Total No. of Questions—5] [Total No. of Printed Pages—4+2

Seat No.	

[4967]-1005

B.B.A. (First Semester) EXAMINATION, 2016
BUSINESS MATHEMATICS
(2013 PATTERN)

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

***N.B.* :—** (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

(*iii*) Use of calculator is allowed.

1. Attempt any *four* of the following : [4×4=16]

(*a*) Explain singular matrix and non-singular matrix.

(*b*) With the help of the following matrices, show that :

$$A(B + C) = AB + AC$$

$$A = \begin{bmatrix} 8 & 1 \\ 0 & 6 \end{bmatrix}, B = \begin{bmatrix} 2 & 4 \\ 3 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 5 \\ 3 & 1 \end{bmatrix}$$

(*c*) Solve the following transportation problem using North-West corner method :

Warehouse

Factories ↓	W_1	W_2	W_3	**Supply**
F_1	2	7	4	5
F_2	3	3	1	8
F_3	5	4	7	7
F_4	1	6	2	14
Demand	7	9	18	34

(*d*) Evaluate :

(*i*) $^{10}P_4$

(*ii*) $^{8}C_2$.

(*e*) If

$$A = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix},$$

then show that :

$$A^2 - 3A + I = 0.$$

(*f*) Find the determinant of the following matrix :

$$A = \begin{bmatrix} 1 & 6 & -1 \\ 2 & -3 & 3 \\ 3 & 3 & 2 \end{bmatrix}.$$

2. Attempt any *four* of the following : [4×4=16]

(*a*) Using Graphical method solve the following L.P.P. :

Maximize : $Z = 3x_1 + 2x_2$

Subject to constraints

$$2x_1 + x_2 \leq 40$$

$$2x_1 + 3x_2 \leq 60$$

$$x_1, x_2 \geq 0.$$

(*b*) In how many ways a committee of 3 men and 2 women can be selected from seven men and 10 women ?

(*c*) What is unbalanced Transportation Problem ?

(*d*) Find cofactor of the matrix :

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

(*e*) Mr. Sofi invested ₹ 75,375 to purchase equity shares of a company at market price of ₹ 250 through a brokerage firm, charging 0.5% brokerage. The face value of a share is ₹ 10. How many shares did Mr. Sofi purchase ?

(*f*) Define the following matrices with an example :

(*i*) Column matrix

(*ii*) Square matrix.

3. Attempt any *four* of the following : [4×4=16]

(*a*) Find the number of different 4-letter words that can be formed from the letters of the word "NUMBER" ?

[Repetition is not allowed].

(*b*) A company produces two types of hats. Each hat of the first type requires twice as much labor time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second type to 150 and 250 hats, respectively. Assuming that the profits per hat are ₹ 8 for type A and ₹ 5 for type B, formulate the problem as a linear programming problem in order to determine the number of hats to be produced of each type so as to maximize the profit.

(*c*) Define :

(*i*) Feasible region

(*ii*) Optimal solution in L.P.P.

(*d*) Find the inverse of :

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

(*e*) If

$$^{48}C_{12} + {}^{48}C_{13} + {}^{49}C_{14} = {}^{50}C_{x},$$

then find x.

(*f*) Kartik owns 560 shares of a company. The face value of each share is ₹ 25 and the company declares a dividend of 9%. Calculate :

(*i*) The dividend Kartik would receive.

(*ii*) The rate of interest on his investment considering that Kartik bought these shares at ₹ 30 per share in the market.

4. Attempt any *four* of the following : [4×4=16]

(*a*) Define :

(*i*) Permutations

(*ii*) Combinations.

(*b*) Solve the following L.P.P. by graphical method :

Minimize : $Z = 3x_1 + 2x_2$

Subject to constraints

$$5x_1 + x_2 \geq 10$$
$$x_1 + 4x_2 \geq 12$$
$$x_1, x_2 \geq 0.$$

(*c*) Find the adjoint of matrix A, where :

$$A = \begin{bmatrix} 3 & -4 & 1 \\ -3 & 6 & -1 \\ 4 & -8 & 2 \end{bmatrix}.$$

(*d*) Obtain an initial basic feasible solution to the following transportation problem by least cost method :

Sources	**Destination**				**Supply**
	D_1	**D_2**	**D_3**	**D_4**	
S_1	12	8	6	25	200
S_2	6	7	10	18	500
S_3	14	3	11	20	300
Demand	180	320	100	400	

(*e*) What is Share ? Explain various types of shares.

(*f*) Explain the procedure to solve L.P.P. by graphical method.

5. Attempt any *two* of the following : [2×8=16]

(*a*) Solve the following equations by matrix inverse method :

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

(*b*) Obtain an initial basic feasible solution using Vogel's Approximation method to the following Transportation Problem :

Sources	**Destination**				**Supply**
	$\mathbf{D_1}$	$\mathbf{D_2}$	$\mathbf{D_3}$	$\mathbf{D_4}$	
S_1	50	150	60	70	50
S_2	80	70	10	90	60
S_3	15	90	80	80	40
Demand	20	70	10	50	

(*c*) Find the inverse of the matrix :

$$A = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2 \end{bmatrix}.$$