Mahindra University Hyderabad

École Centrale School of Engineering

Minor II

Program: B.Tech. **Branch: Computation & Mathematics** **Year: Second** **Semester: Spring**

Subject: Optimization Techniques (MA 2210)

Date: 01/05/2023 **Start Time: 10: 00 AM**

Time Duration: 1. 5 Hours **Max. Marks: 20**

Instructions:

1) **All questions are compulsory.**
2) **Please start each answer on a separate page, and ensure you clearly number the responses. Also, make sure to address all parts of each question together and in the correct order.**
3) **It is essential to provide an explanation of each step. Correct outcomes without any description will not be evaluated.**

Q 01: Please select the correct option for the following questions and explain your choice correctly. Any correct choice without a valid reason will not be accepted. [01 × 04]

A) If the i^{th} constraint of a primal (maximization) is equality, then the dual (minimization) variable 'y_i' is:

i) ≥ 0 ii) ≤ 0

iii) Unrestricted in sign iv) None of the above

B) Dual simplex method applies to those linear programming problems that start with

i) An infeasible solution ii) An infeasible but optimum solution

iii) A feasible solution iv) A feasible and optimum solution

C) Identify the type of the feasible region given by the set of following inequalities:

$$\left.\begin{matrix} x - y \leq 1 \\ x - y \geq 2 \end{matrix}\right\}; \text{ and } x \geq 0 \text{ and } y \geq 0.$$

i) A triangle ii) A rectangle

iii) An unbounded region iv) An empty region

D) In the graphical method of linear programming problem, every corner of the feasible polygon indicates

i) Optimum solution ii) A basic feasible solution

iii) Both (i) and (ii) iv) None of the above

Q 02: Please answer the following question with a detailed description. It is highly recommended that you provide an explanation of each step. [07 × 02]

A) Solve the following linear programming problem and check whether the problem has an alternate optimum solution. If yes, find all the optimum solutions and mention the optimum value.

$\max z = 2000x_1 + 3000x_2$; subject to the constraints

$$\left.\begin{aligned} 6x_1 + 9x_2 &\leq 100 \\ 2x_1 + x_2 &\leq 20 \end{aligned}\right\}; \text{ and } x_1 \geq 0, x_2 \geq 0.$$

B) Use dual simplex method to solve the following linear programming problem:

$\max z = -2x_1 - x_3$; subject to the constraints

$$\left.\begin{aligned} -x_1 - x_2 + x_3 &\leq -5 \\ -x_1 + 2x_2 - 4x_3 &\leq -8 \end{aligned}\right\}; \text{ and } x_1, x_2, x_3 \geq 0.$$

Q 03: Obtain the dual of the following primal problem: [02]

$\min z_x = 3x_1 - 2x_2 + x_3$; subject to the constraints

$$\left.\begin{aligned} 2x_1 - 3x_2 + x_3 &\leq 5 \\ 4x_1 - 2x_2 &\geq 9 \\ -8x_1 + 4x_2 + 3x_3 &= 8 \end{aligned}\right\}; \text{ and } x_1 \geq 0, x_2 \geq 0, \text{ and } x_3 \text{ is unrestricted.}$$