JEE Main 2026 April 5 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 α, β be the roots of the equation $x^2 - x + p = 0$ and γ, δ be the roots of the equation $x^2 - 4x + q = 0$; $p, q \in \mathbb{Z}$. If $\alpha, \beta, \gamma, \delta$ are in G.P., then $|p+q|$ equals :

(A) 16

(B) 32

(C) 34

(D) 38

2. Let $z_1, z_2 \in \mathbb{C}$ be the distinct solutions of the equation $z^2 + 4z - (1 + 12i) = 0$. Then $|z_1|^2 + |z_2|^2$ is equal to :

(A) 18

(B) 22

(C) 29

(D) 34

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3. If $f : \mathbb{N} \to \mathbb{Z}$ is defined by

$$f(n) = \begin{vmatrix} n & -1 & -5 \\ -2n^2 & 3(2k+1) & 2k+1 \\ -3n^3 & 3k(2k+1) & 3k(k+2)+1 \end{vmatrix}, k \in \mathbb{N},$$

and $\sum_{n=1}^{k} f(n) = 98$, then k is equal to :

(A) 3

(B) 4

(C) 5

(D) 6

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4. Let M be a 3×3 matrix such that $M\begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}, M\begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$ and $M\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$. If $M\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 7 \\ 11 \end{pmatrix}$, then $x + y + z$ equals :

(A) 4

(B) 5

(C) 7

(D) 11

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5. If the sum of the first 10 terms of the series $\frac{1}{1+1^4\cdot 4}+\frac{2}{1+2^4\cdot 4}+\frac{3}{1+3^4\cdot 4}+\ldots$ is $\frac{m}{n}$, gcd$(m,n)=1$, then $m+n$ is equal to :

(A) 256

(B) 264

(C) 276

(D) 284

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6. Let $A_1, A_2, A_3, \ldots, A_{39}$ be 39 arithmetic means between the numbers 59 and 159. Then the mean of A_{25}, A_{28}, A_{31} and A_{36} is equal to :

(A) 129

(B) 136

(C) 131.50

(D) 134

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7. The coefficient of x^2 in the expansion of $\left(2x^2+\frac{1}{x}\right)^{10}, x \neq 0$, is :

(A) 3240

(B) 3360

(C) 3480

(D) 3600

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8. The probabilities that players A and B of a team are selected for the captaincy for a tournament are 0.6 and 0.4, respectively. If A is selected the captain, the probability that the team wins the tournament is 0.8 and if B is selected the captain, the probability that the team wins the tournament is 0.7. Then the probability, that the team wins the tournament, is :

(A) 0.74

(B) 0.76

(C) 0.72

(D) 0.78

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9. **A box contains 5 blue, 6 yellow and 4 red balls. The number of ways, of drawing 8 balls containing at least two balls of each colour, is :**

(A) 4100

(B) 4140

(C) 4230

(D) 4290

10. **A variable X takes values $0, 0, 2, 6, 12, 20, \ldots, n(n-1)$ with frequencies $\binom{n}{0}, \binom{n}{1}, \binom{n}{2}, \binom{n}{3}, \binom{n}{4}, \binom{n}{5}, \ldots, \binom{n}{n}$ respectively. If the mean of this data is 60, then its median is :**

(A) 56

(B) 42

(C) 72

(D) 90

11. **Let the point P be the vertex of the parabola $y = x^2 - 6x + 12$. If a line passing through the point P intersects the circle $x^2 + y^2 - 2x - 4y + 3 = 0$ at the points R and S, then the maximum value of $(PR + PS)^2$ is :**

(A) 10

(B) 20

(C) 25

(D) 5

12. **Let the directrix of the parabola $P : y^2 = 8x$, cut x-axis at the point A. Let $B(\alpha, \beta), \alpha > 1$, be a point on P such that the slope of AB is $3/5$. If BC is a focal chord of P, then six times the area of $\triangle ABC$ is :**

(A) 80

(B) 160

(C) 174

(D) 192

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13. Let the eccentricity e of a hyperbola satisfy the equation $6e^2 - 11e + 3 = 0$. If the foci of the hyperbola are $(3, 5)$ and $(3, -4)$, then the length of its latus rectum is :

(A) 11/3

(B) 17/3

(C) 15/2

(D) 17/2

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14. Let a triangle PQR be such that P and Q lie on the line $\frac{x+3}{8} = \frac{y-4}{2} = \frac{z+1}{2}$ and are at a distance of 6 units from R(1, 2, 3). If (α, β, γ) is the centroid of $\triangle PQR$, then $\alpha + \beta + \gamma$ is equal to :

(A) 4

(B) 5

(C) 6

(D) 8

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15. If the distance of the point $(a, 2, 5)$ from the image of the point $(1, 2, 7)$ in the line $\frac{x}{1} = \frac{y-1}{1} = \frac{z-2}{2}$ is 4, then the sum of all possible values of a is equal to :

(A) 11

(B) 9

(C) 6

(D) 4

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16. Let O be the origin, $\vec{OP} = \vec{a}$ and $\vec{OQ} = \vec{b}$. If R is the point on $\vec{OP}$ such that $\vec{OP} = 5\vec{OR}$, and M is the point such that $\vec{OQ} = 5\vec{RM}$, then $\vec{PM}$ is equal to :

(A) $\frac{1}{5}(\vec{a} - 4\vec{b})$

(B) $\frac{1}{5}(\vec{b} - 4\vec{a})$

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(C) $\frac{1}{5}(-\vec{a}+4\vec{b})$

(D) $\frac{1}{5}(-\vec{b}+4\vec{a})$

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17. Let $f(x)=\lim_{y\to 0}\frac{(1-\cos(xy))\tan(xy)}{y^3}$. Then the number of solutions of the equation $f(x)=\sin x$, $x\in\mathbb{R}$ is :

(A) 0

(B) 2

(C) 3

(D) 1

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18. Let $(2^{1-a}+2^{1+a}), f(a), (3^a+3^{-a})$ be in A.P. and α be the minimum value of $f(a)$. Then the value of the integral $\int_{\log_e(\alpha-1)}^{\log_e(\alpha)}\frac{dx}{(e^{2x}-e^{-2x})}$ is :

(A) $\frac{1}{2}\log_e\left(\frac{4}{3}\right)$

(B) $\frac{1}{4}\log_e\left(\frac{4}{3}\right)$

(C) $\frac{1}{2}\log_e\left(\frac{8}{5}\right)$

(D) $\frac{1}{4}\log_e\left(\frac{8}{5}\right)$

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19. Let $f:[1,\infty)\to\mathbb{R}$ be a differentiable function defined as $f(x)=\int_1^x f(t)dt+(1-x)(\log_e x-1)+e$. Then the value of $f(f(1))$ is :

(A) $(1+e^e)$

(B) $(1+e)$

(C) $(1+e+e^e)$

(D) $1+2e$

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20. Let $f(x)$ and $g(x)$ be twice differentiable functions satisfying $f''(x)=g''(x)$ for all $x\in\mathbb{R}$, $f'(1)=2g'(1)=4$ and $g(2)=3f(2)=9$. Then $f(25)-g(25)$ is equal to :

(A) 20

(B) 40

(C) -20

(D) -40

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21. Let $A = \{1, 4, 7\}$ **and** $B = \{2, 3, 8\}$**. Then the number of elements in the relation** $R = \{((a_1, b_1), (a_2, b_2)) \in (A \times B) \times (A \times B) : a_1 + b_2$ **divides** $a_2 + b_1\}$ **is :**

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22. From the point $(-1, -1)$**, two rays are sent making angles of** 45° **with the line** $x + y = 0$**. These rays get reflected from the mirror** $x + 2y = 1$**. If the equations of the reflected rays are** $ax + by = 9$ **and** $cx + dy = 7$, $a, b, c, d \in \mathbb{Z}$**, then the value of** $ad + bc$ **is :**

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23. If $S = \{\theta \in [-\pi, \pi] : \cos\theta \cos\frac{5\theta}{2} = \cos 7\theta \cos\frac{7\theta}{2}\}$**, then** $n(S)$ **is equal to :**

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24. Let $f : \mathbb{R} \to \mathbb{R}$ **be a function such that** $f(x) + 3f\left(\frac{\pi}{2} - x\right) = \sin x, x \in \mathbb{R}$**. Let the maximum value of** f **on** $\mathbb{R}$ **be** α**. If the area of the region bounded by the curves** $g(x) = x^2$ **and** $h(x) = \beta x^3, \beta > 0$**, is** α^2**, then** $30\beta^3$ **is equal to :**

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25. Let $y = y(x)$ **be the solution of the differential equation** $(\tan x)^{1/2} dy = (\sec^3 x - (\tan x)^{3/2}) dx, 0 < x < \frac{\pi}{2}, y\left(\frac{\pi}{4}\right) = \frac{6\sqrt{2}}{5}$**. If** $y\left(\frac{\pi}{3}\right) = \frac{4}{5}\alpha$**, then** α^4 **equals :**
