University of Kelaniya – Sri Lanka
Centre for Distance & Continuing Education
Bachelor of Science (General) External
First year Second semester examination - 2019 (2022 August)
(New Syllabus)
Faculty of Science

Statistics
STAT 17542 – Optimization I

No. of Questions: **Five (05)** No. of Pages: **Two (02)** Time: **Two (02) Hours.**

Answer **Four (04)** questions only.

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1. *(a)* Describe briefly the following terms used in Optimization Theory:
(i) Feasible Region *(ii)* Feasible Solution *(iii)* Optimal Solution

(b) Consider the following Linear Programming Problem (LPP):

$$\begin{aligned} \textit{Minimize} \quad & z = 3x_1 + 2x_2 \\ \textit{subject to} \quad & \\ & 5x_1 + x_2 \geq 10 \\ & x_1 + x_2 \geq 6 \\ & x_1 + 4x_2 \geq 12 \\ & x_1 \geq 0, x_2 \geq 0 \end{aligned}$$

Find the optimal solution for the above linear programming problem using the graphical method.

2. An industry is manufacturing two types of products A and B. The profits per Kg of the two products are Rs 3 and Rs 2 respectively. These two products require processing in three types of machines. The following table shows the available machine hours per day and the processing time required on each machine to produce one Kg of A and B.

Type of Machine	Time required per one kg of		Total available machine hours /day
	A	B	
Machine-1	2	1	18
Machine-2	2	3	42
Machine-3	3	1	24

(i). Formulate the above problem as a linear programming model.

(ii). Using Simplex Algorithm, find the optimal production schedule in order to maximize the profit of the industry.

3. *(a)* Explain why do we use Big-M method in solving Linear Programming Problems?

(b) Consider the following Linear Programming Problem (LPP):

$$\begin{aligned} &\textit{Minimize} \quad z = 3x_1 + x_2 \\ &\textit{subject to} \\ &\qquad 4x_1 + x_2 \;\; = 4 \\ &\qquad 5x_1 + 3x_2 \geq 7 \\ &\qquad 3x_1 + 2x_2 \leq 6 \\ &\qquad x_1, x_2 \geq 0 \end{aligned}$$

Find the optimal solution to the above LPP using Big – M Method.

4. *(a)* Briefly explain the method of Two-Phase used in Linear Programming problems.

(b) Consider the following Linear Programming Problem (LPP):

$$\begin{aligned} &\textit{Maximize } Z = 4x_1 + 5x_2 \\ &\textit{subject to} \qquad 2x_1 + 3x_2 \leq 6 \\ &\qquad\qquad\qquad 3x_1 + x_2 \geq 3 \\ &\qquad\qquad\qquad x_1, x_2 \geq 0 \end{aligned}$$

Find the optimal solution to the above LPP using Two-Phase Method.

5. Consider the following Linear Programming Problem (LPP):

$$\begin{aligned} &\textit{Minimize } Z = 2x_1 + 3x_2 \\ &\textit{subject to} \qquad 2x_1 - x_2 - x_3 \geq 3 \\ &\qquad\qquad\qquad x_1 - x_2 + x_3 \geq 2 \\ &\qquad\qquad\qquad x_1, x_2, x_3 \geq 0 \end{aligned}$$

Obtain the optimal solution to the above LPP using Dual Simplex Method.