[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 5297 **D** **Your Roll No.....**

Unique Paper Code : 290579

Name of the Course : **B.A. (Prog.) III (Application Course)**

Name of the Paper : Mathematics for Social Sciences – I

Semester : V

Duration : 2 Hours Maximum Marks : 55

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Questions No. **1** is compulsory and carries **15** marks.
3. Attempt **four** more questions selecting at least **one** question from each section. Each question carries **10** marks.

1. (i) If $y = \frac{\log x}{x}$, find $\frac{dy}{dx}$.

(ii) Show that the function f(x) defined by

$$f(x) = \begin{cases} 5x-4, & \text{if } 0 < x \le 1 \\ 4x^3-3x, & \text{if } 1 < x < 2 \end{cases}$$

is continuous at x = 1.

(iii) Find $\int_0^1 \frac{1}{3x+2}\,dx$.

(iv) Find $\lim_{x\to 1} \frac{x-1}{x^2-1}$.

(v) Find the equation of straight line passing through points (–1, 1) and (2, –4).

SECTION – I

2. (i) The total revenue received from the sale of x units of a product is given by $R(x) = 200 + \frac{x^2}{5}$. Find (i) the average revenue (ii) the marginal revenue.

P.T.O.

(ii) Evaluate $\int x \sin x^2 \, dx$.

3. (i) Sketch the graph of Ellipse

$4x^2 + 36y^2 = 144$

(ii) Find $\frac{dy}{dx}$, when $x^3 + y^3 = 3xy$.

SECTION – II

4. (i) Evaluate the following :

$$\int_1^4 f(x)dx, \text{ where } f(x) = \begin{cases} 2x + 8, & \text{if } 1 \le x \le 2 \\ 6x, & \text{if } 2 \le x \le 4 \end{cases}$$

(ii) Find the intervals on which the function $f(x) = 2x^3 - 9x^2 + 12x$ is increasing or decreasing.

5. (i) If $C(x) = 0.01x^2 + 5x + 100$ is a cost function, find the average cost function. At what level of production x is there a minimum average cost ? What is this minimum ?

(ii) Verify Mean Value Theorem for the function

$f(x) = x^2 - 4x - 3$ in the interval $[1, 4]$.

SECTION – III

6. (i) Write down the Taylor's series expansion for e^x and compute $e^{0.1}$ to three places of decimals.

(ii) If $x^y = e^{x-y}$, show that $\frac{dy}{dx} = -\frac{\log x}{(1 + \log x)^2}$.

7. (i) Test for convergence the series $\sum_{n=1}^{\infty} \frac{n}{n^3 + 2}$.

(ii) Examine the concavity of the following function :

$f(x) = x^3 - 3x^2 + 3x - 3$