MURANG'A UNIVERSITY COLLEGE

A constituent college of Jomo Kenyatta University of Agriculture and Technology

University Examination 2015/2016

SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN HUMAN RESOURCE MANAGEMENT YEAR 3 SEMESTER 1/BACHELOR OF COMMERCE YEAR 2

HEH 2305/HBC 2210: OPERATIONS RESEARCH

DATE: 30TH JULY 2016 **TIME: 2 HOURS**

Instructions: Answer question **One** and **Two** other questions

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Question One (30 Marks)

a) (i) Give three reasons why Operations research has assumed an indispensable role in management. (3 Marks)

(ii) Identify any three characteristics of operations research. (3 Marks)

b) A company sells two different products A and B. The company makes a profit of Kshs 40 and Kshs 30 per unit on products A and B respectively, The two products are made in a common production process and are sold in two different markets. The production process has a total capacity of 30,000 man hours. It takes three hours to produce a unit of A and one hour to produce a unit of B. From a survey conducted on the market, the maximum number of units of A that can be sold is 8,000 while that of B is 12,000 Formulate the linear programming problem in order for the company to maximize Profit. (5 Marks)

c) Use the Simplex method to solve the problem:

$Maximize\ x_o = 45x_1 + 80x_2$

$Subject\ to$:

$5x_1 + 20x_2 \leq 400$

$10x_1 + 15x_2 \leq 450$

$x_1 \geq 0, x_2 \geq 0.$

(6 Marks)

d) State and explain four economic implications of queues.

(4 Marks)

e) Use a graphical method to determine the optimal solution to the following problem:

Maximize: $z = 3x_1 + 5x_2$

Subject to: $x_1 \leq 4$

$2x_2 \leq 12$

$3x_1 + 2x_2 \leq 18$

$x_1 \geq 0, x_2 \geq 0$

(6 Marks)

f) Describe the steps involved in decision making. (3 Marks)

Question Two (20 Marks)

a) State six steps of the Simplex method involved in the computation of an optimal solution to a linear programming problem. (6 Marks)

b) A plant is engaged in the production of two products which are processed through three departments. The number of hours required to finish each are given below:

	Products		
Departments	A	B	Maximum hours available per month
I	7	8	1600
II	8	12	1600
III	15	16	1600

If the profit of the products is Kshs 60 per unit of A and Kshs 40 per unit of B, formulate the problem to maximize the profit and use the Simplex method to determine the optimal solution. (14 Marks)

Question Three (20 Marks)

a) An investor is considering two alternatives – stock A and stock B – for which he has Kshs 35,000 to invest. Stock A offers a 0.5 probability of doubling the investment and a 0.5 probability of losing 60 per cent of the entire amount. Stock B has a 0.3 probability of doubling the stock and 0.7 probability that 60 per cent of the amount invested will be lost. The investor is considering three options:

(i) To invest the complete amount in stock A.

(ii) To invest the complete amount in stock B.

(iii) To invest half the amount in stock A and keep half the amount.

He has the following utilities for the change in his assets,

Kshs 70,000 = 1; Kshs 35,000 = 0.7; - Kshs 10,500 = 0.4 and – Kshs 21,000 = 0

What option should he select? (8 Marks)

b) The Perfect Manufacturing Company current transportation schedule is shown in the table below. The firm has three factories and five warehouses. The necessary data in terms of unit transportation costs(in Kshs.), factory capacities and warehouse requirements are given in the table. Find an optimal schedule.

FACTORIES

Warehouse	A	B	C	Warehouse requirements
1	50	40	80	400
2	80	70	40	400
3	60	70	60	500
4	60	60	60	400
5	30	50	40	800
Requirement	800	600	1,100	2,500

(12 Marks)

Question Four (20 Marks)

a) Explain the various environments under which decisions can be made. (7 Marks)

b) A merchant buys strawberries for Rs 20 per case and sells them for Rs 50 per case. As strawberries are highly perishable, any unsold quantity must be thrown away at the end of the day. The past 100 days sales are given below:

Daily sales(cases)	10	11	12	13
Number of days	15	20	40	25

Calculate how many cases the merchant should stock at the beginning of the day.

(8 Marks)

c) Mohan is a confectioner. He buys plastic boxes in bulk and uses them to pack his chocolates. His annual requirement of boxes is 1200 and each box costs him Rs 30. He has estimated that his ordering costs are Rs 10 per order and his carrying costs are 20 per cent.

How many boxes should he order at a time so as to minimize his expenses? (5 Marks)

Question Five (20 Marks)

A project has the following time schedule:

Activity	Time in months	Activity	Time in months
1 – 2	2	4 – 6	3
1 – 3	2	5 – 8	1
1 – 4	1	6 – 9	5
2 – 5	4	7 – 8	4
3 – 6	8	8 – 9	3
3 – 7	5		

a) Draw a network and compute: (5 Marks)

(i) Critical path and its duration. (2 Marks)

(ii) Total float for each activity. (5 Marks)

b) Find the minimum number of cranes the project must have for its activities 2 – 5 , 3 – 7,

and 8 – 9 without delaying the project. (8 Marks)