Roll No. .....

(01/23-II)

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 from each Section. Q. No. **10** is compulsory.

Section I

1. (a) Let $f(x) = x^2 - 5x + 6$, find $f(A)$ if

$$A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$$ 7

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(b) If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$; verify that : 8

$$AA' = A'A = I_3.$$

2. (a) Prove that : 8

$$\begin{vmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$$

(b) Find the value of x so that the given matrix is singular : 7

$$\begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & -2 & 3 \end{bmatrix}$$

3. (a) For the matrix $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y so that $A^2 + xI = yA$. Hence find A^{-1}. 7

(b) Solve the following system of equations : 8

$$x + 2y + 5z = 10$$

$$x - y - z = -2$$

$$2x + 3y - z = -11.$$

Section II

4. (a) Evaluate : 7

$$\lim_{x \to 2}\left(\frac{4}{x^2-4} + \frac{1}{2-x}\right)$$

(b) Find the value of a if the function f given by $f(x) = \begin{cases} 2x-1, & x<2 \\ a, & x=2 \\ x+1, & x>2 \end{cases}$ is continuous at $x = 2$. 8

5. (a) If $y = \frac{x}{x+4}$, show that : 7

$$x\frac{dy}{dx} = y(1-y).$$

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(b) If $y\sqrt{x^2+1} = \log\left(\sqrt{x^2+1} - x\right)$, prove that : 8

$$(x^2+1)\frac{dy}{dx} + xy + 1 = 0.$$

6. (a) Show that a cylinder of given volume, open at the top, has minimum total surface area provided its height is equal to the radius of its base. 8

(b) If the demand law is $p = \frac{10}{(x+1)^2}$, find the elasticity of demand in terms of x. 7

Section III

7. (a) Exhibit graphically the solution set of the linear constraints : 8

$$2x + 3y - 12 \geq 0$$
$$2x - y + 2 \geq 0$$
$$3x - 4y + 12 \geq 0$$
$$x \leq 4$$
$$y \geq 2.$$

(b) Maximize $Z = 3x + 4y$, if possible, subject to constraints : 7

$$x - y \leq -1$$
$$-x + y \leq 0,$$
$$x \geq 0$$
$$y \geq 0.$$

8. Using simplex method, solve the following LPP : 15

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

Subject to constraints :

$$2x + 3y \leq 8$$
$$2y + 5z \leq 10$$
$$3x + 2y + 4z \leq 15$$
$$x, y, x \geq 0.$$

9. (a) Find the compound interest on ₹ 6,950 for 3 years if interest is payable half yearly, the rate of interest for the first two years being 6% p.a. and for the third year is 9% p.a. 7

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(b) Find the effective rate of interest equivalent to nominal rate 6% p.a. compounded continuously [Take $e = 2.71828$]. 8

(Compulsory Question)

10. (a) Construct a 2×2 matrix $C = [C_{ij}]$, where

$$C_{ij} = \frac{|2i - 3j|}{2}.$$ 4

(b) For what value of x, the given matrix

$$A = \begin{bmatrix} 3-2x & x+1 \\ 2 & 4 \end{bmatrix}$$ is a singular matrix. 4

(c) Differentiate $\log (1 + x^2)$. 4

(d) For a supply function $x = 15 + 5p^2$, find the elasticity of supply at $p = 2$. 4

(e) What is the present value of ₹ 1,000 to be received after 2 years compounded annually at 10% ? 4

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