UNIVERSITY OF EMBU

2016/2017 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (AGRIBUSINESS MANAGEMENT)

AEB 204: OPERATIONS RESEARCH

DATE: APRIL 5, 2017 **TIME: 8:30-10:30 AM**

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions.

QUESTION ONE (30 MARKS)

a) Define operations research? (2 marks)

b) State the three steps in formulating a mathematical model (2 marks)

c) Sketch the common feasible region represented by the inequalities

$$2x + 5y \leq 10$$

$$5x + 2y \leq 10$$

$$2x + 3y \leq 6$$ (5 marks)

d) Outline the principle phases of implementing operation research model. (5 marks)

e) Distinguish primal model from standard form model (4 marks)

f) What is the difference between optimization problem and transportation problem? (4 marks)

g) Distinguish between week duality theorem and fundamental theorem. (4 marks)

h) Given the LP problem below, write the standard form, (4 marks)

Minimize $p = -3x + 4y$

Subject to

$$x + 3y \leq 54$$

$$3x + y \leq 34$$

$$-x + 2y \geq 12 \quad , (x, y \geq 0)$$

QUESTION TWO (20 MARKS)

A production hire can be set to produce x or product y. The following table gives the breakdown for each product.

Product	Labor (Minutes)	Materials (Kg)	Testing (Minutes)
X	30	2	3
Y	15	4	4

In any one week only 30hrs of labor and 280kgs of materials is available, and owing to cost and availability, the testing equipment must be used for at least 4hrs.Also, atleast 20X products must be produced. The contribution from each unit of X produced is sh.12 and each unit of Y, sh.9.Find;

a) The weekly production that will maximize contribution and calculate these contributions (7 marks)

b) The weekly production that will minimize contribution and calculate the resulting contribution. (7marks)

c) The percentage utilization of the available labor for both minimum and maximum contribution (6marks)

QUESTION THREE (20 MARKS)

a) State the steps followed to solve a Linear program using simplex method. (7 marks)

b) Solve the following linear programming problem using the simplex method (13 marks)

Maximize $p = 4x + 3y$

subject to $-x + y \leq 4$

$x + 2y \leq 14$

$2x + y \leq 16 \quad (x, y \geq 0)$

QUESTION FOUR (20 MARKS)

a) Solve the following job machine assignment problem. Cost data are given below (12 marks)

		Machines					
		1	**2**	**3**	**4**	**5**	**6**
Jobs	**A**	21	35	20	20	32	28
	B	30	31	22	25	28	30
	C	28	29	25	27	27	21
	D	30	30	26	26	31	28
	E	21	31	25	20	27	30
	F	25	29	22	25	30	21

b) Obtain the dual of (8 marks)

$$minimize\ z = 8x_1 + 3x_2 + 15x_3$$

Subject to

$$,2x_1 + 4x_2 + 3x_3 \geq 28,$$

$$3x_1 + 5x_2 + x_36 \geq 30$$

$$x_1, x_2, x_3 \geq 0$$

QUESTION FIVE (20 MARKS)

Find the initial basic feasible solution (BFS) of the following transportation problem using the north- west corner rule (NWC) (20 marks)

		TO					
		M_1	M_2	M_3	M_4		
From	F_1	3	2	4	1	20	supply
	F_2	2	4	5	3	15	
	F_3	3	5	2	6	25	
	F_4	4	3	1	4	40	
		30	20	25	25		
		Demand					

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