



PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY
COURSE CODE: BSIT202
COURSE TITLE: OPERATIONS RESEARCH
CAMPUS: ROYSAMBU
EXAM DATE: XXXXX XXXXX/APRIL,2024
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) Outline two areas where linear programming has been used successfully to solve practical problems in business. **[2**

Marks]

b) The XYZ retail store stocks two types of shirts A and B. In one week, the store can sell a maximum of 400 shirts of type A and a maximum of 300 shirts of type B. The storage capacity, however, is limited to a maximum of 600 of both types combined. Type A shirt fetches a profit of Kshs.20 per unit and type B a profit of Kshs.50 per unit The store wants to establish how many of each type of shirt should be stocked per week in order to maximize the total profit. Formulate the linear programming problem to maximize the total profit.

[4 Marks]

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

Activity	A-B	A-C	B-C	B-D	C-D	D-E
Duration(Days)	12	15	10	20	5	16

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:

A company produces three products A, B, and C. The unit profit contribution of each of the products are Ksh. 5, 10 and 8 respectively. Each unit of product A requires 3kgs of material, 4 machine hours and 2 labour hours; each units of product B requires 5kgs of material, 4 machine hours and 4 labour hours; each unit of product C requires 2kgs of material, 4 machine hours and 5 labour hours. The company has

60 kgs of materials, 72 machine hours and 100 labour hours available everyday. The company wants to maximize its daily profits using the available resources,

Required:

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:

Origins	Destinations				
	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

Obtain the initial feasible solution using

i. North –west corner method. **[5**

Marks]

ii. Least cost method. **[5**

Marks]

Question 4:

A small garment making unit (firm) has five tailors stitching five different types of garments. All the five tailors are capable of stitching all the five types of garments. The output per day per tailor and the profit (Ksh) for each type of garment are given below:

Tailor	Garment				
	V	W	X	Y	Z
A	7	9	4	8	6
B	4	9	5	7	8
C	8	5	2	9	8
D	6	5	8	10	10
E	7	8	10	9	9
Profit sh. per garment	2	3	2	3	4

- i. Using Hungarian technique, assign the type of garment to a tailor. **[8 Marks]**
- ii. Determine the minimum cost. **[2 Marks]**

Question 5:

A firm of office equipment suppliers has 3 depots located in various towns. It receives orders for a total of 15 special filing cabinets from four customers. In total in the 3 depots there are 15 of the current filing cabinets available and the management wish is to minimize delivery costs by dispatching the filing cabinets from the appropriate depot for each customer. Details of the availabilities, requirements and transport costs per filing cabinet are given in the following table.

	Customer A	Customer B	Customer C	Customer D	Supply capacity
Customer Depot					
X	13	11	15	20	2

Y	17	14	12	13	6
Z	18	18	15	12	7
Demand	3	3	4	5	

Using Vogel's approximation method, 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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