conducted by National Testing Agency (NTA)

### General Instructions

(i) **Duration:** The total duration of the examination is 1 hours (60 minutes).

(ii) **Total Marks:** The complete Mathematics paper carries a maximum of 100 marks.

(iii) **Structure:** The paper consists of two sections:

- **Section A:** 20 Multiple Choice Questions (MCQs).
- **Section B:** 5 Numerical Value Type Questions.

(iv) **Compulsory Questions:** All 25 questions are compulsory.

(v) Each question has four options. Only **one** option is correct.

(vi) Correct Answer: +4 marks.

(vii) **Incorrect Answer:** −1 mark (Negative marking).

(viii) **Unanswered/Marked for Review:** 0 marks.

## Mathematics Section - A

**1. Let $\alpha, \beta$ be the roots of the equation $x^2 - 3x + r = 0$, and $\frac{\alpha}{2}, 2\beta$ be the roots of the equation $x^2 + 3x + r = 0$. If the roots of the equation $x^2 + 6x = m$ are $2\alpha + \beta + 2r$ and $\alpha - 2\beta - \frac{r}{2}$, then $m$ is equal to:**

(A) $-135$

(B) $-567$

(C) $135$

(D) 567

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**2. Let the circles $C_1 : |z| = r$ and $C_2 : |z-3-4i| = 5, z \in \mathbb{C}$, be such that $C_2$ lies within $C_1$. If $z_1$ moves on $C_1$, $z_2$ moves on $C_2$ and $\min|z_1-z_2| = 2$, then $\max|z_1-z_2|$ is equal to:**

(A) 12
(B) 17
(C) 22
(D) 24

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**3. If the system of equations**

$x+5y+6z = 4$

$2x+3y+4z = 7$

$x+6y+az = b$

**has infinitely many solutions, then the point $(a, b)$ lies on the line**

(A) $y-x = 3$
(B) $x-y = 3$
(C) $x+y = 11$
(D) $x+y = 12$

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**4. Let $a_1, a_2, a_3, \ldots$ be an A.P. and $g_1 = a_1, g_2, g_3, \ldots$ be an increasing G.P. If $a_1 = a_2 + g_2 = 1$ and $a_3 + g_3 = 4$, then $a_{10} + g_5$ is equal to:**

(A) 81
(B) 76
(C) 62
(D) 55

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**5. The sum $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \ldots$ up to 8 terms, is:**

(A) 70

(B) 71

(C) 72

(D) 73

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**6. If for $3 \le r \le 30$, $\binom{30}{30-r} + 3\binom{30}{31-r} + 3\binom{30}{32-r} + \binom{30}{33-r} = \binom{m}{r}$, then $m$ equals:**

(A) 31

(B) 32

(C) 33

(D) 34

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**7. Let $p_n$ denote the total number of triangles formed by joining the vertices of an $n$-side regular polygon. If $p_{n+1} - p_n = 66$, then the sum of all distinct prime divisors of $n$ is:**

(A) 7

(B) 8

(C) 5

(D) 6

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**8. A man throws a fair coin repeatedly. He gets 10 points for each head he throws and 5 points for each tail he throws. If the probability that he gets exactly 30 points is $\frac{m}{n}$, $\gcd(m,n) = 1$, then $m+n$ is equal to:**

(A) 53

(B) 55

(C) 107

(D) 105

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**9. The mean and variance of $n$ observations are 8 and 16, respectively. If the sum of the first $(n-1)$ observations is 48 and the sum of squares of the first $(n-1)$ observations is 496, then the value of $n$ is:**

(A) 21

(B) 16

(C) 13

(D) 7

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**10. Let a circle pass through the origin and its centre be the point of intersection of two mutually perpendicular lines $x+(k-1)y+3=0$ and $2x+k^2y-4=0$. If the line $x-y+2=0$ intersects the circle at the points $A$ and $B$, then $(AB)^2$ is equal to:**

(A) 10

(B) 27

(C) 18

(D) 34

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**11. Let $O$ be the origin, and $P$ and $Q$ be two points on the rectangular hyperbola $xy=12$ such that the mid point of the line segment $PQ$ is $\left(\frac{1}{2},-\frac{1}{2}\right)$. Then the area of the triangle $OPQ$ equals:**

(A) $\frac{3}{2}$

(B) $\frac{5}{2}$

(C) $\frac{7}{2}$

(D) $\frac{9}{2}$

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**12. Let the parabola $y=x^2+px+q$ passing through the point $(1,-1)$ be such that the distance between its vertex and the $x$-axis is minimum. Then the value of $p^2+q^2$ is:**

(A) 2

(B) 4

(C) 5

(D) 8

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**13. Let $P=\{\theta\in[0,4\pi]:\tan^2\theta\neq 1\}$ and $S=\{a\in\mathbb{Z}:2(\cos^8\theta-\sin^8\theta)\sec 2\theta=a^2,\theta\in P\}$. Then $n(S)$ is:**

(A) 0

(B) 1

(C) 2

(D) 3

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**14. Let the vectors $\vec{a} = -\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} + \hat{k}$. For some $\lambda, \mu \in \mathbb{R}$, let $\vec{c} = \lambda\vec{a} + \mu\vec{b}$. If $\vec{c} \cdot (3\hat{i} - 6\hat{j} + 2\hat{k}) = 10$ and $\vec{c} \cdot (\hat{i} + \hat{j} + \hat{k}) = -2$, then $|\vec{c}|^2$ is equal to:**

(A) 8

(B) 12

(C) 14

(D) 15

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**15. Let the point $A$ be the foot of perpendicular drawn from the point $P(a, b, 0)$ on the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-\alpha}{3}$. If the midpoint of the line segment $PA$ is $\left(0, \frac{3}{4}, -\frac{1}{4}\right)$, then the value of $a^2 + b^2 + \alpha^2$ is equal to:**

(A) 1

(B) 2

(C) 6

(D) 9

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**16. Two adjacent sides of a parallelogram PQRS are given by $\vec{PQ} = \hat{j} + \hat{k}$ and $\vec{PS} = \hat{i} - \hat{j}$. If the side PS is rotated about the point P by an acute angle $\alpha$ in the plane of the parallelogram so that it becomes perpendicular to the side PQ, then $\sin^2\left(\frac{5\alpha}{2}\right) - \sin^2\left(\frac{\alpha}{2}\right)$ is equal to:**

(A) $\frac{1}{2}$

(B) $\frac{\sqrt{3}}{2}$

(C) $\frac{\sqrt{3}}{4}$

(D) $\frac{2\sqrt{3}}{5}$

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**17. The value of $\int_0^{20\pi}(\sin^4 x + \cos^4 x)dx$ is equal to:**

(A) $\frac{15\pi}{2}$

(B) $25\pi$

(C) $15\pi$

(D) $\frac{25\pi}{2}$

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**18. Let $f(x)$ be a polynomial of degree 5, and have extrema at $x = 1$ and $x = -1$. If $\lim_{x\to 0}\left(\frac{f(x)}{x^3}\right) = -5$, then $f(2) - f(-2)$ is equal to:**

(A) 0

(B) 50

(C) 92

(D) 112

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**19. Let $f(x) = \int \frac{16x+24}{x^2+2x-15}dx$. If $f(4) = 14\log_e(3)$ and $f(7) = \log_e(2^\alpha \cdot 3^\beta), \alpha, \beta \in \mathbb{N}$, then $\alpha + \beta$ is equal to:**

(A) 31

(B) 37

(C) 39

(D) 41

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**20. Let $x = x(y)$ be the solution of the differential equation $2y^2\frac{dx}{dy} - 2xy + x^2 = 0, y > 1, x(e) = e$. Then $x(e^2)$ is equal to:**

(A) $\frac{3}{2}e^2$

(B) $\frac{2}{3}e^2$

(C) $e^2$

(D) $2e^2$

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## Mathematics Section - B

**21.** **Let** $A = \{2, 3, 4, 5, 6\}$**. Let** $R$ **be a relation on the set** $A \times A$ **given by** $(x, y)R(z, w)$ **if and only if** $x$ **divides** $z$ **and** $y \leq w$**. Then the number of elements in** $R$ **is** ________**.**

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**22.** **Consider the matrices** $A = \begin{bmatrix} 2 & -2 \\ 4 & -2 \end{bmatrix}$ **and** $B = \begin{bmatrix} 3 & 9 \\ 1 & 3 \end{bmatrix}$**. If matrices** $P$ **and** $Q$ **are such that** $PA = B$ **and** $AQ = B$**, then the absolute value of the sum of the diagonal elements of** $2(P + Q)$ **is** ________**.**

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**23.** **Let** $A$ **be the point** $(3, 0)$ **and circles with variable diameter** $AB$ **touch the circle** $x^2 + y^2 = 36$ **internally. Let the curve** $C$ **be the locus of the point** $B$**. If the eccentricity of** $C$ **is** $e$**, then** $72e^2$ **is equal to** ________**.**

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**24.** **If the area of the region bounded by** $16x^2 - 9y^2 = 144$ **and** $8x - 3y = 24$ **is** $A$**, then** $3(A + 6\log_e(3))$ **is equal to** ________**.**

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**25.** **The number of points in the interval** $[2, 4]$**, at which the function** $f(x) = \left[x^2 - x - \frac{1}{2}\right]$**, where** $[\cdot]$ **denotes the greatest integer function, is discontinuous, is** ________**.**

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