Seat No. : _____

AC-105

April-2019

B.B.A., Sem.-II

CC-112 : Business Mathematics

Time : 2:30 Hours] **[Max. Marks : 70**

Instructions : (1) **All** questions are *compulsory*.
(2) Use of simple calculator is allowed.

1. (A) (1) Define the derivative of a function. Also state the rules of differentiation. **7**

(2) Find the derivates of the following function with respect to x : **7**

(i) $y = \log [e^{2x} \cdot (2x + 1)^{-3}]$

(ii) $y = (x^4 + 2x^2 + 8)^{3/2}$

(iii) $y = x^{15} \cdot \log x$.

OR

(1) If the demand function of a commodity is $P = 20 - 3x$, find

(i) Marginal Revenue

(ii) Average Revenue

(2) If $y = \left(\frac{1+x}{1-x}\right)^2$ prove that $(1 - x^2)\frac{dy}{dx} = 4y$.

(B) Answer the following : (any **four**) **4**

(1) If $f(x) = x^3 + 3x^2 + 1$ find $f'(1)$.

(2) Define elasticity of demand.

(3) If the cost function is $((x) = x^3 + 5x^2 + 4x + 100)$. Find marginal cost.

(4) If elasticity of demand is 2, give your comment.

(5) _____ expressed elasticity of demand.

(6) When elasticity of supply is equal to 1, the supply is said to be perfectly inelastic supply. (True/False)

2. (A) (1) If $y = e^{4x} + e^{-4x}$ prove that $\frac{d^2y}{dx^2} = 16\ y$. **7**

(2) Find the maximum and minimum values of the following function $f(x) = 2x^3 - 6x + 7$. **7**

OR

(1) Verify that $\frac{\partial^2 u}{\partial x \cdot \partial y} = \frac{\partial^2 u}{\partial y \cdot \partial x}$, when u is given by $u = x^3y + 2x^2y + xy^3$.

(2) The price P per unit at which a company can sell all that it produces is given by the function $P = 300 - 4x$. The cost function is $C(x) = 500 + 28x$ where x is the number of units produced. Find x so that the profit is maximum.

(B) Answer the following : (any **four**) **4**

(1) If $y = x^3 - 8x^2 + 9$ find $\frac{d^2y}{dx^2}$.

(2) Define utility.

(3) What is second order derivative ?

(4) The budget equation I = _____.

(5) _____ is used to maximize utility under certain conditions.

(6) If $Z = 3x + 8y + 10$ find $\frac{\partial z}{\partial x}$.

3. (A) (1) Define the following matrices with illustrations : **7**

(i) Scalar matrix

(ii) Column matrix.

(iii) Inverse of a matrix

(2) If $A = \begin{bmatrix} 4 & 1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 2 \\ -1 & 0 \end{bmatrix}$ then verify that

(i) $(A + B)' = A' + B'$

(ii) $(AB)' = B' \cdot A'$ **7**

OR

(1) Solve the following system of equations, using inverse of a matrix : **7**

$$x + y + z = 3$$

$$x + 2y + 3z = 6$$

$$3x + y + 2z = 6$$

(2) If $A = \begin{bmatrix} -5 & 2 \\ -6 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -3 \\ 3 & -1 \end{bmatrix}$, then verify that adj (AB) = (adj B) (adj A). **7**

(B) Answer the following : (any **three**) **3**

(1) If $|A| = 0$, A^{-1} is possible. (True/False).

(2) If $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ find A^2.

(3) Give one difference between matrix and determinant.

(4) _____ discovered matrices in the year 1980.

(5) If $A = \begin{bmatrix} 3 & 6 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ -1 & 1 \end{bmatrix}$ find A – B.

4. (A) (1) Aasha deposited ₹ 15,000 with a leasing company at 11% rate of compound interest. What amount will she receive at the end of 5 years ? How much interest will she get ? $[(1.11)^5 = 1.685058]$ **7**

(2) Find the present value of ₹ 2,000 p.a. for 14 years at 10% p.a. rate of interest. $[(1.1)^{-14} = 0.2632]$. **7**

OR

(1) Prove that in order that a sum of money may double itself in 10 years by investment at compound interest, payable annually, the rate of interest should be 7.2% approximately. [log 2 = 0.3010; Antilog (0.0301) = 1.072].

(2) If a sum of ₹ 5000 is deposited with a Shroff at the end of every year for 10 years at 15% compound rate of interest, find out the total amount of annuity at the end of 10 years. $[(1.15)^{10} = 4.0456]$.

(B) Answer the following : (any **three**) **3**

(1) Define Sinking Fund.

(2) At the end of 1st year simple interest and compound interest are same. (True/False.)

(3) Find simple interest for ₹ 1,000 at 5% for 3 years.

(4) What is annuity ?

(5) What is the amount of perpetual annuity of ₹ 60 at 6% compound interest per year ?