Strathmore
UNIVERSITY

STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES (SIMS)
MASTER OF SCIENCE IN DATA SCIENCE AND ANALYTICS
CAT 1
DSA 8205: OPTIMIZATION FOR DATA SCIENCE

DATE: 18th November, 2024 **TIME**: 1 Hour (6pm-7pm)

INSTRUCTIONS

1. Answer **ALL** the **QUESTION**.
2. You may use a **SIMPLE CALCULATOR**. No **MOBILE PHONES** in the exams room.

Question One (10 Marks)

(i) Find the solution to the minimization problem below by solving its dual using the simplex method. Show clearly all the steps. (5 marks)

$$\begin{aligned} &\textbf{Minimize} && Z = 12x_1 + 16x_2 \\ &\textbf{Subject to:} && x_1 + 2x_2 \geq 40 \\ & && x_1 + x_2 \geq 30 \\ & && x_1 \geq 0; x_2 \geq 0 \end{aligned}$$

(ii) Suppose we are required to maximize the function $f(x) = 12x - 3x^4 - 2x^6$, explain how we can use one-dimensional search procedure to solve the problem hence obtain its optimal solution. (5 marks)

Question Two (10 Marks)

(i) Explain five types of nonlinear programming problems. (5 marks)

(ii) Solve the following NLP problem graphically. (5 marks)

$$\begin{aligned} &\textbf{Maximize} && Z = 2x_1 + 3x_2 \\ &\textbf{Subject to:} && x_1 x_2 \leq 8 \\ & && x_1^2 + x_2^2 \leq 20 \\ & && x_1 \geq 0; x_2 \geq 0 \end{aligned}$$

END