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AB-231142

M.Sc. (Semester-III) Examination, Dec 2024

(Regular)

MATHEMATICS

(Operation Research-I)

Time Allowed : Three Hours

Maximum Marks : 70

Note : This question paper is divided into four sections. Attempt questions of all four sections as per given direction. Distribution of marks is given in each section.

SECTION-A

(Objective Type Questions)

Note : Attempt **any ten** questions. Each question carries **1** mark. [10x1=10]

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1. (A) Choose the correct answer of the following :

(i) Operation Research came into existence during:

(a) World War I

(b) India and Pak War

(c) World War II

(d) None of the above

(ii) The first country to use Operation Research method to solve problems to :

(a) India

(b) China

(c) U.K.

(d) U.S.A.

(iii) The key row indicates :

(a) Incoming variable

(b) Outgoing variable

(c) Slack variable

(d) Surplus variable

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(iv) Primal of a dual is :

(a) Primal

(b) Dual

(c) Prime Dual

(d) Prime Primal

(v) The assignment problem is solved by :

(a) Simplex method

(b) Graphical method

(c) Vector method

(d) Hungarian method

(B) Fill in the blanks :

(vi) Assignment problem is basically a _____ problem.

(vii) Lowest cost entry method is also called as _____ method.

(viii) '$\leq$' constraints changes to _____ type in dual L.P.

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(ix) Linear Programming is a _____ process.

(x) Both objective function and constraints are expressed in _____ form.

(C) True of False :

(xi) The feasible region is a convex set.

(xii) Dual of a dual is dual.

SECTION-B

(Very Short Answer Type Questions)

Note : Attempt **any five** questions. Each question carries **2** marks. (Word limit : **25-30** words) [5×2=10]

2. (i) Discuss any two advantages of Operation Research.

(ii) Define Convex Set.

(iii) Define Slack and Surplus variable.

(iv) Define Feasible solution and Basic feasible solution.

(v) Discuss North-West corner method.

(vi) Write any two characteristics of Operation Research.

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(vii) Discuss Least cost method of Transportation problem.

SECTION -C

(Short Answer Type Questions)

Note : Attempt **any five** questions. Each question carries **4** marks. (Word limit : **250** words) [5×4=20]

3. (i) Solve the following LPP graphically :

Max $Z = 45x_1 + 80x_2$

Subject to $5x_1 + 20x_2 \leq 400$

$10x_1 + 15x_2 \leq 450$

and $x_1, x_2 \geq 0$

(ii) Show that the set $S = \{(x_1, x_2) : 3x_1^2 + 2x_2^2 \leq 6\}$ is convex. https://www.pyqonline.com

(iii) Solve the following LPP by two phase method:

Min $Z = x_1 + x_2$

Subject to $2x_1 + x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

and $x_1, x_2 \geq 0$

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(iv) Write any four differences between Transportation problem and Assignment problem.

(v) Discuss about Hungarian method to solve an assignment problem.

(vi) Give the dual of the following LPP

Max $Z = 2x_1 + 3x_2 + x_3$

Subject to $4x_1 + 3x_2 + x_3 = 6$

$x_1 + 2x_2 + 5x_3 = 4$

and $x_1, x_2, x_3 \geq 0$

(vii) Solve the following assignment problem

Job

	I	II	III	IV	V
A	1	3	3	8	2
B	7	10	12	5	10
C	15	2	8	10	7
D	6	5	3	2	8
E	9	15	20	6	30

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SECTION -D

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries **10** marks. (Word limit : **500** words) [3×10=30]

4. (i) Solve the following LPP :

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

Subject to $2x_1 + 3x_2 \le 8$

$2x_2 + 5x_3 \le 10$

$3x_1 + 2x_2 + 4x_3 \le 15$

and $x_1, x_2, x_3 \ge 0$

(ii) Solve the following LPP by Big-M method :

Min $Z = 4x_1 + 8x_2 + 3x_3$

subject to $x_1 + x_2 \ge 2$

$2x_1 + x_3 \ge 5$

and $x_1, x_2, x_3 \ge 0$

(iii) Solve the following LPP by dual simplex method :

Min $Z = 3x_1 + x_2$

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Subject to $x_1 + x_2 \ge 1$

$2x_1 + 3x_2 \ge 2$

and $x_1, x_2 \ge 0$

(iv) For the following LPP :

Min $Z = \lambda x_1 - \lambda x_2 - x_3 + x_4$

Subject to $3x_1 - 3x_2 - x_3 + x_4 \ge 5$

$2x_1 - 2x_2 + x_3 - x_4 \le 3$

and $x_1, x_2, x_3, x_4 \ge 0$

(v) Find optimal solution of following Transportation problem :

		Warehouses				
		W_1	W_2	W_3	W_4	Supply
Origin	F_1	21	16	25	13	11
	F_2	17	18	14	23	13
	F_3	32	27	18	41	19
Demand		6	10	12	15	

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