MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

THIRD YEAR SECOND SEMESTER EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF ARTS IN ECONOMICS WITH
INFORMATION TECHNOLOGY

MAIN CAMPUS

AEC 305: QUANTITATIVE METHODS II

Date: 12th June, 2017   Time: 3.30 - 6.30 pm

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AEC 305: QUANTITATIVE METHODS II

INSTRUCTIONS:

- Answer QUESTION ONE and any other THREE questions
- Question one carries 25 marks and the rest 15 marks each.

QUESTION ONE

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i. Differentiate between balanced and unbalanced transportation problem (2 marks)

ii. Explain the concept of critical task in network analysis (2 marks)

iii. Mombasa Industry has 1000 pounds of special plastic only and 40 hours of production time per week to manufacture bowls and mugs. The marketing requirement is that total production for both bowls and mugs should not exceed 700 dozens, and that the number of dozens of bowls should not exceed the number of dozens of mugs by more than 350. Production of bowls require 2 pounds of plastic and 3 minutes of labour per dozen while 1 pound of plastic and 4 minutes of labour is required to produce a dozen of mugs. The current production plan for the company calls for producing as much as possible of the more profitable product, bowls at Ksh. 8 profit per dozen then use the left over resources to produce mugs at ksh.5 profit per dozen while remaining within the marketing requirement. Currently, Mombasa industry is producing 450 dozen of bowls and 100 dozen of mugs per week. Assume you are the operations manager and the company is seeking a production schedule that will increase its profits:

a. Calculate the current weekly profits for Mombasa industry (2 marks)

b. Formulate LP model to this problem (5 marks)

c. Solve the industry's decision problem and interpret the results (8 marks)

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iv. Every lunch and dinner hours, Maseno students tend to take their meals at the university cafeteria. Assume that the students' arrival follows a Poisson process, customers arrive at a rate of 64 per hour, and the service rate is 100 customers per hour.

    a) Calculate the average number of customers waiting for service   (3 Marks)

    b) What is the average time customers will wait in a queue   (3 Marks)

QUESTION TWO

i. A company has 4 clients to be attended to onsite by four sales persons. The cost associated with assigning a sales person to a client has been established in the standard table below

	SALES PERSONS			
CLIENTS	A	B	C	D
1	25	18	33	14
2	38	15	53	23
3	15	17	41	30
4	26	28	36	19

Required:

Determine the assignment that would minimize the total cost   (10 Marks)

ii. Savematt needs 1000 coffee makers per year. The cost of each coffee maker is $78. Ordering cost is $100 per order. Carrying cost is 40% of per unit cost. Lead time is 5 days. SaveMatt is open 365 days/yr. What is the optimal order quantity?   (5 marks)

QUESTION THREE

Consider the transportation schedule given in the table below, where values in the cells represent costs,

	W_1	W_2	W_3	Supply
Plant 1	7	6	9	20
Plant 2	5	7	3	28
Plant 3	4	5	8	17
Demand	21	25	19	65

a. Find the Initial feasible solution using the vogel's approximation method (5 marks)

b. Use the North west corner method to find the solution (5 marks)

c. Use stepping stone method to test for optimality of the solution in (b) (5 marks)

QUESTION FOUR

Consider the following activity dependence table:

Activity	Immediate predecessor	Durations			Crash time	Normal	crash
		Pessimistic	optimistic	Most likely			
A	- -	24	10	14	10	1500	1800
B	A	15	5	10	8	2000	2600
C	A	8	4	6	4	1000	1500
D	A	12	4	8	5	900	1200
E	D	10	4	7	3	1200	1800
F	D	9	3	6	5	1500	1900
G	B	9	3	6	4	1200	1600
H	B	12	4	8	3	2400	3400
I	G, C, E	6	2	4	1	3600	4200
J	F	12	4	8	7	1800	2800
K	H, I, J	24	10	14	12	2400	3600
L	F	12	4	8	3	1900	3900
M	L, K	25	11	15	10	2400	3900

i. Find the estimated time for each activity using the three estimates given in the table (5 marks)

ii. Determine the total float for all the activities and interpret the results (5 marks)

iii. The management has proposed that the project should take two weeks less than the scheduled time, determine the new schedule (network diagram) and the cost implication. (5 marks)

QUESTION FIVE

Maseno finance department has four service stations in its office to receive students who have problems and complains about their school fees reports. The arrival average 80 person in an 8hrs working day. Each accounts assistant spends a random amount of time serving the arriving students which have been found to have an exponential distribution. The average service time is estimated to be 20minutes

Required, Calculate

i. The average number of customers in the system (3 Marks)

ii. The average waiting time for a customer (4 Marks)

iii. How many weeks hours each week does an accounts assistant spends performing his job (4 Marks)

iv. What is the expected number of time spent by the accounts assistant at a specified time (4 Marks)

QUESTION SIX

i. A farmer has 100acres on which to plant maize and beans. He also has a capital of Ksh. 10,800, 000. One acre of maize requires Ksh. 240, 000 to cultivate while that of beans requires Ksh. 120, 000. The farmer has a workforce of 480 laborers and it takes 6 laborers to work on 2 acres of maize and 12 Laborers to work on 2 acres of beans. The profit per acre is Ksh. 60,000 maize and Ksh.80, 000 for beans. The decision problem is to maximize the profits.

a) Set up a linear programming problem (5 Marks)

b) By use of simplex algorithm method solve the linear programming problem (10 Marks)