



MUEO

MOI UNIVERSITY

OFFICE OF THE DVC ACADEMIC AFFAIRS, RESEARCH AND EXTENSION

UNIVERSITY EXAMINATIONS

2013/2014 ACADEMIC YEAR

THIRD YEAR END OF SEMESTER II EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF BUSINESS MANAGEMENT

COURSE CODE: BBM 355

EXAM TITLE: OPERATIONS RESEARCH I

DATE: 3RD SEPTEMBER, 2014 TIME: 9.00 A.M. – 12.00 NOON.

INSTRUCTION TO CANDIDATES

➤ SEE INSIDE

MAIN EXAMINATION

INSTRUCTIONS

Answer question ONE and any other THREE questions

QUESTION ONE

- a) Explain clearly the following concepts as applied game theory:
 - i) Prisoner's dilemma **(2 marks)**
 - ii) Maximin-Minimax principle **(2 marks)**
 - iii) Saddle point **(2 marks)**
- b) Briefly explain the advantages of simulation. **(4 marks)**
- c) A company sells two different products A and B, making a profit of sh.40 and sh. 30 per unit on them respectively. They are produced in a common production process and are sold in two different markets. The production process has a 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. The market has been surveyed and company officials feel that the maximum number of units of A that can be sold is 8,000 units and that of B is 12,000 units. Subject to these limitations, products can be sold in any combination. Formulate this problem as an LP model. **(6 marks)**
- d) A car hire company has one car at each of the five depots V, W, X, Y and Z. A customer in each of the five towns A, B, C, D and D requires a car. The distance (in kilometers) between the depots (origins) and the towns (destinations) where the customers are is given in the following distance matrix.

	Depots				
	V	W	X	Y	Z
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

Determine how the cars should be assigned to customers so as to minimize the distance travelled? **(9 marks)**

QUESTION TWO

- a) A firm has three shops with a total of 80 televisions. An order is received from the Local Authority for 70 sets to be delivered to 4 schools. The transportation costs from shops to schools are shown below together with the availabilities and requirements.

Available	Shops	Schools					Requirements
			A	B	C	D	
		Sets	20	30	15	5	
	Shop 1	40	2	4	1	6	Costs
	Shop 2	20	4	3	3	3	
	Shop 3	20	1	2	5	2	

Using least cost method, determine the optimal transportation schedule for the firm and hence the minimum cost of transportation. **(8marks)**

- b) Solve the following game matrix

PLAYER A	PLAYER B				
	B1	B2	B3	B4	B5
A1	-1	-2	-1	10	50
A2	1	-2	5	-2	-2
A3	-5	2	-5	10	50
A4	1	-10	5	-10	-10
A5	1	-50	5	-50	-50

(7 marks)

QUESTION THREE

Solve the following linear programming problem using graphical method and interpret the results

$$\begin{aligned} \text{Maximize } & Z=3x_1+5x_2 \\ \text{Subject to: } & x_1+x_2 \geq 7 \\ & x_1+x_2 \geq 6 \\ & x_1+3x_2 \geq 9 \end{aligned}$$

$$x_1, x_2 \geq 0 \quad \text{(6 marks)}$$

- a) Avico Enterprises manufacturers 30 items per day. The sales of these items depend upon demand which has the following distribution.

Sales (units)	Probability
27	0.1
28	0.15
29	0.2
30	0.35
31	0.15
32	0.05

The production cost and selling price of each unit are Kshs.40 and Kshs.50 respectively. Any unsold product is to be disposed off at a loss of Kshs.15 per unit. There is a penalty of Kshs.5 per unit if the demand is not met.

Required.

- i) Using the following random numbers estimate total profit/loss for the company for the next 10 days (Random numbers: 03 99 38 17 32 69 57 24 61 30 48 80 33 78 55).
- ii) If the company decides to produce 29 items per day, what is the advantage or disadvantage to the company? **(9 marks)**

QUESTION FOUR

- a) Solve the following linear programming problem

$$\text{Maximize } 2x_1 + 4x_2 + x_3 + x_4$$

$$\text{Subject to: } x_1 + 3x_2 + x_4 \leq 4$$

$$2x_1 + x_2 \leq 3$$

$$x_2 + 4x_3 + x_4 \leq 3$$

$$x_i \geq 0, i = 1, 2, 3, 4. \quad \text{(7marks)}$$

QUESTION FIVE

- a) Briefly but clearly explain the fundamental elements of queuing process. **(7 marks)**
- b) Students' arrival at a university cafeteria is at an average rate of 7 students per minute, which is slower than attendant service rate which is 6 students per minute. The manager of the cafeteria wishes to calculate the average number of students in the cafeteria, the average time each student spends in the queue and the average time each student spends the system. Assume that students arrive randomly at each time at the rate of 5 per minute. Calculate the operating statistics for this cafeteria. **(8 marks)**