

PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY
COURSE CODE: BCIT202
COURSE TITLE: OPERATIONS RESEARCH
CAMPUS: ROYSAMBU
EXAM DATE: XXXXX XXXXX/APRIL,2022
TIME: XXXXX

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) Operations research is the application of scientific methods to arrive at the optimal solutions to the problems. Justify this statement. **[2 Marks]**

b) A manufacturing company produces two products X and Y. The Company has three machines A, B and C. Product X requires two minutes of Machine A, three minutes of Machine B and one Minute of Machine C. Product Y requires three minutes of machine A, two minutes of machine B and one minute of machine C. The capacity available is 1,500 minutes of machine A, 1500 minutes of machine B and 600 minutes of machine C. Each unit of product X sold gives a profit of ksh.100 and ksh.120 for each of product Y. What is produced is sold immediately.

Formulate the problem as a linear programming problem to maximize the total profit.

[4 Marks]

c) The following table gives activities of a construction project and duration

Activity	Preceding Activity	Duration
A	-	2
B	A	3
C	A	5
D	A	8
E	B	6
F	C	1
G	C	2
H	C,D	3
I	E,F	7
J	G,H	4
K	I, J	5

Required:

i. Construct a network diagram for the project.

[2 Marks]

ii. Determine the critical path of the project.

[2 Marks]

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

Question 2:

Consider the following transportation problem:

	Destinations				
Origins	A	B	C	D	Supply
P	2	3	4	5	6
Q	5	4	3	1	8
R	1	3	3	2	10
Demand	4	6	8	6	24

Find the initial basic feasible solution using:

- i. North-West Corner Method [5]

Marks]

- ii. Least Cost Method [5]

Marks]

Question 3:

The following formulated Linear Programming model is provided;

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

Subject to

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

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

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

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

- i. Using Simplex Method give the initial tableau [7]

Marks]

- ii. State the pivot element, leaving variable and entering variables at this stage.

[3 Marks]

Question 4:

a) A company has five jobs V, W, X, Y and Z and five machines A, B, C, D and E. The given matrix shows the returns in shillings of assigning a job to a machine. Using Hungarian technique assign the jobs to machines, find the minimum total time taken.

[10 Marks]

	Machines				
Jobs	A	B	C	D	E
V	5	11	10	12	4
W	2	4	6	3	5
X	3	12	5	14	6
Y	6	14	4	11	7
Z	7	9	8	12	5

Question 5:

You are provided with the following information on the transportation costs per unit from each source to each destination and the availabilities and the demand

Source	X	Y	Z	Capacity
P	5	8	2	200
Q	12	6	5	480
R	9	10	4	320
Demand	400	250	350	

Use Vogel's Approximation Method to develop an initial transportation schedule and compute the minimum cost for your allocation.

[10 Marks]

Question 6:

A project consists of the following activities.

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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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