MATHEMATICS

JEE-MAIN EXAM JANUARY, 2025

Date: - 23-01-2025 (SHIFT-2)

MATHEMATICS

SECTION-A

| 1. | Let $A = \begin{bmatrix} a_{ij} \end{bmatrix}$ be a 32 | $\times 3$ matrix such that A | | and $A\begin{bmatrix} 2\\1\\2\end{bmatrix} = \begin{bmatrix} 1\\0\\0\end{bmatrix}$, then a_{23} | | | | |
|----|---|---|--|---|--|--|--|--|
| 2. | equals : (1) 0 A spherical chocolate b of the ice-cream layer is | (2) 1 all has a layer of ice-cre to 1 cm, the ice-cream m ses at the rate of $\frac{1}{100}$ | (3) 2 eam of uniform thicknes elts at the rate of 81cm | (4) -1 (4) -1 (4) -1 (4) -1 (4) -1 (4) -1 (5) -1 (5) -1 (7) -1 (7) -1 (8) -1 (7) -1 (7) -1 (8) -1 (7) -1 (7) -1 (8) -1 (9) $-$ | | | | |
| 3. | ball (without the ice-creation $(1) 256\pi$ A board has 16 square a | am layer) is : (2) 128π as shown in the figures : | (3) 196 <i>π</i> | (4) 225π | | | | |
| | Out of these 16 squares common is: (1) $\frac{23}{2}$ | s, two squares are chos (2) $\frac{4}{-}$ | Sen at random. The prof (3) $\frac{3}{2}$ | pability that they have no side in $(4) \frac{7}{2}$ | | | | |
| 4. | The length of the chord | of the ellipse $\frac{x^2}{4} + \frac{y^2}{2} =$ | 5 = 1, whose mid-point is | $\left(1,\frac{1}{2}\right)$, is : | | | | |
| | (1) $\sqrt{15}$ | (2) $\frac{5}{3}\sqrt{15}$ | (3) $\frac{2}{3}\sqrt{15}$ | (4) $\frac{1}{3}\sqrt{15}$ | | | | |
| 5. | Let $x = x(y)$ be the solution of the differential equation $y = \left(x - y\frac{dx}{dy}\right)\sin\left(\frac{x}{y}\right), y > 0$ and $x(1) = \frac{\pi}{2}$ | | | | | | | |
| | Then $\cos(x(2))$ is equal to : | | | | | | | |
| | (1) $1-2(\log_{e} 2)$ | (2) $1 - 2(\log_e 2)^2$ | (3) $2(\log_e 2)^2 - 1$ | (4) $2(\log_e 2) - 1$ | | | | |
| C | OFFICE ADDRESS : Plot number 35, Gopalpura Bypass Rd, near Riddhi Siddhi Circle, Scheme, Triveni Nagar, Gopal Pura Mode, Jaipur, Rajasthan 302020 Mob. 7410900901, 7410900906, 7410900907, 7410900908 | | | | | | | |
| | | | | | | | | |

6. The system of equations x + y + z = 6. x + 2y + 5z = 9, $x+5y+\lambda z=\mu$, has no solution if (2) $\lambda = 17, \mu = 18$ (3) $\lambda \neq 17, \mu \neq 18$ (4) $\lambda = 15, \mu \neq 17$ (1) $\lambda = 17, \mu \neq 18$ 7. Let the point A divide the line segment joining the points P(-1, -1, 2) and Q(5, 5, 10) internally in the ratio r: l(r > 0). If O is the origin and $(\overrightarrow{OQ} \cdot \overrightarrow{OA}) - \frac{1}{5} |\overrightarrow{OP} \times \overrightarrow{OA}|^2 = 10$, then the value of r is : (4) $\sqrt{7}$ (3) 3 (1) 7(2) 14 Let $X = \mathbf{R} \times \mathbf{R}$. Define a relation R on X as : 8. $(a_1,b_1)R(a_2,b_2) \Leftrightarrow b_1 = b_2.$ Statement I: R is an equivalence relation. **Statement II**: For some $(a,b) \in X$, the set $S = \{(x,y) \in X : (x,y) R(a,b)\}$ represents a line parallel to y = x. In the light of the above statements, choose the correct answer from the options given below : (1) Statement I is true but Statement II is false (2) Both Statement I and Statement II are true (3) Statement I is false but Statement II is true (4) Both Statement I and Statement II are false Let the range of the function $f(x) = 6 + 16\cos x \cdot \cos\left(\frac{\pi}{3} - x\right) \cdot \cos\left(\frac{\pi}{3} + x\right) \cdot \sin 3x \cdot \cos 6x, x \in \mathbb{R}$ be 9. $[\alpha, \beta]$. Then the distance of the point (α, β) from the line 3x + 4y + 12 = 0 is : (1) 9 (2) 11 (3) 8 (4) 10 If in the expansion of $(1+x)^p(1-x)^q$, the coefficients of x and x^2 are 1 and -2, respectively, then 10. $p^2 + q^2$ is equal to : (1) 8 (2) 20 (3) 13 (4) 18 Let A = { $(x, y) \in \mathbb{R} \times \mathbb{R} : |x + y| \ge 3$ } and B = { $(x, y) \in \mathbb{R} \times \mathbb{R} : |x| + |y| \le 3$ }. 11. If $C = \{(x, y) \in A \cap B : x = 0 \text{ or } y = 0\}$, then $\sum_{(x,y)\in C} |x + y|$ is : (1) 18 (3) 24 (4) 15 (2) 12 If the square of the shortest distance between the lines $\frac{x-2}{1} = \frac{y-1}{2} = \frac{z+3}{-3}$ and 12. $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z+5}{5}$ is $\frac{m}{n}$, where m, n are coprime numbers, then m+n is equal to : (1) 14 (2) 21(3) 6(4)9OFFICE ADDRESS : Plot number 35, Gopalpura Bypass Rd, near Riddhi Siddhi Circle, 10 B competishun Scheme, Triveni Nagar, Gopal Pura Mode, Jaipur, Rajasthan 302020 Мов. 7410900901, 7410900906, 7410900907, 7410900908 2 www.competishun.com

| 13. | Let the shortest distance from (a, 0), a > 0, to the parabola $y^2 = 4x$ be 4. Then the equation of the | | | | | | | | |
|-----|--|---|--|---|--|--|--|--|--|
| | circle passing through the point (a, 0) and the focus of the parabola, and having its centre on the axis of the parabola is : | | | | | | | | |
| | (1) $x^2 + y^2 - 4x + 3 = 0$ | | (2) $x^2 + y^2 - 8x + 7 = 0$ | | | | | | |
| | (3) $x^2 + y^2 - 6x + 5 =$ | (3) $x^2 + y^2 - 6x + 5 = 0$ | | $(4) x^2 + y^2 - 10x + 9 = 0$ | | | | | |
| 14. | The number of complex | k numbers z, satisfying ∣∶ | $z \mid = 1$ and $\left \frac{z}{\overline{z}} + \frac{\overline{z}}{z} \right = 1$, is : | | | | | | |
| | (1) 6 | (2) 4 | (3) 8 | (4) 10 | | | | | |
| 15. | A rod of length eight un | its moves such that its e | ends A and B always lie o | on the lines x-y+2=0 and y+2=0, | | | | | |
| | respectively. If the locus of the point P , that divides the rod AB internally in the ratio 2 : 1 is | | | | | | | | |
| | $9(x^2 + \alpha y^2 + \beta xy + \gamma x + 28y) - 76 = 0$, then $\alpha - \beta - \gamma$ is equal to : | | | | | | | | |
| | (1) 23 | (2) 22 | (3) 24 | (4) 21 | | | | | |
| 16. | If the area of the regior | $\{(x, y): -1 \le x \le 1, 0 \le$ | $\leq y \leq a + e^{ x } - e^{-x}, a > 0$ | $\left. \right\}$ is $rac{{{e}^{2}}+8e+1}{e}$, then the value | | | | | |
| | of a is: | | | | | | | | |
| | (1) 7 | (2) 5 | (3) 6 | (4) 8 | | | | | |
| 17. | $\lim_{x \to \infty} (2x^2 - 3x + 5)(3x^2 - 3x^2 - 3x + 5)(3x^2 - 3x^2 - 3x + 5)(3x^2 - 3x^2 - 3$ | $\frac{(x-1)^{\frac{x}{2}}}{(x+2)^{x}}$ is equal to : | | | | | | | |
| | (1) $\frac{2}{\sqrt{3e}}$ | (2) $\frac{2}{3\sqrt{e}}$ | (3) $\frac{2e}{3}$ | (4) $\frac{2e}{\sqrt{3}}$ | | | | | |
| 18. | The distance of the line | $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$ | from the point (1, 4, 0) a | long the line $\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3}$ | | | | | |
| | is : | | | | | | | | |
| | (1) $\sqrt{13}$ | (2) $\sqrt{17}$ | (3) $\sqrt{15}$ | (4) $\sqrt{14}$ | | | | | |
| 19. | Let $\int x^3 \sin x dx = g(x)$ |) + C , where C is the co | nstant of integration. If | | | | | | |
| | $8\left(g\left(\frac{\pi}{2}\right)+g'\left(\frac{\pi}{2}\right)\right)=\alpha\pi^3+\beta\pi^2+\gamma,\alpha,\beta,\gamma\in Z \text{ , then } \alpha+\beta-\gamma \text{ equals :}$ | | | | | | | | |
| | (1) 47 | (2) 48 | (3) 55 | (4) 62 | | | | | |
| 20. | If $I = \int_0^{\frac{\pi}{2}} \frac{\sin^{\frac{3}{2}} x}{\sin^{\frac{3}{2}} x + \cos^{\frac{3}{2}} x} dx$, then $\int_0^{21} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$ equals : | | | | | | | | |
| | (1) $\frac{\pi^2}{16}$ | (2) $\frac{\pi^2}{12}$ | (3) $\frac{\pi^2}{4}$ | (4) $\frac{\pi^2}{8}$ | | | | | |
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SECTION-B

21. The focus of the parabola $y^2 = 4x + 16$ is the centre of the circle *C* of radius 5. If the values of λ , for which C passes through the point of intersection of the lines 3x - y = 0 and $x + \lambda y = 4$, are λ_1 and $\lambda_2, \lambda_1 < \lambda_2$, then $12\lambda_1 + 29\lambda_2$ is equal to _____.

- 22. The number of ways, 5 boys and 4 girls can sit in a row so that either all the boys sit together or no two boys sit together, is _____
- **23.** The variance of the numbers 8,21,34,47,, 320 is._____.
- 24. The roots of the quadratic equation $3x^2 px + q = 0$ are 10^{th} and 11^{th} terms of an arithmetic progression with common difference $\frac{3}{2}$. If the sum of the first 11 terms of this arithmetic progression is 88, then q 2p is equal to _____.
- 25. Let α, β be the roots of the equation $x^2 ax b = 0$ with $Im(\alpha) < Im(\beta)$. Let $P_n = \alpha^n \beta^n$. If
 - $P_3 = -5\sqrt{7}i$, $P_4 = -3\sqrt{7}i$, $P_5 = 11\sqrt{7}i$ and $P_6 = 45\sqrt{7}i$, then $|\alpha^4 + \beta^4|$ is equal to _____.

| NTA ANSWERS | | | | | | | | | | | | | |
|-------------|-------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | (4) | 2. | (1) | 3. | (2) | 4. | (3) | 5. | (3) | 6. | (1) | 7. | (1) |
| 8. | (1) | 9. | (2) | 10. | (3) | 11. | (2) | 12. | (4) | 13. | (3) | 14. | (3) |
| 15. | (1) | 16. | (2) | 17. | (2) | 18. | (4) | 19. | (3) | 20. | (1) | 21. | 15 |
| 22. | 17280 | 23. | 8788 | 24. | 474 | 25. | 31 | | | | | | |

