

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE (AUTONOMOUS)

Department of Statistics

Sample questions for UG admission test

1. Objective type questions

I. If $f(x) = x(x-1)(x-2)^2(x-3)^3$, then $f'(2) =$ _____

II. $\sum_{n=1}^{100} \frac{1}{4n^2-1} =$ _____

III. $\lim_{x \rightarrow 0^-} \frac{\sqrt{x^2}}{x} =$ _____ $\lim_{x \rightarrow 0^+} \frac{\sqrt{x^2}}{x} =$ _____

IV. If $[x]$ denotes the greatest integer $\leq x$, then

$$\int_0^9 [\sqrt{x}] dx =$$

V. The maximum area bounded by the ellipse $\frac{x^2}{m} + \frac{y^2}{1-m} = 1, 0 < m < 1$, is

VI. Which one is larger : π^e, e^π ? _____

VII. The maximum value of $f(x) = e^{-\{|x|+|x-1|+|x-2|\}}$ is _____

VIII. $\lim_{n \rightarrow \infty} \frac{1}{\sqrt{n}} \left(1 + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \dots + \frac{1}{\sqrt{n}} \right) =$ _____

IX. The number of factors of 360 is _____

X. The number of roots of the equation : $(x-1)^2 + (x-2)^2 + (x-3)^2 = 0$ is

XI. $\int_0^{\pi} \max(\sin x, \cos x) dx =$ _____

XII. The coefficient x^3yz^2 in the expansion of $(x+y+z)^6$ is _____

2. Short answer type questions

- I. Consider a sequence of independent events $A_1, A_2, \dots, A_n, \dots$ with respective probabilities $p_1, p_2, \dots, p_n, \dots$. Find the probability (q_n) that at least one of the events will occur. Hence, find $\lim_{n \rightarrow \infty} q_n$.
- II. Draw the graph of $y = \frac{1}{x}$ and sketch the area bounded by the curve $y = \frac{1}{x}$ between the lines $x=1$ and $x=n+1$. Hence, using an approximation to the area, show that $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} > \log_e(n+1)$.
- III. Give an example of a function which is continuous everywhere but not differentiable at three points.
- IV. Find the maximum area of a rectangle that can be inscribed in a circle of radius r .
- V. Is $f(x) = \sin x$ one-to-one mapping on \mathbb{R} ? How do you define $\sin^{-1}x$? Explain clearly.
- VI. A box contains tickets numbered 1 to 20. 3 tickets are drawn from the box with replacement. Find the probability that the largest number on the tickets drawn is 7.