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UNIVERSITY EXAMINATIONS: 2025/2026

EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

DICT0124

OPERATION RESEARCH

DATE: 5.30PM-8.30PM,FRIDAY,DECEMBER, 2025 **TIME: 2 HOURS**

INSTRUCTIONS: Question One is Compulsory, Choose Three Other Questions

SECTION A (COMPULSORY)

QUESTION ONE (15 marks)

a) Define Operation Research. (2 Marks)
b) Describe the main phases of Operation Research? (2 marks)
c) Discuss two applications of Linear Programming. (2 marks)
d) Difference between PERT and CPM. (2 marks)
e) Explain three characteristics of a good inventory control system. (3 marks)
f) A company ignores OR methods and relies purely on experience. Discuss two possible consequences. (4 marks)

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SECTION B
(ANSWER ANY THREE (3) QUESTIONS IN THIS SECTION)

Question Two (15 Marks)

a) A company produces Product X and Product Y.
Profit per unit: X = KSh 20, Y = KSh 30.
Constraints:

$2X + Y \leq 100$

$X + 3Y \leq 90$

$X, Y \geq 0$

Required:
i. Formulate the LP model. (3 marks)
ii. Determine the optimal profit. (3 marks)

b) Using an appropriate example, explain degeneracy in transportation problem. (3 Marks)

c) Describe three types of solutions generated from Integer programming methods. (3 Marks)

d) Explain any two advantages and two limitations of Simulation. (3 Marks)

Question Three (15 marks)

a) Evaluate the strengths and weaknesses of mathematical models compared to managerial intuition. (7 marks)

b) A company has four factorise A,B,C and D which supply warehouses E,F,G and H respectively. Monthly production capacities of these factories are 200, 275, 300 and 175 units respectively. The current warehouse requirements are 200, 275, 300 and

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400 units respectively. Unit transportation costs from factories to warehouses are given below.

Factories	Warehouse			
	E	F	G	H
A	10	13	17	10
B	16	18	12	16
C	21	25	13	21
D	15	12	14	15

Using least cost method first to find the initial feasible solution, find the optimal solution (8 Marks)

Question Four (10 marks)

a) A bank plans to open a single-server drive- in banking facility at a particular centre. It is estimated that 28 customers will arrive each hour on average. On average, 2 minutes are required to process a customer's transaction. Assuming Poisson arrivals and exponential service, determine:
   i) The probability that a customer arriving at the facility will have to wait. (3 Marks)
   ii) The proportion of time the server will be idle, (3 Marks)
   iii) On average, how long a customer will have to wait for service, (3 Marks)
   iv) The average time a customer spends in the system. (3 Marks)
   v) The average number of customers in the system. (3 Marks)

Question Five (15 Marks)

a) Explain the scope of Operation Research. (3 Marks)
b) Distinguish between PERT and CPM. (3 Marks)
c) A certain project is composed of mini activities whose time estimates are given below:

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Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6	6-7	5-7
Duration	1	3	2	1	3	2	4	6	3

Draw the project network and find out the critical path. (8 Marks)

Question Six (15 Marks)

c) A company has two warehouses supplying goods to three retail stores. Supply and demand are as follows:

	Store 1	Store 2	Store 3	Supply
W1	4	6	8	50
W2	5	4	3	40
Demand	30	30	30	

i. Formulate the transportation model. (4 Marks)
ii. Obtain an initial feasible solution using the North-West Corner method. (5 Marks)
iii. Test for optimality using the MODI method. (6 Marks)

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