



PAN AFRICA CHRISTIAN UNIVERSITY

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY
COURSE CODE: DICT0124
COURSE TITLE: OPERATIONS RESEARCH
CAMPUS: ROYSAMBU
EXAM DATE: WEDNESDAY, XXXXX/AUGUST, 2024
TIME: 8:00AM-11:00AM

INSTRUCTIONS

- This exam script has **TWO (2)** sections.
- Read all questions carefully before attempting.
- Answer All questions in Section **A** and any other Three questions in Section **B**.
- Write only your **student number** on the answer booklet provided.

SECTION A
(Answer ALL questions in this section)

Question 1:

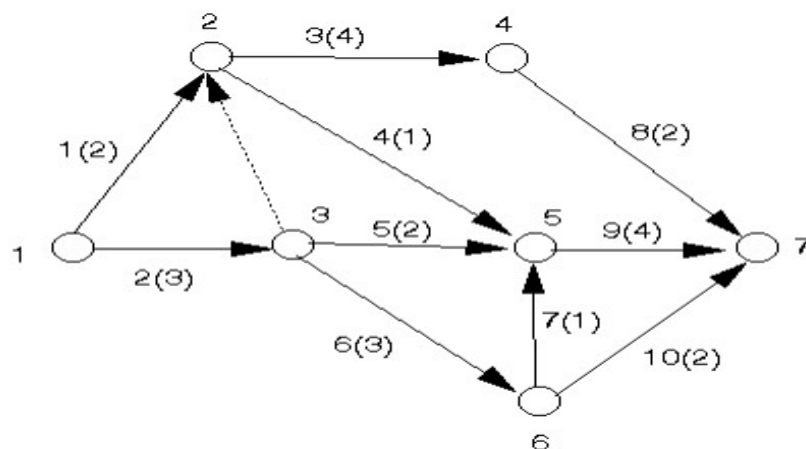
a) Explain how Operations Research has impacted on the following, giving an appropriate example from the Kenyan context: - **[2 Marks]**

- i. Finance
- ii. Production Management

b) ABC company produces doors and windows both of which requires welding hours and painting hours. Each door takes 6 hours in welding and 4 hours in painting. Each window takes two hours in welding and two hours in painting. Only 500 hours of welding and 200 hours of painting are available. The cost of production for each door is sh. 4000 and sh. 3000 for each window. Each door is sold at sh. 4500 and each window is sold at sh. 3300. Formulate the problem as a linear programming problem.

[4 Marks]

c) The following network diagram shows activities of a construction project and duration



Calculate the critical activity and the overall project completion time.

[4 Marks]

SECTION B
(Answer any THREE (3) questions in this section)

Question 2:

The following formulated Linear Programming model is provided;

$$\text{Max } Z = x_1 + 2x_2 + 3x_3$$

Subject to

$$2x_1 + x_2 + x_3 \leq 1$$

$$3x_1 + 4x_2 + 4x_3 \leq 4$$

$$5x_1 + 7x_2 + 4x_3 \leq 2$$

$$x_1, x_2, x_3, \geq 0$$

a) Using Simplex Method, draw the initial tableau form.

[7 Marks]

b) State the:

i. Entering variable

[1 Mark]

ii. Leaving variable

[1 Mark]

iii. Pivot element

[1 Mark]

Question 3:

Consider the following transportation problem:

		Destinations		
Origin	P	Q	R	Supply
A	5	7	8	70
B	4	4	6	30
C	6	7	7	50
Demand	65	42	43	150

Compute the initial feasible solution using:

i. North-West Corner Method

[5 Marks]

ii. Least Cost Method

[5 Marks]

Question 4:

Four jobs are to be assigned to four machines. The table below shows the costs associated with each job- machine combination.

		Machine			
Job		A	B	C	D
	1	8	6	2	4
	2	6	7	11	10
	3	3	5	7	6
	4	5	10	12	9

i. Using Hungarian technique assign the jobs to machines.

[8 Marks]

ii. Determine the minimum cost.

[2 Marks]

Question 5:

A construction company wants cement at three of its project sites P1, P2 and P3. It procures cement from four plants C1, C2, C3 and C4. Transportation costs per tonne, capacities and requirements are as follows:

	P1	P2	P3	Capacity(tonnes)
C1	2	7	4	50
C2	3	3	1	80
C3	5	4	7	70
C4	1	6	2	140
Requirement	70	90	180	340

Use Vogel's Approximation Method to develop an initial feasible solution.

[10 Marks]

Question 6:

A new construction product is to be released on a deadline for which few days are left. The activities involved in the product launch with their interdependencies and probabilistic times for completion in days are shown in the table below.

Activity	Preceding activity	Optimistic	Time in most likely	Days pessimistic
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D and E	3	6	15
H	F and G	1	2	3

a) Calculate the expected time of each activity.

[5 Marks]

b) Find the variances of each activity.

[5 Marks]

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