

This question paper contains 4+2 printed pages]

Your Roll No.

7602

B.A. (Prog.)/III

D-I

APPLICATION COURSE

MATHEMATICS FOR SOCIAL SCIENCES

(Admissions of 2004 and onwards)

Time : 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.

Note :— The maximum marks printed on the question paper are applicable for the students of the regular colleges (Cat. A). These marks will, however, be scaled up proportionately in respect of the students of NCWEB at the time of posting of awards for compilation of result.

P.T.O.

1. (i) Find $\frac{dy}{dx}$, when

$$x^3 + y^3 = xy. \quad 3$$

- (ii) Test the existence of $\lim_{x \rightarrow 0} f(x)$, if

$$f(x) = \begin{cases} -3x & \text{when } x \leq 0 \\ 2x & \text{when } x > 0 \end{cases} \quad 3$$

- (iii) Find the value of k , if :

$$\begin{pmatrix} 5 & k+2 \\ k+1 & -2 \end{pmatrix} = \begin{pmatrix} k+3 & 4 \\ 3 & -k \end{pmatrix} \quad 3$$

- (iv) Differentiate with respect to x :

$$f(x) = \frac{x}{e^x - 1} \quad 3$$

- (v) Evaluate :

$$\int \log x \, dx. \quad 3$$

SECTION I

2. (i) The total cost $C(x)$ of a firm is :

$$C(x) = 1500 + 30x + x^2$$

where x is the output. Determine :

(a) The marginal cost

(b) The actual cost of producing twenty first unit. 6

- (ii) Sketch the graph of parabola :

$$y^2 = 16x. \quad 4$$

3. (i) Evaluate :

$$\int x(x^2 + 3)^5 dx. \quad 5$$

- (ii) Show that :

$$y = x - \frac{1}{x}$$

is an increasing function in \mathbb{R} , except at $x = 0$. 5

SECTION II

4. (i) Give the Taylor's series expansion of e^x and compute $e^{0.1}$ to two decimal places. 6

- (ii) If

$$\vec{u} = (2, 3, 4) \text{ and } \vec{v} = (1, -7, 6)$$

determine $\|\vec{u}\|$ and $\vec{v} \cdot \vec{u}$. 4

5. (i) Examine for convergence of the series :

$$\sum \frac{3n+7}{4n^4+9} \quad 5$$

- (ii) Solve the differential equation :

$$\frac{dy}{dx} = 3x^2y^3,$$

given $y(1) = 1$.

5

SECTION III

6. (i) Find the rank of A, where

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$$

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- (ii) Solve the following system of Linear equations :

$$2x - y + 3z = 8$$

$$-x + 2y + z = 4$$

$$3x + y - 4z = 0$$

6

7. (i) Find

$$\frac{\partial Q}{\partial L} \quad \text{and} \quad \frac{\partial Q}{\partial K}$$

when $Q = 4L^{3/4} K^{1/4}$. Also prove that :

$$L \frac{\partial Q}{\partial L} + K \frac{\partial Q}{\partial K} = Q.$$

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- (ii) Use graphical method to solve the following Linear Programming Problem :

Minimize $Z = 20x + 10y,$

Subject to : $x + 2y \leq 40$

$$3x + y \geq 30$$

$$4x + 3y \geq 60$$

$$x, y \geq 0.$$

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