JEE Main 2026 April 4 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. For the function $f : [1, \infty) \to [1, \infty)$ defined by $f(x) = (x-1)^4 + 1$, among the two statements:
(I) The set $S = \{x \in [1, \infty) : f(x) = f^{-1}(x)\}$ contains exactly two elements, and
(II) The set $S = \{x \in [1, \infty) : f(x) = f^{-1}(x+1)\}$ is an empty set,

(A) only (I) is TRUE

(B) only (II) is TRUE

(C) both (I) and (II) are TRUE

(D) neither (I) nor (II) is TRUE

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2. Let $S = \{z \in \mathbb{C} : z^2 + 4z + 16 = 0\}$. Then $\sum_{z\in S} |z + \sqrt{3}i|^2$ is equal to:

(A) 42

(B) 23

(C) 27

(D) 38

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3. If the system of equations:

$x + y + z = 5$

$x + 2y + 3z = 9$

$x + 3y + \lambda z = \mu$

has infinitely many solutions, then the value of $\lambda + \mu$ is:

(A) 16

(B) 18

(C) 19

(D) 21

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4. If $\alpha = 1$ and $\beta = 1 + i\sqrt{2}$, where $i = \sqrt{-1}$ are two roots of the equation $x^3 + ax^2 + bx + c = 0$, $a, b, c \in \mathbb{R}$, then $\int_{-1}^{1}(x^3 + ax^2 + bx + c)dx$ is equal to:

(A) -2

(B) -4

(C) -8

(D) -10

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5. If the quadratic equation $(\lambda + 2)x^2 - 3\lambda x + 4\lambda = 0, \lambda \neq -2$, has two positive roots, then the number of possible integral values of λ is:

(A) 1

(B) 2

(C) 3

(D) 4

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6. Let $A = \begin{bmatrix} 1 & 2 & 7 \\ 4 & -2 & 8 \\ 3 & 8 & -7 \end{bmatrix}$ **and** $\det(A - \alpha I) = 0$, **where** α **is a real number. If the largest possible value of** α **is p, then the circle** $(x-p)^2 + (y-2p)^2 = 320$, **intersects the co-ordinate axes at**

(A) 1 point

(B) 2 points

(C) 3 points

(D) 4 points

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7. Let $\alpha = \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \ldots \infty$ **and** $\beta = \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots \infty$. **Then the value of** $(0.2)^{\log_{\sqrt{5}}(\alpha)} + (0.04)^{\log_5(\beta)}$ **is equal to:**

(A) 4

(B) 5

(C) 8

(D) 25

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8. For 10 observations $x_1, x_2, \ldots, x_{10}$, **if** $\sum_{i=1}^{10}(x_i+2)^2 = 180$ **and** $\sum_{i=1}^{10}(x_i-1)^2 = 90$, **then their standard deviation is:**

(A) 2

(B) $\sqrt{3}$

(C) $2\sqrt{2}$

(D) 3

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9. In the expansion of $\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}$, $x > 0$, **if the term independent of x is** $(221)k$, **then** k **is**

equal to:

(A) 84

(B) 78

(C) 168

(D) 198

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10. Let P $(3\cos\alpha, 2\sin\alpha)$, $\alpha \neq 0$, be a point on the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$. Q be a point on the circle $x^2 + y^2 - 14x - 14y + 82 = 0$ and R be a point on the line $x + y = 5$ such that the centroid of the triangle PQR is $\left(2 + \cos\alpha, 3 + \frac{2}{3}\sin\alpha\right)$. Then the sum of the ordinates of all possible points R is:

(A) 6

(B) 2

(C) 4

(D) 8

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11. Let $H : \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be a hyperbola such that the distance between its foci is 6 and the distance between its directrices is $\frac{8}{3}$. If the line $x = \alpha$ intersects the hyperbola H at the points A and B such that the area of the triangle AOB is $4\sqrt{15}$, where O is the origin, then α^2 equals

(A) 12

(B) 16

(C) 24

(D) 25

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12. $\max_{0 \le x \le \pi}\left(16\sin\left(\frac{x}{2}\right)\left|\cos^3\left(\frac{x}{2}\right)\right|\right)$ is equal to:

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

(B) $3\sqrt{3}$

(C) $4\sqrt{3}$

(D) $6\sqrt{3}$

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13. The shortest distance between the lines
$\vec{r} = \left(\frac{1}{3}\hat{i} + 2\hat{j} + \frac{8}{3}\hat{k}\right) + \lambda\left(2\hat{i} - 5\hat{j} + 6\hat{k}\right)$
and $\vec{r} = \left(-\frac{2}{3}\hat{i} - \frac{1}{3}\hat{k}\right) + \mu\left(\hat{j} - \hat{k}\right)$, $\lambda, \mu \in \mathbb{R}$, **is:**

(A) $\sqrt{5}$

(B) 3

(C) $2\sqrt{3}$

(D) $\sqrt{15}$

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14. If $\left(2\alpha + 1, \alpha^2 - 3\alpha, \frac{\alpha-1}{2}\right)$ **is the image of** $(\alpha, 2\alpha, 1)$ **in the line** $\frac{x-2}{3} = \frac{y-1}{2} = \frac{z}{1}$, **then the possible value(s) of** α **is (are)**

(A) Only 3

(B) Only 3 and -1

(C) Only 3, 1/4 and -1

(D) Only 3 and 1/4

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15. Let $\hat{u}$ **and** $\hat{v}$ **be unit vectors inclined at an acute angle such that** $|\hat{u} \times \hat{v}| = \frac{\sqrt{3}}{2}$. **If** $\vec{A} = \lambda\hat{u} + \hat{v} + (\hat{u} \times \hat{v})$, **then** λ **is equal to:**

(A) $\frac{4}{3}(\vec{A} \cdot \hat{u}) - \frac{2}{3}(\vec{A} \cdot \hat{v})$

(B) $\frac{2}{3}(\vec{A} \cdot \hat{u}) - \frac{1}{3}(\vec{A} \cdot \hat{v})$

(C) $\frac{4}{3}(\vec{A} \cdot \hat{u}) + \frac{2}{3}(\vec{A} \cdot \hat{v})$

(D) $(\vec{A} \cdot \hat{u}) - \frac{1}{2}(\vec{A} \cdot \hat{v})$

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16. Let for some $\alpha \in \mathbb{R}$, $f : \mathbb{R} \to \mathbb{R}$ **be a function satisfying** $f(x+y) = f(x) + 2y^2 + y + \alpha xy$ **for all** $x, y \in \mathbb{R}$. **If** $f(0) = -1$ **and** $f(1) = 2$, **then the value of** $\sum_{n=1}^{5}(\alpha + f(n))$ **is:**

(A) 110

(B) 140

(C) 150

(D) 170

17. Let $A = \{(a, b, c) : a, b, c$ are non-negative integers and $a + b + 2c = 22\}$. Then $n(A)$ is equal to:

(A) 121

(B) 124

(C) 144

(D) 169

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18. The area of the region bounded by the curves $x + 3y^2 = 0$ and $x + 4y^2 = 1$ is equal to:

(A) $\frac{1}{3}$

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

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

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

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19. Let $y = y(x)$ be the solution of the differential equation: $\frac{dy}{dx} + \left(\frac{6x^2+(3x^2+2x^3+4)e^{-2x}}{(x^3+2)(2+e^{-2x})}\right)y = 2 + e^{-2x}, x \in (-1, 2)$, satisfying $y(0) = \frac{3}{2}$. If $y(1) = \alpha(2 + e^{-2})$, then α is equal to:

(A) $\frac{13}{8}$

(B) $\frac{6}{13}$

(C) $\frac{12}{13}$

(D) $\frac{13}{12}$

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20. The integral $\int_0^1 \cot^{-1}(1 + x + x^2)dx$ is equal to:

(A) $2\tan^{-1} 2 + \frac{1}{2}\log_e\left(\frac{5}{4}\right) + \frac{\pi}{2}$

(B) $2\tan^{-1} 2 + \frac{1}{2}\log_e\left(\frac{5}{4}\right) - \frac{\pi}{2}$

(C) $2\tan^{-1} 2 - \frac{1}{2}\log_e\left(\frac{5}{4}\right) + \frac{\pi}{2}$

(D) $2\tan^{-1} 2 - \frac{1}{2}\log_e\left(\frac{5}{4}\right) - \frac{\pi}{2}$

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21. From a month of 31 days, 3 different dates are selected at random. If the probability that these dates are in an increasing A.P. is equal to a/b, where $a, b \in \mathbb{N}$ and $\gcd(a, b) = 1$, then $a + b$ is equal to ______

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22. Let $f(x) = \begin{cases} e^{x-1}, & x < 0 \\ x^2 - 5x + 6, & x \geq 0 \end{cases}$ and $g(x) = f(|x|) + |f(x)|$. If the number of points where g is not continuous and is not differentiable are α and β respectively, then $\alpha + \beta$ is equal to ______.

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23. Let A, B be points on the two half-lines $x - \sqrt{3}|y| = \alpha, \alpha > 0$ at a distance of α from their point of intersection P. The line segment AB meets the angle bisector of the given half-lines at the point Q. If $PQ = \frac{9}{2}$ and R is the radius of the circumcircle of $\triangle PAB$, then $\frac{\alpha^2}{R}$ is equal to ______

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24. Let A, B and C be the vertices of a variable right angled triangle inscribed in the parabola $y^2 = 16x$. Let the vertex B containing the right angle be $(4, 8)$ and the locus of the centroid of $\triangle ABC$ be a conic C_0. Then three times the length of latus rectum of C_0 is ______.

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25. Let f be a twice differentiable function such that $f(x) = \int_0^x \tan(t-x)dt - \int_0^x f(t)\tan t dt, x \in (-\frac{\pi}{2}, \frac{\pi}{2})$. Then $f''(\frac{\pi}{6}) + 12f'(-\frac{\pi}{6}) + f(\frac{\pi}{6})$ is equal to ______.
