PAN AFRICA CHRISTIAN UNIVERSITY
EXAMININATIONS PAPER

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BACHELORS OF INFORMATION COMMUNICATION TECHNOLOGY

END OF TERM EXAMINATION

DEPARTMENT:	**COMPUTING & INFORMATION TECHNOLOGY**
COURSE CODE:	**DICT0124**
COURSE TITLE:	**OPERATION RESEARCH**
CAMPUS:	**ROYSAMBU**
EXAM DATE:	**FRIDAYXXXX/AUGUST**
TIME:	**START HOUR – 11.00AM-2.00PM**

INSTRUCTIONS

- This exam carry a total of SIX Questions of [10 Marks Each]
- Section One (I) is compulsory.
- Answer any 3(Three) Questions from Section Two (II)
- Read all questions carefully before attempting.

SECTION A
(Answer ALL questions in this section)

QUESTION ONE (10 Marks)

a) Discuss common applications of Operations Research in various industries. (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 two characteristics of a good inventory control system. (2 marks)

SECTION B

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

QUESTION TWO (10 Marks)

a) Explain the steps involved in solving a linear programming problem using the graphical method. (2 marks)
b) Describe the North-West Corner Rule method for solving transportation problems. (3 marks)
c) Solve the following assignment problem using the Hungarian method: (5 marks)

$$\begin{bmatrix} 12 & 7 & 9 & 7 \\ 8 & 9 & 6 & 6 \\ 7 & 17 & 12 & 14 \\ 15 & 14 & 6 & 6 \end{bmatrix}$$

QUESTION THREE (10 marks)

a) A machine breakdown follows a Poisson distribution with a mean of 2 per hour, and the service time follows an exponential distribution with a mean of 3 per hour. Calculate the average number of machines in the queue and the average waiting time. (4 marks)

b) Use the **Simplex Method** to solve the following LPP: (6 marks)

Maximize $Z=3x_1+5x_2$

Subject to:

$$x_1 + 2x_2 \leq 6$$
$$3x_1 + 2x_2 \leq 12$$
$$x_1, x_2 \geq 0$$

QUESTION FOUR (10 marks)

a) Clearly explain the following terms;
(i) Critical activity
(ii) Shadow cost
(iii) Feasible region
(iv) Optimum solution (4 marks)

b) Discuss the development of OR giving reasons for its growth (6 marks)

QUESTION FIVE (10 Marks)

A small town is experiencing frequent traffic congestion at a major intersection during peak hours. The local council wants to use an OR approach to alleviate this problem.

i) As an OR professional, how would you begin to define this complex problem, and state key information would you seek.

(3 marks)

ii) Propose at least two distinct OR techniques (e.g., queuing theory, simulation, network flow) that could be relevant to analyzing this traffic congestion problem. For each technique, briefly explain how it would be applied and what specific insights it could provide. (3 marks)

iii) Discuss two non-quantitative factors that might influence the ultimate decision of the town council, even if your OR model provides a mathematically optimal solution and how would you incorporate these factors into your recommendations? (4 marks)

A	-	1	2	3
B	A	2	4	6
C	A	3	5	7
D	B	2	2	2
E	B, C	4	5	6

Activity	Predecessor	O	M	P
A	-	1	2	3
B	A	2	4	6
C	A	3	5	7
D	B	2	2	2
E	B, C	4	5	6
F	D, E	3	6	9

i) Calculate the expected time and variance for all activities. (2 marks)
ii) Construct the PERT network. (2 Marks)
iii) Identify the critical path. (2 marks)
iv) Estimate the project completion time and standard deviation. (2 marks)
v) Calculate the probability that the project will be completed in 20 days. (2 marks)