Reg. No.: .....

Name: .....

University of Kerala

Y7661

Fourth Semester FYUGP Degree Examination, May 2026

Discipline Specific Elective

MATHEMATICS

UK4DSEMAT201 - Introduction to Operations Research

Academic Level: 200-299

2024 Admission

Time: 1 Hour 30 Minutes(90 Mins.) **Max. Marks: 42**

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn No.	Question	CL	CO
1	The variable added to convert a " less than or equal to" constraint into equality constraint is called.....	RE	1
2	What is the condition for proceeding to Phase II in the Two-Phase method?	RE	4
3	State the condition for an infeasible region in the graphical method of a Linear programming problem.	UN	2
4	A solution is called feasible if it satisfies all the _____.	UN	3
5	State True or False : “If the objective function coefficient of an artificial variable is –M, then the problem is a minimization problem”.	UN	4
6	Convert the RHS of inequality constraint $x_1 - 2x_2 + 3x_3 \leq -2$ into positive.	UN	1

Part B. 8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Define the basic variable and basic solution of an LPP.	UN	2
8	Differentiate between objective function and constraints.	UN	3
9	Identify whether the following solution is feasible: $x = 2, y = 3$, given $x + y \leq 4$.	AP	3
10	In a maximization problem solved using the Big-M method, if an artificial variable A_1 is present in the basis with a zero value in the final table, what conclusion can be inferred?	AP	4

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer.7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) Apply the graphical method to solve the following Linear Programming Problem $$\text{Maximize } Z = 2x_1 + x_2$$ $$\text{subject to the constraints}$$ $$x_1 + 2x_2 \leq 10$$ $$x_1 + x_2 \leq 6$$ $$x_1 - x_2 \leq 2$$ $$x_1 - 2x_2 \leq 1$$ $$x_1 \geq 0, \quad x_2 \geq 0$$ OR B) Explain the procedure for solving a two-variable Linear Programming Problem graphically.	AP	2, 2
12	A) Consider the LPP : Maximize $Z = 2x + y$ subject to $$x + y \geq 5$$ $$x + y = 3$$ $$x, y \geq 0$$ Without fully solving, analyse the outcome of Phase I. OR B) Use Two Phase method to examine the solution of the following LPP : Maximize $Z = 5x + 3y$ subject to $$2x + y \leq 1$$ $$x + 4y \geq 6$$ $$x, y \geq 0.$$	AN	4, 4
13	A) Solve using simplex method: $Minimize\ z = x_1 - 3x_2 + 2x_3$ subject to	EV	3, 3

Qn No.	Question	CL	CO
	$3x_1 - x_2 + 2x_3 \leq 7$ $-2x_1 + 4x_2 \leq 12$ $-4x_1 + 3x_2 + 8x_3 \leq 10$ $x_1, x_2, x_3 \geq 0$ OR B) Solve using simplex method. $Maximize\ z = 20x_1 + 6x_2 + 8x_3$ subject to $8x_1 + 2x_2 + 3x_3 \leq 250,$ $4x_1 + 3x_2 \leq 150,$ $2x_1 + x_3 \leq 50,$ $x_1, x_2, x_3 \geq 0,$		
14	A) A coaching center offers Mathematics and Science classes. Each Mathematics class requires 2 hours of teaching and earns ₹1000.Each Science class requires 3 hours of teaching and earns ₹1500. Total teaching hours available per week is 30 hours. At least 4 Science classes must be conducted weekly. Create a Linear Programming model. OR B) Create an example for a linear programming model for a situation where a factory produces three products with limited machine time and labour.	CR	1, 1