

This question paper contains 2 printed pages.

Your Roll No.

Sl. No. of Ques. Paper : 251
Unique Paper Code : 290579
Name of Paper : Mathematics for Social Sciences
Name of Course : B.A. (Prog.) (Application Course)
Semester : V
Duration : 2 hours
Maximum Marks : 55

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(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 $x^m y^n = (x + y)^{m+n}$, then show that $\frac{dy}{dx} = \frac{y}{x}$
- (ii) Evaluate $\int 2x^3 \sqrt{x^4 + 4} dx$
- (iii) Evaluate $\lim_{x \rightarrow 2} \frac{x^4 - 16}{x - 2}$
- (iv) Write the equation of the line passing through the points $(-1, 1)$ and $(2, -4)$.
- (v) Test the continuity of the function $f(x)$ at the origin

$$f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$$

SECTION-I

2. (i) Sketch the graph and find the co-ordinates of foci, the vertices, the eccentricity and the length of the latus rectum of the ellipse

$$\frac{x^2}{4} + \frac{y^2}{25} = 1$$

- (ii) Evaluate : $\int x \sin x dx$

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3. (i) If $y = 3e^{2x} + 2e^{3x}$, prove that $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = 0$
- (ii) The total cost $C(x)$ of a firm is $C(x) = \frac{1}{3}x^3 + 3x^2 - 7x + 16$, where x is output. Determine the average and marginal cost functions.

SECTION-II

4. (i) By using properties of Definite Integral,
Evaluate : $\int_0^{\pi/2} \frac{\cos^5 x}{\sin^5 x + \cos^5 x} dx$
- (ii) Find the intervals in which the function $f(x) = 2x^3 - 9x^2 + 12x$ is increasing or decreasing
5. (i) Show that the maximum value of $f(x) = \left(\frac{1}{x}\right)^x$ is $e^{\frac{1}{e}}$
- (ii) Verify Mean Value Theorem for the function $f(x) = x(x-2)$ in the interval $[1, 3]$

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) Show that the series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n} + \sqrt{n+1}}$ diverges.
7. (i) If $x^y = e^{x-y}$, then show that $\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$
- (ii) The cost of producing x units is given as $C(x) = 0.001x^3 - 0.3x^2 + 30x + 42$. Determine where cost function is concave up and where it is concave down. Also find the inflexion point.