# 4477

## B. Com. (Gen./Voc.) EXAMINATION

(For Batch 2017 & Onwards)

(First Semester)

BUSINESS MATHEMATICS

BC-1.5/BCCA-1.5

*Time : Three Hours*          *Maximum Marks : 80*

**Note** : Attempt *Five* questions in all, selecting at least *one* question but not more than *two* questions from each Unit and Q. No. **10** is compulsory. Each question carries equal marks and compulsory question is of 20 marks.

## Unit I

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

$B = \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix}$; find a matrix X s.t.

A + 2X = B.   7½

(b) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$; then show that : 7½

$$A^3 - 6A^2 + 7A + 2I_3 = 0$$

2. (a) Prove that :   7½

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc + bc + ca + ab$$

(b) If $A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$; and

$B^{-1} = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & -1 \\ 1 & 0 & 2 \end{bmatrix}$; then find $(AB)^{-1}$. 7½

3. (a) Solve the system of equations by matrix method : 7½

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

$$2x - y + 3z = 9$$

and $$3x - y - z = 2$$

(b) The demand curve for a certain comodity over some period is given as $x_1 = 1500 + 0.2x_2$, where $x$, is price of the comodity and $x_2$ is its corresponding quantity and the supply curve is given by $x_1 = 600 + 0.4x_2$. Using matrix find $x_1$ and $x_2$. 7½

## Unit II

4. (a) Evaluate :          7½

$$\lim_{x \to 0} \frac{\sqrt{1-x^2} - \sqrt{1+x^2}}{2x^2}$$

(b) Differentiate the function :

$$x^x + x^{\frac{1}{x}}$$

with respect to $x$.          7½

5. (a) Show that the function :

$$f(x) = \begin{cases} 1+x^2; & 0 \le x \le 1 \\ 2-x; & x > 1 \end{cases}$$

is discontinuous at $x \le 1$.          7½

(b) If $y \log x = x - y$, prove that :      7½

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

6. (a) Find the points of local maxima or local minima of the function $f(x) = (x-1)(x+2)^2$. Find also local maximum and minimum values. 7½

(b) The demand curve for a monopolist is given by $x = 100 - 4P$, then find the total revenue, average revenue, marginal revenue and at what value of $x$, MR (marginal revenue) is zero and what is the price when MR is zero. 7½

## Unit III

7. Solve the following LPP graphically and by using corner point as well as by iso cost line or iso cost profit method : 15

Maximize : $Z = 2x + y$

Subject to constraints :

$$5x + 10y \leq 50$$
$$x + y \geq 1$$
$$x - y \leq 0$$

and $y \leq 4, x, y \geq 0$

8. (a) Find the dual of the following linear programming problem :

Minimize : $Z = 3x_1 + x_2$,

Subject to constraints :

$$2x_1 + 3x_2 \geq 2$$

$$x_1 + x_2 \geq 1$$

$$x_1 \geq 0, x_2 \geq 0$$

(b) Using Simplex method solve the following LPP :                    11

Maximize : $Z = 3x + 5y + 4z$

Subject to constraints :

$$2x + 3y \leq 8$$

$$2y + 5z \leq 10$$

$$3x + 2y + 4z \leq 15$$

and $x \geq 0, y \geq 0, z \geq 0$

9. (a) Divide Rs. 2522 into three parts, such that their amounts at 5% compound interest per annum in 4, 5 and 6 years respectively may all be equal.                7½

(b) How long will it take for a principal to be four times of itself, if money is worth 10% per annum. Compounded Continuously. 7½

**Compulsory Question**

10. (a) (i) Construct a 3×3 matrix A = $[a_{ij}]$ whose elements are given $a_{ij} = (i+j)^2$. 2

(ii) Solve the matrix equation : 2

$$2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

(b) Find the value of $x$, s.t. : 4

$$\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$$

(c) Divide 14 into two parts such that sum of their squares is minimum. 4

(d) A man purchased an old scooter for Rs. 16,000. If the cost of scooter after 2 years depreciates to Rs. 14,440. Find the rate of depreciation.  4

(e) If $x\sqrt{1+y} + y\sqrt{1+x} = 0, x \neq y$, then : 4 prove that :

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