



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF
BUSINESS ADMINISTRATION

BMS 848: OPERATIONS RESEARCH

DATE: Monday, 27th November 2017 TIME: 2.00p.m-5.00p.m

INSTRUCTIONS: Answer question one and any other Three

Question one

- a) What are the assumptions underlying the common queuing models? (4 marks)
- b) From historical data, Harry's car wash estimates that dirty cars arrive at the rate of 10 per hour all day Saturday. With a crew working the wash line, Harry figures that cars can be cleaned at the rate of one every 5 minutes. One car at a time is cleaned in this example of a single channel waiting line. Assuming Poisson arrivals and exponential service times, find the
- i. Average number of cars in line (2 marks)
 - ii. Average time a car waits before it is washed (2 marks)
 - iii. Utilization rate of the car wash (2 marks)
 - iv. Average time the car spends in the system (2 marks)
 - v. Probability that no cars are in the system (2 marks)
- c) A manufacturer of complex electronic equipment has just received a sizeable contract and plans to subcontract part of the job. He has solicited bids for 6 subcontracts from 4 firms. Each job is sufficiently large that any one firm can take only one job. The table below shows the bids and the cost estimates (in Sh. 10,000) for doing the jobs internally. Not more than two jobs can be performed internally

Firm	Job					
	1	2	3	4	5	6
1	48	72	36	52	50	65
2	44	67	41	53	48	64
3	46	69	40	45	45	68
4	43	73	37	51	44	62
Internal	50	65	35	50	46	63

Determine the optimal assignment

(8 marks)

- d) Solve the following game for optimum strategies and the value of the game given the following matrix;

	Player B			
Player A	18	4	6	4
	6	2	13	7
	11	5	17	3
	7	6	12	2

(8 marks)

- e) The primary contribution of the game theory has been in its concepts rather than its formal application to solving real problems explain

(10 marks)

Question Two

- a) Explain why a manager of a company might be forced to use simulation models instead of analytical model in dealing with a problem of:
- Inventory ordering policy
 - Bank teller service windows

iii. Ships docking in a port to unload (6 marks)

- b) The manager of Tujenge savings and loan is attempting to determine how many sellers are needed at the drive –in- window during peak times. As a general policy, the manager wishes to offer service such that the average customer waiting time does not exceed 2 minutes.
- Given the existing service level as shown in the following data, does the drive-in window meet this criterion? Use the following random numbers

Arrival: 50 28 68 36 90 62 27 50 18 36 61 21 46 01 14

Service: 52 37 82 69 98 96 33 50 88 90 50 27 45 81 66

Data for service time

Data for customer arrivals

Service time (Minutes)	probability (Frequency)	Time between successive customer arrivals	probability (Frequency)
0	0.00	0	0.10
1.0	0.25	1.0	0.35
2.0	0.20	2.0	0.25
3.0	0.40	3.0	0.15
4.0	0.15	4.0	0.10
		5.0	0.05

(14 marks)

Question Three

- a) State the assumptions made in solving a transportation problem (4 marks)

- b) The hard rock concrete company has plants in three locations and is currently working on the four major construction projects, each located at different site. The shipping cost per truckload of concrete, daily plant capacities, and the daily project requirements are provided in the table below:

Location	Project A	Project B	Project C	Project D	Plant
					capacities
A	12	4	9	5	55
B	8	1	6	6	45
C	1	12	4	7	30
Project requirement	40	20	50	20	

- Formulate an initial feasible solution to hard rock transportation problem using VAM method (6 marks)
- Solve for the least cost of shipment using MODI method (10 marks)

Question Four

Consider a project with the following activities. The normal duration and cost, crash duration and cost and the precedence of activity are:

Activity	Dependency	Normal time	Crash time	Normal cost	Crash cost
A	Start	4	4	4000	-
B	Start	8	6	8000	1500
C	F, d, finish	3	3	600	-
D	B	6	5	900	150
E	Start	7	5	350	100
F	A	15	12	9000	900
G	B	12	10	1200	200
H	G, finish	10	8	1000	150
J	L, finish	5	4	1000	300
K	E	9	7	900	150
L	G & K	11	8	2200	350

Fixed overhead cost per day is shs. 500.00

- i. Draw a network diagram for the above project and calculate the expected completion time (7 marks)
- ii. Crash the project and determine the ultimate crash duration (10 marks)
- iii. Calculate the cost associated with crashing the above project (3 marks)

Question Five

a) A repairman is to be hired by a company to repair machines that break down following a Poisson process, with an average rate of four per hour. The cost of non-productive machine time is Sh. 90 per hour. The company has the option of choosing either a fast or a slow repairman. The fast repairman charges Sh. 70 per hour and will repair machines at an average rate of 7 per hour, while the slow repairman charges Sh. 50 per hour and will repair machines at an average rate of 6 per hour. Determine the repairman who should be hired? (10 marks)

- b) Johnson is an estate agent and he has been asked by his client to sell for him three products A,B and C.He agrees to pay him 5% commission on each sale and specifies certain conditions:the state agent must sell property A first within 60 days. If and when A is sold , the agent receives a commision on that sale. He can then either back out at this stage or nominate and try to sell one of the remaining two properties within 60 days.If he does not succeed in selling the nominated property at that period,he is not given the opportunity to sell the other. If he does sell it in that period, he is given the opportunity to sell the third property on the same conditions. The following table summarises the prices, selling costs (incurred by the sales agent whenever a sale is made) and the estate agent's estimated probability of making a sale.

Property	price of property	selling costs	probability of sale
A	12,000	400	0.7
B	25,000	225	0.6
C	50,000	450	0.5

- i. Draw up an appropriate decision tree for the state agent (4 marks)
- ii. What is th estate agents best strategy under EMV approach? (6 marks)