MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

FOURTH YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF BUSINESS ADMINISTRATION WITH INFORMATION TECHNOLOGY

CITY CAMPUS

ABA 402: QUANTITATIVE METHODS II

Date: 18th July, 2017 Time: 5.30 - 8.30 pm

INSTRUCTIONS:

- Answer question ONE and any other THREE questions.
- Show all your workings clearly.
- Question ONE carries 25 marks while the rest carry 15 marks each.

QUESTION ONE [25 MARKS] COMPULSORY

(a) Define the following terms as used in quantitative techniques

i. Queue discipline.

ii. A slack variable;

iii. Balanced transportation model.

iv. Pay-off table. [4 marks]

(b) Discuss the components of a queuing system. [4 marks]

(c) A furniture manufacturer makes two types of furniture chairs and sofas. The production of the sofas and chairs requires three operations carpentry, finishing, and upholstery. Manufacturing a chair requires 3 hours of carpentry, 9 hours of finishing, and 2 hours of upholstery. Manufacturing a sofa requires 2 hours of carpentry, 4 hours of finishing, and 10 hours of upholstery. The factory has allocated at most 66 labor hours for carpentry, 180 labor hours for finishing, and 200 labor hours for upholstery. The profit per chair is Ksh 90 and the profit per sofa is Ksh 75. How many chairs and how many sofas should be produced each day to maximize the profit?. Formulate this as a LPP. [5 marks]

(d) Find the optimal solution to the following TP by using North West Corner rule to make the initial allocation.

		Warehouses				
		W1	W2	W3	W4	Capacity
Factories	F1	19	30	50	10	7
	F2	70	30	40	60	9
	F3	40	8	70	20	18
	Demand	5	6	7	14	

[5 marks]

(e) In a waiting line situation, arrivals occur at a rate of 2 customers per minute and the service times average 20 seconds per customer, find

i. Expected number of customers in the supermarket. [1 mark]

ii. Average waiting time for a customer for getting services. [1 mark]

(f) A book supplier has three salesperson to assign to four regions. The salespersons are able to cover the regions in different amounts of time. The amount of time, in days, required by each salesperson to cover each region is given as below. Obtain the optimal assignment that minimizes time and the total time.

	Regions			
Salesperson	A	B	C	D
1	10	2	8	6
2	9	3	11	3
3	3	1	4	2

[5 marks]

QUESTION TWO [15 MARKS]

(a) In linear programming, some assumptions are made on the contribution of each decision variables. Discuss briefly these assumptions. [4 marks]

(b) Write short notes on Unbalanced TP and Maximization of an AP. [6 marks]

(c) A company has factories at A, B and C which supply warehouses at D, E and F. Weekly factory capacities are 200, 160 and 90 units respectively. Weekly warehouse requirements (demands) are 180, 120 and 150 units respectively. Unit shipping costs (in Ksh) are as follows: (Use North-West Corner rule to determine the initial feasible solution).

		Factories			Depot requirements
		A	B	C	
Depot	D	16	26	12	180
	E	14	8	18	120
	F	26	24	16	150
Factory capacities		200	160	90	

[5 marks]

JESTION THREE [15 MARKS]

(a) Differentiate between assignment and transportation problem. [2 marks]

(b) Hi Dec produces two models of electronic gadgets that use resistors, capacitors and chips. The following table summarizes the data of the situation:-

Requirements	Model 1	Model 2	Availability
Resistors	2	3	1200
Capacitors	2	1	1000
Chips	0	4	800
Unit Profit	3	4	

i. Formulate the linear programming problem for the firm and solve for the optimal solution using the simplex method. [5 Marks]

ii. Interpret the above solution as thoroughly as possible. Be sure to interpret the shadow prices/marginal values for the resources. [3 Marks]

iii. Formulate the dual problem corresponding to the problem in (i) above. Using the dual theorems, determine the optimal solution to the dual problem. . [5 marks]

ESTION FOUR [15 MARKS]

a) At a man barber shop, customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and his hair cutting time was exponentially distributed with an average hair cut taking 10 minutes. It is assumed that because of his expertise customers were always willing to wait. Find

i. Average time a customers spends in the line and the average number of customers waiting for a hair cut. [2 marks]

ii. The percent of time an arrival will have to wait. [1 mark]

iii. The average time a customer spends in the shop. [2 marks]

(b) A trucking company has a contract to move 115 truckloads of sand per week between three sand-washing plants W,X and Y, and three destinations, A,B and C. Cost and volume information is given below. Compute the optimal transportation cost.

	Project A	Project B	Project C	Supply
Plant W	5	10	10	35
Plant X	20	30	20	40
Plant Y	5	8	12	40
Demand	45	50	20	

Find the optimum transportation schedule, use Least Cost Method to make the initial allocation. [5 marks]

(c) The head of the business department, has decided to apply the Hungarian method in assigning lecturers to courses next semester. As a criterion for judging who should teach each course, the head of department reviews the past two years teaching evaluations. All the four lecturers have taught each of the courses at one time or another during the two year period. The ratings are shown in the table below. Find the best assignment of lecturers to courses to maximize the overall teaching rating.

	Course			
Lecturer	Statistics	Management	Finance	Economics
Jacky	90	65	95	40
Davies	70	60	80	75
John	85	40	80	60
Njeri	55	80	65	55

[5 marks]

QUESTION FIVE [15 MARKS]

(a) Formulate the seven steps in methodology of Operations Research. [7 marks]

(b) A manufacturer makes wooden desks (X) and tables (Y). Each desk requires 2.5 hours to assemble, 3 hours for buffing, and 1 hour to crate. Each table requires 1 hour to assemble, 3 hours to buff, and 2 hours to crate. The firm can do only up to 20 hours of assembling, 30 hours of buffing, and 16 hours of crating per week. Profit is Ksh 3 per desk and Ksh 4 per table. Find the maximum profit. [3 marks]

(c) What are the basic advantages and disadvantages of business simulation? [5 marks]