MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411
Fax: 064-30321
Website: www.must.ac.ke Email: info@mucst.ac.ke

University Examinations 2012/2013

SECOND YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF COMMERCE AND BACHELOR OF BUSINESS INFORMATION
TECHNOLOGY

HBC 2122: OPERATIONS RESEARCH I

DATE: APRIL 2013   TIME: 2HOURS

INSTRUCTIONS: *Answer questions **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

a) State four advantages of linear programming in decision making.   (4 Marks)
b) Explain the concept of duality in linear programming.   (3 Marks)
c) Find the dual of the problem

$minimize\ y_0 = 5y_1 + 2y_2$
$subject\ to \quad\quad y_1 + 2y_2 \geq 5$
$\quad\quad\quad\quad\quad\quad 2y_1 - y_2 \geq 12$
$\quad\quad\quad\quad\quad\quad y_1 + 3y_2 \geq 4$
$\quad\quad\quad\quad\quad\quad y_1 \geq 0, y_2 \geq 0$

(5 Marks)

d) Convert the linear program to canonical form.

$minimize\ z = 3x + 4y$
$subject\ to \quad\quad x + 2y \geq 12$
$\quad\quad\quad\quad\quad\quad 2x - 3y \leq 18$
$\quad\quad\quad\quad\quad\quad x, y \geq 0$ (2 Marks)

e) Arrivals at a service counter are considered Poisson with an average time of 10 minutes
between arrivals. The length of service is assumed to be distributed exponentially with a
mean 3 minutes.

   i.   What is the probability that a person arriving at the counter will have to wait?

(4 Marks)

   ii.   What is the average length of queues that form from time to time? (4 Marks)

f) Mombasa publishers a leading manufacturer of books publishes the books in 3 printing machines that are distributed to 4 regions. The distribution costs per book, the production capacity in each plant and demand for books in each region is given below.

Source	Destination				
	Malindi	Kwale	Voi	Kilifi	Supply
P_1	21	32	52	12	7000
P_2	72	32	42	62	9000
P_3	42	10	72	22	18000
Demand	5000	8000	7000	1400	

Apply Vogel's approximation method to find the initial solution.   (8 Marks)

QUESTION TWO (20 MARKS)

a) A small project has been broken down into 10 activities A-J with the following predecessors and duration.

Activity	predecessor	Duration(weeks)
A	-	5
B	-	7
C	A,B	8
D	-	10
E	C	10
F	B	5
G	C,F,H	8
H	D	12
I	D	7
J	I	9

Draw the network diagram and identify the critical path.   (10 Marks)

b) i) What is Economic Order quantity?   (10 Marks)

ii) A manufacturer has to supply his customers with 2400 units of his product every year. This demand is fixed and known. Since the unit is used by the customer in an assembly line operation and the customer has no storage space for units, the manufacturer must supply a days requirements each day. If the manufacturer fails to apply the required units the shortage cost is 2 shillings per unit per month and the set up cost per run is 3500 shillings. Determine;

   i.   Optimum run size.   (4 Marks)

   ii.   Optimum level of inventory at the beginning of any period.   (4 Marks)

QUESTION THREE (20 MARKS)

a) Explain the difference between transport and assignment models. (2 Marks)

b) A distribution system has the following transportation schedule.

		Warehouse			
		1	2	3	Supply
Factory	A	10	7	8	45
	B	15	12	9	15
	C	7	8	12	40
Demand		25	55	20	100

Determine the initial feasible solution by the least cost method. (8 Marks)

c) A company has 4 plants each of which can manufacture any of the four company's products. Production costs differ from one plant to another as to the costs of raw materials.

Given the production data below, assign the products to plants so as to realize maximum profit and state the maximum profit. (10 Marks)

	Product (profit "000" ksh				
	Products	A	B	C	D
Plants	1	1	8	4	1
	2	5	7	6	5
	3	3	5	4	2
	4	3	1	6	3

QUESTION FOUR (20 MARKS)

a) Set up the starting simplex table for the L.P.P and show that the starting solution is degenerate. (5 Marks)

$minimize\ p = 3x + 9y$

$subject\ to \quad x + 2y \le 4$

$\qquad\qquad x + 4y \le 8$

$\qquad\qquad (x, y) \ge 0$

b) A firm produces three types of pumps A, B, C each of which requires the four processes of turning, drilling, assembling and testing

Pump type	Process in (hours)per pump Turning	Drilling	Assembling	Testing	Profit/pump (ksh)
A	2	1	3	4	84
B	1	1	4	3	72
C	1	1	2	2	52
Total available time (hours per week)	98	60	145	160	

From the information given in the table, apply simplex method to determine the weekly output of each type of pump to maximize profit and state the maximum profit.

(15 Marks)

QUESTION FIVE (20 MARKS)

a) Explain the minimax – maxmin principle in Game Theory. (4 Marks)

b) Consider the pay-off matrix for two players A and B given;

$$player\ B$$

$$player\ A \qquad \begin{array}{cc} B_1 & B_2 \end{array}$$
$$\begin{array}{c} A_1 \\ A_2 \end{array} \begin{bmatrix} 1 & 7 \\ 6 & 2 \end{bmatrix}$$

Calculate the value of the game to A. (4 Marks)

c) State and explain 3 three assumptions of Game Theory. (6 Marks)

d) State and explain 3 limitations of games in competition. (6 Marks)