

This question paper contains 4 printed pages]

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S. No. of Question Paper : 183

Unique Paper Code : 290579

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Name of the Paper : Mathematics for Social Sciences-I

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

Semester : V

Duration : 2 Hours

Maximum Marks : 55

*(Write your Roll No. on the top immediately on receipt of this question paper.)*

Question No. 1 is compulsory and carries 15 marks.

Attempt *four* more questions selecting at least *one* question

from each Section. Each question carries 10 marks.

1. (i) If

$$y = \log(5x^2 + 7),$$

find

$$\frac{dy}{dx}$$

(ii) Find

$$\int_0^1 \frac{x^3}{\sqrt{1+x^4}} dx,$$

P.T.O.

(iii) Show that :

$$\lim_{x \rightarrow 4} \frac{x^2 - 9x + 20}{x^2 - 3x - 4} = -\frac{1}{5}$$

(iv) Find the equation of straight line passing through point  $(-4, 3)$  with slope  $\frac{1}{2}$ .

(v) Examine the continuity of the function :

$$f(x) = \begin{cases} 2 + x, & \text{if } x \leq 1 \\ 2 - x, & \text{if } x > 1 \end{cases} \text{ at } x = 1.$$

### SECTION I

2. (i) Sketch the graph of the parabola :

$$y^2 = 12x$$

(ii) Evaluate :

$$\int xe^x dx$$

3. (i) If

$$y = 2x^3 + 5x^2 - 7x + 4$$

find

$$\frac{d^2y}{dx^2}$$

(ii) The total cost  $c(x)$  of a firm is  $c(x) = 2x^2 + 4x + 3$ , where  $x$  is output. Determine the average cost and the marginal cost.

**SECTION II**

4. (i) Evaluate :

$$\int_0^2 x \sqrt{2-x} dx$$

- (ii) Find the intervals on which the function :

$$f(x) = -2x^3 + 3x^2 + 12x + 6$$

is increasing or decreasing.

5. (i) A firm has found from past experience that its profit in terms of number of units  $x$  produced is given by :

$$P(x) = \frac{-x^3}{3} + 729x - 2500, 0 \leq x \leq 35.$$

Compute the value of  $x$  that maximizes the profit and what is this profit ?

- (ii) Verify Mean Value Theorem for the function :

$$f(x) = x^2 \text{ in the interval } [2, 4]$$

**SECTION III**

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

(ii) Test for convergence the series :

$$\sum_{n=1}^{\infty} \frac{n}{n^2 + 2}$$

7. (i) If

$$y = x^x,$$

find

$$\frac{dy}{dx}$$

(ii) Show that the function  $f(x) = x^2 + 4$  is concave upward for all values of  $x$ .