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PA—78—2024

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

APRIL/MAY, 2024

(CBCS/New Pattern)

MATHEMATICS

Paper XIV

(Operation Research)

(Tuesdday, 23-04-2024) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

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

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

1. Explain the *four* basic assuptions necessary for all linear programming problem. 15

Or

(*a*) Define standard form and prove that the set of feasible solution to an L.P.P is a convex set. 8

(*b*) Use the graphical method to solve the following LPP : 7

Maximize : $Z = 2x_1 + 3x_2$

Subject to the constraints :

$x_1 + x_2 \leq 30$, $x_1 - x_2 \geq 0$, $x_2 \geq 3$, ...

$0 \leq x \leq 20$ and $0 \leq x_2 \leq 12$.

2. Explain simplex algorithm for the solution of L.P.P. and find the maximum value of $Z = 107x_1 + x_2 + 2x_3$ 15

Subject to the constraints :

$$14x_1 + x_2 - 6x_3 + 3x_4 = 7$$

$$16x_1 + x_2 - 6x_3 \leq 5$$

$$3x_1 - x_2 - x_3 \leq 0;$$

$$x_1, \ x_2, \ x_3, \ x_4 \geq 0.$$

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Or

(*a*) Explain Hungarian Assignment Method. 8

(*b*) Write existence of an optimum solution and prove that the number of basic (decision) variables of the general transportation problem at any stage of feasible solution must be $m + n - 1$. 7

3. Attempt any *two* of the following :

(*a*) State the major steps for mathematical formulation of linear programming problem. 5

(*b*) Use graphical method to solve the L.P.P. 5

Maximum $Z = 2x_1 + 4x_2$

Subject to the constraints :

$x_1 + 2x_2 \leq 5$, $x_1 + x_2 \leq 4$ and

$x_1, x_2 \geq 0$

(*c*) Prove that any convex combination of k different optimum solutions to an LPP is again an optimum solution to the problem. 5

(*d*) Explain Simplex Method for solution method for Assignment problem. 5

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