

Seat No. : _____

XS-117

April-2013

B.B.A. (Sem.-II)

CC-112 : (Business Mathematics)

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) All questions carry equal marks.
(2) Simple calculator is allowed.

1. (a) Define differentiation using definition. Give illustration. **4**

OR

- (a) Define the following terms :

- (i) Elasticity of Demand
(ii) Marginal Revenue Function

- (b) Find the derivatives of the following functions with respect to x : **4**

(i) $y = \log[e^x(8x + 1)^2]$

(ii) $y = \frac{x^3}{\log x + 7}$

OR

- (b) Find the derivatives of the following functions with respect to x :

(i) $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

(ii) $xy + x + y = 5$

- (c) (i) If the demand function of a commodity is $p = 40 - 3x$, find marginal Revenue and Average Revenue. **2**

- (ii) If $x^y = e^{x-y}$, prove that **4**

$$\frac{dy}{dx} = \frac{\log x}{(1 + \log x)^2}$$

OR

- (c) (i) The demand function of a commodity is $x = 4(9 - \sqrt{p})$, find the elasticity of demand when $p = 4$. 3
- (ii) If $y = x \log y$, then prove that 3
- $$\frac{dy}{dx} = \frac{y^2}{x(y-x)}$$

2. (a) Define the following terms : 4
- (i) Utility
- (ii) Partial Derivative

OR

- (a) Find the second order partial derivatives of $u = 4x^2 + 9xy - 5y^2$ prove that
- $$\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$$

- (b) A monopolist firm manufacturing pressure cookers at a cost of ₹ $\left(\frac{x^2}{30} + 3x + 50\right)$.
The demand function for pressure cookers is $x = 75 - 3p$. How many cookers should be manufactured by the firm to get maximum profit ? Also find the maximum profit and the corresponding price. 5

OR

- (b) The utility function is $u = 48 - (x - 5)^2 - 3(y - 4)^2$ and the budget equation is $x + 3y = 9$. Find the values of x and y so that the consumer gets maximum utility.
- (c) If $u = \log(x^2 + y^2 + z^2)$, prove that 5
- $$x \frac{\partial^2 u}{\partial y \partial z} = y \frac{\partial^2 u}{\partial z \partial x} = z \frac{\partial^2 u}{\partial x \partial y}$$

OR

- (c) If $y = \frac{1 - \log x}{x}$ prove that

$$x^3 \frac{d^2 y}{dx^2} + 2x^2 \frac{dy}{dx} - 1 = 0$$

3. (a) Define the following terms : 4
- (i) Identify Matrix
- (ii) Row Matrix
- (iii) Skew-symmetric Matrix
- (iv) Null Matrix

OR

(a) Write the difference between matrix and determinant.

(b) If $A = \begin{bmatrix} 0 & 1 & 2 \\ 2 & -3 & 0 \\ 1 & 1 & -1 \end{bmatrix}$, then prove that

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$$A^3 + 4A^2 - A = 12I$$

OR

(b) (i) If $A^2 = \begin{bmatrix} 13 & 12 \\ 12 & 13 \end{bmatrix}$ then find matrix A.

(ii) If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then prove that $(aI + bE)^3 = a^3I + 3a^2bE$

(c) Solve the following equation by using matrix inversion method :

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$$\frac{3}{x} - \frac{4}{y} - \frac{2}{z} = 1$$

$$\frac{1}{x} + \frac{2}{y} + \frac{1}{z} = 2$$

$$\frac{2}{x} + \frac{5}{y} - \frac{2}{z} = 3$$

OR

(c) (i) If $A = \begin{bmatrix} 1 & 2 \\ 3 & 8 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 5 \\ 1 & 4 \end{bmatrix}$, verify that $\text{adj}(AB) = (\text{adj } B) (\text{adj } A)$

(ii) Solve the following equation by matrix method :

$$3x + 5y = 2xy$$

$$7x + 11y = 4xy$$

4. (a) Define the following terms :

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(i) Nominal Interest Rate

(ii) Sinking Fund

OR

(a) ₹ 4,000 are invested for one year at 8% compound rate of interest and the interest is calculated quarterly, what is the effective rate of interest.

(b) Initial cost of appliance is ₹ 64,000. The rate of depreciation for the first two years is 5%, then it comes to 8% for the next two years and it becomes 10% for the fifth year. Find the depreciated value of appliance after five years.

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OR

- (b) Dhairya has opened a recurring account for a period of 10 years. He deposits ₹ 2,500 in this account in the beginning of every year. If the rate of interest is 11% find out the total amount in his account at the end of 10 years. $[(1.11)^{10} = 2.8394]$
- (c) Soniya has attained a loan to start an ISP unit. This loan is to be repaid in 10 installments of ₹ 1,75,000 each at the end of year. If the rate of compound interest is 12%, find the amount of the loan. $[(1.12)^{10} = 3.1058]$. 5

OR

- (c) Nandini borrows ₹ 32,000 at rate 16% of simple interest and invests it on the same day at the rate 14% of compound interest. At the end of 4 years how much profit or loss will she have ?

5. Do as Directed : 14

- (i) Define minor of a matrix.
- (ii) If $A : n \times K$, $B : k : m$, write order of matrix AB .
- (iii) Give formula for obtaining ordinary annuity.
- (iv) If the demand function of a commodity is $p = 40 - 3x$, find marginal revenue.
- (v) If $f(x) = x^4 - 4x^3 + 3x^2 + x + 1$, find $f''(0)$.
- (vi) In a skew-symmetric matrix, all the diagonal elements are always _____.
- (vii) Define Compound Interest.
- (viii) Define Sinking Fund.
- (ix) Give division rule of differentiation.
- (x) If $y = 2x^2 + 9x - 32$, find $\frac{dy}{dx}$.
- (xi) What are the conditions for obtaining minimum value ?
- (xii) Give necessary conditions for adding two matrices.
- (xiii) If $A = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ find $(A)'$.
- (xiv) Write a matrix with order 3×4 .
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