KENYA METHODIST UNIVERSITY

END OF 1ST TRIMESTER 2010 EXAMINATIONS

NYERI CAMPUS

FACULTY	**:**	**COMPUTING AND INFORMATICS**
DEPARTMENT	**:**	**COMPUTER INFORMATION SYSTEMS**
UNIT CODE	**:**	**MATH 331**
UNIT TITLE	**:**	**OPERATION RESEARCH 1**
TIME	**:**	**2 HOURS**

Instructions:

- *Answer question 1 and any other 2 questions.*

Question 1

a) State the two duality theorems used in OR. (4 mks)

b) Given the LPP below, solve using the simplex method;

Maximize $z = x_1 + 4x_2 + 5x_3$

Subject to $3x_1 + 3x_2 + 3x_3 \leq 22$

$x_1 + 2x_2 + 3x_3 \leq 14$

$3x_1 + 2x_2 \leq 14$

$x_1, x_2, x_3 \geq 0$ (11 mks)

c) Explain briefly five limitations of linear programming. (5 mks)

d) Solve the following LPP graphically;

Maximize $z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0$ (10 mks)

Question 2

a) Explain briefly at least six characteristics of linear programming. (6 mks)

b) Use the Big-M method to solve the following LPP

Minimize $z = 4x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$ (14 mks)

Question 3

a) Explain the following terms as used in linear programming;

i) Sensitivity Analysis

ii) Degenerate (6 mks)

b) Obtain the dual of the following and solve it.

Minimize $z = 4x_1 + 2x_2 + 3x_3$

Subject to $2x_1 + \quad +4x_3 \geq 5$

$2x_2 + 3x_2 + x_3 \geq 4$

$x_1, x_2, x_3 \geq 0$

Hence or otherwise, find the solution of the primal. (14 mks)

Question 4

Find the optimum integer solutions of the following LPP using the cutting plane method

Maximize $z = 7x_1 + 9x_2$

Subject to $-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

$x_1, x_2 \geq 0$ and integers (20 mks)