



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2018/2019

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF BUSINESS
ADMINISTRATION

BMS 848: OPERATIONS RESEARCH

DATE: Wednesday, 3rd April 2019

TIME: 5.30pm - 8.30pm

INSTRUCTIONS:

Answer Question ONE and ANY other THREE questions

QUESTION ONE (40 MARKS)

- a) Explain four applications of operation research in the business environment. (6 marks)
- b) Discuss four assumptions of Game theory. (6 marks)
- c) A research and development department in XYZ Company is developing a new product for the company to attract more customers and hence maximize on sales. The R & D manager has revealed that the following activities will take place in the coming weeks.

Activity	Immediate predecessors	Optimistic time	Most likely time	Pessimistic time
A	None	4	6	8
B	A	5	7	15
C	A	4	8	12
D	B	15	20	25
E	B	10	18	26
F	C	8	9	16
G	E	4	8	12
H	D,F	1	2	3
I	G,H	6	7	8

- i. Draw the network for this project. (5 marks)
 - ii. Calculate the estimated time for each activity. (4 marks)
 - iii. Find the Critical Path and the expected number of weeks for completion of the project. (2 marks)
 - iv. What is the probability of completing project in 55 weeks. (4 marks)
- d) A company can produce three products A, B and C. the products yield a contribution of Kshs.8, 5 and 10 respectively. The products use a machine which has 400 hours capacity. Each unit of the product uses 2, 3 and 1 hour respectively of the machines capacity. There are only 150 units available in the period of a special component which is used singly in product A and C. Only 200kgs of a special alloy is available in the period. The usage of special alloy is 2kgs per unit and 4kgs per unit respectively. There is an agreement with a trade association to produce no more than 50 units of product B in the period. Advise the company on the production plan that will maximize contribution. (9 marks)
- e) Explain structure of a queuing system and clearly show its characteristics. (4 marks)

QUESTION TWO (20 MARKS)

- a) Explain the difference between decision making under uncertainty and under risk. (2 marks)
- b) Discuss three differences between PERT and CPM in operations research. (6 marks)
- c) In a textile sales emporium, five salesmen V, W, X, Y, Z are available to be allocated to five geographical locations. The locations are not equally distributed and hence each salesman has to use their potential and sales ability to maximize sales. The following table gives expected sales in thousands per month for each salesman when assigned to any given location.

Location Salesman	RIFT	WEST	COAST	CENTRAL	NORTH
V	300	250	330	260	310
W	350	300	280	280	330
X	280	290	310	230	360
Y	330	310	340	290	350
Z	280	350	350	291	300

- i. How should the salesmen be assigned to the locations in order to maximize sales. (10 marks)
- ii. Compute the total sales (2 marks)

QUESTION THREE (20 MARKS)

A county referral hospital has a single Cuban doctor to take care of patients arriving for specialized medical services across the ten sub counties. it has been established that the situation faced here is a single server situation with poisson arrival and exponential service. from the records it has been established that patients arrive randomly at the rate of 0.25 patients per minute. Patients require different amount of time for treatment, the Doctor reckons that he treats his patients at an average rate of 0.3 patients/minute. Determine;

- a) The average number of patients in the queuing system (4 marks)
- b) Patients waiting in the queue (4 marks)
- c) Average amount of time a patient spends in the queuing system. (4 marks)
- d) The average amount of time a patient spends in the queue (4 marks)
- e) the proportion of the time the doctor is giving the service (4 marks)

QUESTION FOUR (20 MARKS)

- a) Discuss limitations of operation research in decision making (6 marks)
- b) Makueni Company Ltd, produces Mango juice and honey. It has four factories A, B, C and D. The factories supply juice and honey to four warehouses located in Kitui, Machakos, Mombasa and Nairobi. The management of the company wants to determine the minimum cost of transportation schedule for its monthly output. The factory supply and warehouse demand are as follows:

Factories		Warehouse	
A	150	Kitui	100
B	60	Machakos	120
C	140	Mombasa	150
D	110	Nairobi	90

Cost in shillings of transporting one unit of commodity from various factories to deferent warehouse is as follows:-

Factory	Warehouse			
	Kitui	Machakos	Mombasa	Nairobi
A	25	35	36	60
B	55	30	45	38
C	40	50	26	65
D	60	40	66	27

Required:

- Formulate the above problem as a Linear programming problem. (4 marks)
- Solve for feasible solution using least cost method. (8 marks)
- Calculate total transport cost. (2 marks)

QUESTION FIVE (20 MARKS)

- Discuss application of simulation models in business management. (4 marks)
- Explain the meaning of the following terms as used in game theory;
 - saddle point (2 marks)
 - value of the game (2 marks)
 - zero sum game (2 marks)

- c) ABZ company wants to invest in its operations in order to accommodate a new product. It has come up with the following alternatives and the expected returns.

Alternative	High	Medium	Low	No action
Expand existing	50,000	25,000	-25,000	-45,000
Build new	70,000	30,000	-40,000	-80,000
Subcontract	30,000	15,000	-10,000	-10,000

What would be the company's decisions using the following decision making criteria:

- i. Maximax criteria (2 marks)
- ii. Maximin criteria (2 marks)
- iii. Minimax regret (2 marks)
- iv. Laplace rule (2 marks)
- v. Hurwicz rule ($\alpha=0.7$) (2 marks)