



**TECHNICAL UNIVERSITY OF MOMBASA**  
**Faculty of Business and Social Studies**

DEPARTMENT OF BUSINESS STUDIES

UNIVERSITY EXAMINATIONS FOR DEGREE IN  
BACHELOR OF BUSINESS ADMINISTRATION  
BACHELOR OF COMMERCE

**BMS 4307: OPERATIONAL RESEARCH I**

END OF SEMESTER EXAMINATIONS

**SERIES: APRIL 2015**

**TIME: 2 HOURS**

**INSTRUCTIONS:**

- Answer Question **ONE (Compulsory)** and any other **TWO** questions.
- Do not write on the question paper

***This paper consists of Four printed pages***

---

**QUESTION 1 (Compulsory)**

- a) i) What is operations research?  
ii) Briefly explain the benefits of operation research in a business institution. **(6 marks)**
- b) A firm produces three products whose details are given below

Products	Process			Contributions (Ksh.)
	X	Y	Z	
1	8	4	2	20
2	2	3	0	6
3	3	0	1	8
Availability (hrs)	250	150	50	

**Required:**

- i) Formulate problem as a Linear Programming Model. (5 marks)
- ii) Find the dual of (i) above. (3 marks)
- iii) Determine the optimum contribution levels. (10 marks)
- iv) Suppose the available time in hours changes to 300, 180 and 80 hours respectively for the above products. What would be the effect on the optimum levels of the solution in (iii) above. (2 marks)

- c) Briefly define simulation and state **THREE** advantages of simulation models over other modes. (4 marks)

**QUESTION 2**

A cement company has two processing plants in towns A and B with a supply capacity of 100 tones and 110 tones a day respectively. The company has three warehouses R, S and T. The warehouses need 80, 120, and 60 tons of cement each day respectively to meet their daily distribution demands.

The transportation cost from each warehouse is given below:

From	To	Cost /Tone (Kshs.)
A	R	1
A	S	2
A	T	3
B	R	4
B	S	1
B	T	5

**Required:**

- a) Find the initial feasible solution using north west corner method. (4 marks)
- b) Find the initial transportation schedule and its cost. (4 marks)
- c) Test for optimality using the stepping stone method. (9 marks)
- d) Find the optimal transportation schedule and its cost. (3 marks)

### QUESTION 3

- a) Briefly discuss the benefits of an effective inventory control system to a business institution. **(8 marks)**
- b) The demand rate for a particular item is 20,000 units/year. The ordering cost is 120 per order and the holding cost is 1.20 per item per month. If no shortages are allowed and that replacement is instantaneous,  
Determine:
- i) The economic order quantity **(3 marks)**
  - ii) The time between orders. **(3 marks)**
  - iii) The number of order per year. **(3 marks)**
  - iv) The optimum annual cost if the cost of item is 2.5 per item. **(3 marks)**

### QUESTION 4

- a) A competitive situation is called a game. A game must have some assumptions. What are these assumptions that qualifies a competitive situation? **(6 marks)**
- b) A company is currently involved in negotiations with its union on the upcoming wage contract. The table below was constructed by the management group. The pluses are to be interpreted as proposed wage increases while minus figures indicates a wage reduction. Both the company management and the union must decide on an overall strategy before negotiation begins. What game value and strategies are available to the opposing groups. **(8 marks)**

<b>Union Company</b>	<b>U<sub>1</sub></b>	<b>M<sub>2</sub></b>	<b>U<sub>3</sub></b>	<b>M<sub>3</sub></b>
C1	+0.28	+0.27	+0.35	-0.02
C2	+0.20	+0.16	+0.08	+0.08
C3	+0.14	+0.12	+0.15	+0.12
C4	+0.30	+0.14	+0.19	0.00

- c) Using graphical method find the value of the game below:

$$\begin{pmatrix} 18 & 8 \\ 16 & 6 \\ 6 & 10 \\ 4 & 18 \end{pmatrix}$$

**(6 marks)**

## QUESTION 5

- a) Define queueing theory and give **THREE** illustrations of any business institutions that are practicing queueing method. **(4 marks)**
- b) The arrival pattern of customers at TUM Hotel (Kiziwi) follow a poisson distribution with a mean arrival rate of 10 people per hour. The hotel has a good reputation such that customers are willing to wait for service once they arrive. The time it takes to serve a customer is exponential distributed with estimated time of an average 4 minutes.

### **Required:**

- i) The average number of customers in the system. **(5 marks)**
- ii) The average queue length. **(3 marks)**
- iii) The average time a customer spend in the system. **(3 marks)**
- iv) The average time a customer waits before being served. **(3 marks)**
- v) The probability that the server is idle. **(2 marks)**