

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.
(2) Find the derivatives of the following function with respect to x : 7
(i) $y = \log (2x + 1)$
(ii) $y = (x + 2x + 8)^2$
(iii) $y = x^5 \log x$.

OR

- (1) If the demand function of a commodity is $P = 20 - 3x$, find
(i) Marginal Revenue
(ii) Average Revenue
(2) If $y = \frac{1}{x} + \frac{2}{x^2}$ prove that $(1^2) \frac{dy}{dx} = 4y$.

(B) Answer the following : (any four)

4

- (1) If $f(x) = 3x + 3x + 1$ find $f'(1)$.
(2) Define elasticity of demand.
(3) If the cost function is $(C(x) = 5x^2 + 4x + 100)$. 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 $y = e^x + e^{4x}$ prove that $\frac{d^2y}{dx^2} = 16y$. 7

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

OR

(1) Verify that $\frac{d^2u}{dx^2} = \frac{d^2u}{dy^2} \left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} \frac{du}{dy}$ when u is given by $y = x^2y + xy^3$

(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 $I = \underline{\hspace{2cm}}$.

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

(6) If $Z = 3x^2 + 8y + 10$ find $\frac{d^2Z}{dx^2}$

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) $(AB)' = B' A'$ 7

OR

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

$$x + y + z = 3$$

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

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

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

(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 interest. $[(1+10)^{-14} = 0.2632]$. 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. $[\log 2 = 0.3010; \text{Antilog} (0.0301) = 1.072]$.

(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 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 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 ?

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