

This question paper contains 2 printed pages]

SB—127—2022

FACULTY OF SCIENCES

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MAY/JUNE, 2022

(CBCS/ New Pattern)

MATHEMATICS

Paper XIV

(Operation Research)

(Monday, 20-06-2022)

Time : 10.00 a.m. to 12.30 p.m.

Time— 2½ Hours

Maximum Marks—40

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

(ii) Figures to the right indicate full marks.

1. Explain the component of linear programming problem and discuss the basic assumptions. 15

Or

(a) Define slack and surplus variable in LPP and explain the canonical form of linear programming problem. 8

(b) Use graphical method to solve the LPP :

$$\text{Maximize } Z = 2x_1 + 4x_2$$

$$\text{Subject to constraints } x_1 + 2x_2 \leq 5,$$

$$x_1 + x_2 \leq 4 \text{ and}$$

$$x_1, x_2 \geq 0. \quad \text{7}$$

2. Prove that A basic feasible solution to an LPP must correspond to an extreme point of the set of all feasible solutions and conversely. 15

Or

(a) Prove that the number of basic (decision) variables of the general transportation problem of any stage of feasible solution must be $m + n - 1$. 8

P.T.O.

- (b) The following is the cost matrix of assigning 4 clerks to 4 key punching job. Find the optimal assignment if clerk 1 cannot be assigned to job 1 :

Clerk	Job			
	1	2	3	4
1	—	5	2	0
2	4	7	5	6
3	5	8	4	3
4	3	6	6	2

What is the minimum total cost ?

3. Attempt any *two* of the following :
- (a) State the major steps for mathematical formulation of linear programming problem. 5
- (b) Define infeasible solution and solve the following L.P.P. : 5

Maximize $Z = x_1 + x_2$
 subject to constraints

$$\begin{aligned} x_1 + x_2 &\leq 1 \\ -3x_1 + x_2 &\geq 3 \\ x_1, x_2 &\geq 0 \end{aligned}$$

- (c) Let $x_1 = 2, x_2 = 4$ and $x_3 = 1$ be a feasible solution to the system of equations :

$$\begin{aligned} 2x_1 - x_2 + 2x_3 &= 2 \\ x_1 + 4x_2 &= 18 \end{aligned}$$

Reduce the given feasible solution of a basic feasible solution. 5

- (d) Give the Mathematical formulation of an assignment problem.