

F-23/2051
BUSINESS MATHEMATICS–BCH-404
(Semester–IV)

Time : Three Hours]

[Maximum Marks : 70

Note : Attempt any *two* questions from Section A and *two* questions from Section B, each question carries 10 marks and attempt any *ten* short questions from Section-C, each question carries 3 marks.

SECTION–A

I. (a) Define product of two matrices.

(b) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ show that $A^3 - 6A^2 + 7A + 2I = 0$

(3,7)

II. Write the properties of determinant of a matrix with suitable examples. 10

III. (a) Prove that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)$

(b) Find the inverse of $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$ (5,5)

- IV. (a) A sum of money invested at compound interest amounts to Rs. 2420 in 2 years and Rs. 2662 in three years. Find the sum and rate of interest.
- (b) Calculate the amount of an annuity immediate of Rs. 2,000 per annum for 20 years, the rate being $13\frac{1}{2}\%$ per annum. (5,5)

SECTION-B

- V. What do you understand by Linear programming problem ? Discuss the exceptional cases in L.P.P. 10
- VI. What is transportation problem ? Explain the various methods of obtaining Initial feasible solution for a transportation problem. 10
- VII. Solve the following assignment problem to maximise sales :

Salesmen	Regions			
	R ₁	R ₂	R ₃	R ₄
S ₁	42	35	28	21
S ₂	30	25	20	15
S ₃	30	25	20	15
S ₄	24	20	16	12

10

VIII. Maximise $Z = 2x_1 + 3x_2 + 4x_3$

Subject to $3x_1 + x_2 + 4x_3 \leq 600$

$$2x_1 + 4x_2 + 2x_3 \geq 480$$

$$2x_2 + 3x_2 + 3x_3 = 540$$

Where $(x_1, x_2, x_3) \geq 0$

10

SECTION-C

IX. Attempt any *ten* short questions :

(a) Solve the equations by Cramer's Rule :

$$2x_1 + 3x_2 = 13$$

$$x_1 + 7x_2 = 23$$

(b) Define orthogonal matrix with example.

(c) Distinguish symmetric and skew-symmetric matrices.

(d) Define sinking funds.

(e) Distinguish Loans and debentures.

(f) Define minors and Co-factors.

(g) Define problem of degeneracy in transportation problem.

(h) What do you mean by duality ?

(i) Write the steps of Modi method.

- (j) What do you mean by unbalanced Transportation problem ?
- (k) Which is better investment; 15% debentures at 10% discount or 18% debentures at 10% premium ?
- (l) Write the limitations of L.P.P. (10×3=30)
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