PAN AFRICA CHRISTIAN UNIVERSITY

BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT:	**COMPUTING AND INFORMATION TECHNOLOGY**
COURSE CODE:	**BSIT102**
COURSE TITLE:	**DISCRETE MATHEMATICS**
CAMPUS:	**ROYSAMBU**
EXAM DATE:	**THURSDAY, XXXXX/AUGUST,2023**
TIME:	**5:30PM-8:30PM**

INSTRUCTIONS

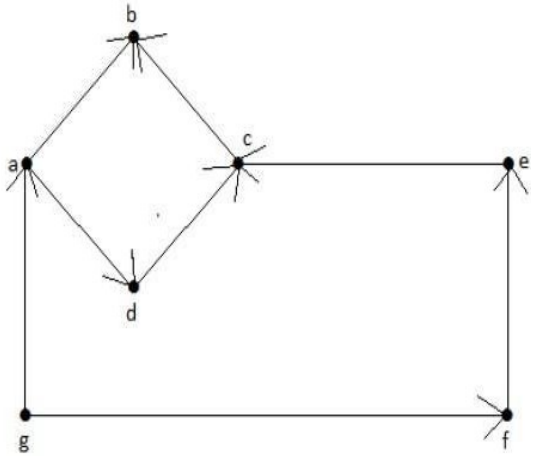
- This exam script has **TWO (2)** sections.
- Read all questions carefully before attempting.
- Answer All questions in Section **A** and any other Three questions in Section **B.**
- Write only your **student number** on the answer booklet provided.

a) Calculate the following**:** **[4 Marks]**

i. $10111_2 + 110001_2$

ii. $10100_2 \times 1111_2$

b) Given the following directed graph.



Compute the indegree and outdegree of following vertices **[2 Marks]**

Vertex	Indegree	Outdegree
a		
b		
e		
g		

c) Given that A = {1,2,3}, compute $p(A)$. **[2 Marks]**

d) Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}

A = {1, 2, 3, 4, 5 }, B = {2, 4, 6, 8, 10} and C = {1, 3, 5, 7, 9} . Find $A' \cap B \cup C$.

[2 Marks]

SECTION B

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

Question 2:

a) Construct truth table for the following statement. **[5 Marks]**

$Q \vee (P \rightarrow (\sim Q \vee \sim P))$

b) Consider the following data for 120 mathematics students at a college concerning the languages; French, German and Russian:
65 study French, 45 study German, 42 study Russian, 20 study French and German, 25 study French and Russian, 15 study Russian and German and 8 study all three languages.
Find the number of students who study at least one of the three languages. **[5 Marks]**

Question 3:

a) Convert $(B7E4)_{16}$ to an octal number. **[3 Marks]**

b) Compute the following to its one (1's) complement form (in 5-bits register) **[4 Marks]**

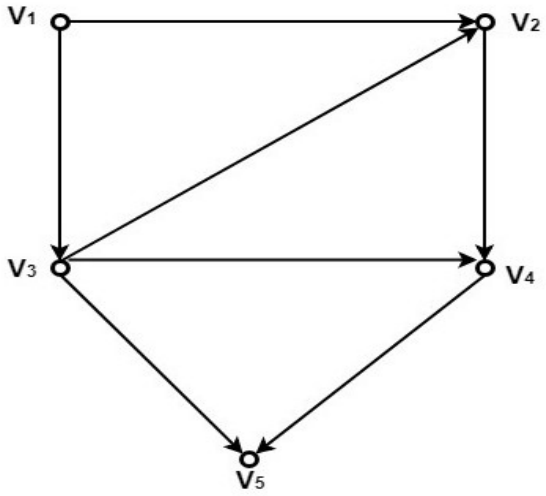
i. $(0101)_2 - (1100)_2$

ii. $(-1101)_2 + (-1110)_2$

c) Perform $(110101)_2 - (100010)_2$ **[3 Marks]**

Question 4:

a) Consider the directed graph shown below.



Determine its adjacency List L_A. **[5 Marks]**

b) Graph G is represented by the following adjacency matrix;

$$\begin{bmatrix} 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Draw the graph G (use a, b, c, d, and e as the vertices). **[5 Marks]**

Question 5:

a) Simplify the following expression using Karnaugh Map:

i. Z=A'B' + A'B+AB **[5 Marks]**

ii. Z= A'B'C + ABC' + A'BC' + AB'C **[5 Marks]**

Question 6:

a) If A = {1, 2, 3, 4} then relation R = { (1, 1),(1,2),(1,3),(1,4),(2,1), (2, 2),(2,3), (2, 4),(3,1),(3,2), (3, 3), (3, 4), (4, 4) }

Determine the following:

i. Reflexive Relation **[2 Marks]**

ii. Symmetric Relation **[2 Marks]**

iii. Transitive Relation **[2 Marks]**

b) Let X = {1, 2, 3, 4}

Y = {a, b, c, d, e}

Function F = {(1, b), (2, a), (3, d), (4, c)

Determine the following in the above function:

i. Domain **[1 Mark]**

ii. Co-Domain **[1 Mark]**

iii. Range **[1 Mark]**

c) Identify the type of function used in (b) above. **[1 Mark]**

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