MUEO

MOI UNIVERSITY

OFFICE OF THE DEPUTY VICE CHANCELLOR, ACADEMIC AFFAIRS, RESEARCH & EXTENSION

UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR

END OF SEMESTER EXAMINATIONS

FOR THE DEGREE
IN BACHELOR OF BUSINESS AND ECONOMICS

EXAM CODE: BBM 351
COURSE TITLE: OPERATIONS RESEARCH

DATE: MONDAY 5TH FEBRUARY 2018 TIME: 8.00 – 11.00 AM

INSTRUCTION TO CANDIDATES

- SEE INSIDE.

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BBM 351: OPERATIONS RESEARCH

INSTRUCTIONS:-

- ANSWER ALL QUESTIONS IN SECTION A AND ANY OTHER TWO IN SECTION B

SECTION A {Question ONE and TWO are Compulsory}

QUESTION ONE - COMPULSORY [20 MARKS]

(a) Define a model and give two examples of mathematical models applied to business and industry. **[2 marks]**

(b) Briefly discuss linear programming as a technique of resource allocation. **[3 marks]**

(c) A firm manufactures three products P_1, P_2 and P_3 using two machines M_1 and M_2. The products yield a contribution of Sh.3, Sh.2, and Sh.4 respectively. Machine M_1 and M_2 have 2,000 and 2,500 machine hours respectively. There is an agreement with trading association to manufacture at least 100 units of P_1, 200 units of P_2 and 50 units of P_3 but not more than 150 units of P_1. The table below shows the processing time in hours for each machine on each product.

Machines	Products		
	P_1	P_2	P_3
M_1	4	3	5
M_2	2	2	4

Required:

(i) The production plan that maximizes contribution. **[13 marks]**

(ii) The total contribution. **[2 marks]**

QUESTION TWO - COMPULSORY [20 MARKS]

(a) Explain the difference between assignment and transportation problems. **[2 marks]**

(b) A company is faced with the problem of assigning five jobs to five machines; each job must be done on only one machine. The cost (in Shs) of processing each job on each machine is as given in the table below.

		Machines				
		M_1	M_2	M_3	M_4	M_5
Jobs	J_1	7	5	9	8	11
	J_2	9	12	7	11	10
	J_3	8	5	4	6	9
	J_4	7	3	6	9	5
	J_5	4	6	7	5	11

Required:

(i) Assign the jobs to machines to minimize the total cost to be incurred. **[8 marks]**

(ii) Calculate the total minimum cost incurred. **[1 Mark]**

(c) A company has three factories F_1, F_2 and F_3 which supply to four warehouses W_1, W_2, W_3 and W_4 on a monthly basis. Each warehouse has a fixed demand per month. The manufacturer wants to know the number of units to ship from each factory to warehouse in order to minimize the total cost of transportation.

Each factory has the following supply of the goods available for shipment each month.

Factory	Supply
F_1	120
F_2	80
F_3	100
	300

Each warehouse has the following monthly demand for the goods:

Warehouse	Demand
W_1	60
W_2	50
W_3	140
W_4	50
	300

The costs for transporting television sets from each warehouse to each retail store are different as a result of different modes of transportation and distances. The shipping cost per television set for each route is as follows:

To / From		Warehouse			
		W_1	W_2	W_3	W_4
Factory	F_1	Sh. 4	Sh. 5	Sh. 2	Sh. 5
	F_2	Sh. 3	Sh. 8	Sh. 2	Sh. 8
	F_3	Sh. 7	Sh. 4	Sh. 7	Sh. 4

Required:

Find the minimum cost of transportation using:

(i) The North West Corner Method. [3Marks]

(ii) The Least Cost Method. [3Marks]

(iii) Vogel's Approximation Method. [3 Marks]

[Total: 20 marks]

SECTION B {Answer any TWO Questions}

QUESTION THREE [15 MARKS]

(a) Define the following terminologies as used in game theory:

(i) Rules of the play. **[1 mark]**

(ii) Rules of dominance. **[1 mark]**

(iii) Plain strategy. **[1 mark]**

(iv) Optimal strategy. **[1 mark]**

(b) Consider the two person zero sum game between players A and B given the following payoff table:

		Player B Strategies				
Player A Strategies		B_1	B_2	B_3	B_4	B_5
	A_1	6	3	-1	0	-3
	A_2	3	2	-4	2	-1

Required:

(i) Using the maximin and minimax values, is it possible to determine the value of the game? Give reasons. **[2 marks]**

(ii) Using dominance principle, determine optimal strategies for the players and determine the value of the game. **[9 marks]**

[Total: 15 marks]

QUESTION FOUR [15 MARKS]

(a) Briefly explain four types decision making in business. **[4 marks]**

(b) For the past 200 days, the sales of bread from *Fresher Bakery* as been as follows:

Daily sales(loaves)	0	100	200	300	400
Number of days	10	60	60	50	20

Required:

(a) Determine the expected sales of bread. **[3 marks]**

(b) The bakery's production cost costs are Sh.25 per loaf, sale price is Sh.50 per loaf, and unsold at the end of the day is contracted to a local farmer who pays Sh.10 per loaf. Draw up a pay-off table for each sales/production combination. **[5 marks]**

(c) Compute the expected profit arising from each level of production and determine the optimal policy. **[3 marks]**

[Total: 15 marks]

QUESTION FIVE [15 MARKS]

A particular project comprises of the following activities. The relevant data about these activities is as given in the table below.

Activity	Preceding Activity	Duration Days
A	-	4
B	A	7
C	A	5
D	A	6
E	B	2
F	C	3
G	E	5
H	B,F	11
I	G,H	7
J	C	4
K	D	3
L	I,J,K	4

Required:

(i) Draw the network diagram and find the critical path. **[6 marks]**

(ii) Calculate the floats of the network in question. **[9 marks]**

[Total: 15 marks]

QUESTION SIX [15 MARKS]

(a) Give a detailed account of the role of operations research in management. **[6 marks]**

(b) Explain the behaviour pattern of customers in a queue system. [4 marks]

(c) "Simulation is an essentially valuable tool in a situation where the mathematics needed to describe system a realistically is too complex to yield analytical solution". Elucidate.

[5 marks]

[Total: 15 marks]

END