

IIT JAM 2025 Mathematical Statistics Question Paper with Solutions

Time Allowed :3 hours	Maximum Marks :100	Total Questions :60
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1. Find the Radius of Convergence (ROC) for the series:

$$\frac{n!}{n^n} x^n$$

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

2. Solve the recurrence relation:

$$x(n+1) = \frac{2}{3} \left(x_n + \frac{-2}{x_n} \right), \quad x_1 = -10$$

- (1) Requires numerical methods
 - (2) Has a closed-form solution
 - (3) Diverges to infinity
 - (4) Converges to zero
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3. Find the expectation of X^3 given that $X \sim N(0, \sigma^2)$.

- (1) 0
 - (2) σ^3
 - (3) $3\sigma^3$
 - (4) $-\sigma^3$
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4. Find C such that:

$$E \left(C \sqrt{\sum X_i^2} \right) = \sigma$$

for $X_1, X_2, \dots, X_5 \sim N(0, \sigma^2)$.

- (1) 0.53

- (2) 1.89
 - (3) 0.67
 - (4) 2.11
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5. If $X \sim U(-1, 1)$, what is the distribution of $\sum X_i / \sum X_i^4$?

- (1) Inverse gamma distribution
 - (2) Beta distribution
 - (3) Normal distribution
 - (4) Exponential distribution
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6. Does the series $\sum (-1)^n \cos(1/n)$ converge?

- (1) Absolutely Convergent
 - (2) Conditionally Convergent
 - (3) Divergent
 - (4) Oscillatory
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7. Given a 3×3 matrix M with two eigenvalues given as 0, determine whether $5M^2 + M$ is invertible.

- (1) Always Invertible
 - (2) Not Invertible
 - (3) Invertible for $x \neq 0$
 - (4) Cannot be Determined
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8. Using Leibniz's rule, given $\phi(x) = \int_0^x \phi(t)dt + \sin x$, find:

$$\lim_{x \rightarrow \pi/2} 2\phi(x) + e^{-x}$$

- (1) $1 + e^{-x}$
 - (2) $2 + e^{-\pi/2}$
 - (3) 0
 - (4) ∞
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9. Solve the ordinary differential equation (ODE):

$$R(x) = 6 \ln x$$

- (1) $R(x) = 6x \ln x + C$
 - (2) $R(x) = 6x + C$
 - (3) $R(x) = x^6 + C$
 - (4) $R(x) = 6 \ln x + C$
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10. Evaluate $\lim_{x \rightarrow 0} (1 - \cos x) \frac{(2^2 + x - 1)^4}{x^c} = \alpha \ln 2$, and find c .

- (1) 1
 - (2) 2
 - (3) 3
 - (4) 4
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11. Evaluate the double integration of $(5 - 3y)$ for $x = y$ to $x = 1$.

- (1) 1.5
 - (2) 2
 - (3) 3
 - (4) 4
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12. Find the volume V given $x + y + z = 4$, $4y = x$, with constraints $x = 0, y = 0, z = 0$. Compute $64V$.

- (1) 32
 - (2) 64
 - (3) 128
 - (4) 256
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13. Convert the double integration to single integration for $\int_0^1 \int_{\sqrt{y}}^1 3e^{3x} dx dy$.

- (1) $\int_0^1 3e^{3x}(x - \sqrt{x})dx$
- (2) $\int_0^1 3e^{3x}(1 - x^2)dx$
- (3) $\int_0^1 3e^{3x}(1 - x)dx$

(4) $\int_0^1 3e^{3x}(1 - \sqrt{x})dx$

14. Find the value of the summation:

$$\sum_{n=0}^{\infty} (-1)^{n+1} (n+1) \frac{(\pi/2)^{2n+1}}{(2n)!}$$

(1) π

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

(3) $-\pi$

(4) 0

15. Solve the differential equation:

$$\frac{dy}{dx} = (y-1)(y-3), \quad y(0) = 2$$

(1) $y = 2$

(2) $y = 1 + e^x$

(3) $y = 3 - e^{-x}$

(4) $y = 2 + \tanh(x)$