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:	**WEDNESDAY, XXXXX/DECEMBER,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) Let $\boldsymbol{p}$ and $\boldsymbol{q}$ be the statements:

$\boldsymbol{p}$: He is rich

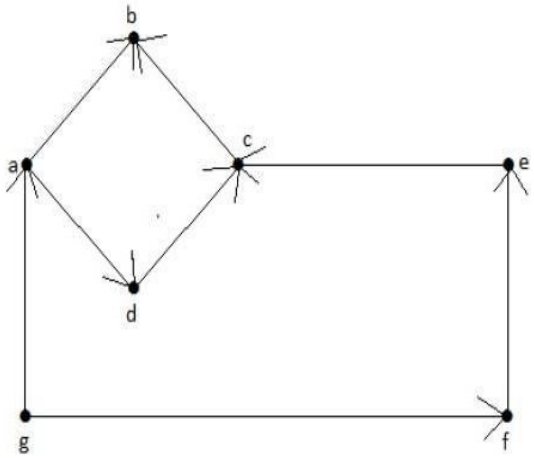
$\boldsymbol{q}$: He is generous

Write the following statements in symbols forms (in terms of $\boldsymbol{p}$ and $\boldsymbol{q}$);

i. 'He is poor but generous' **[2 Marks]**

ii. 'He is poor and not generous' **[2 Marks]**

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 U = {1,2,3,4,5,6,7,8,9} is a universal set, and A={1,4,7 } B={2,4,5,7} and C={3,4,7} are set.

Calculate

i. $A \cup B$ **[2 Marks]**

ii. $(A \cap B)^c$ **[2 Marks]**

SECTION B

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

Question 2:

a) Given that A = { x, y, z }, compute $p(A)$. **[2 Marks]**

b) In a survey involving 60 students, it was found that 26 like Chemistry, 24 like Physics, 18 like Mathematics, 12 both Chemistry and Physics, 10 Chemistry and Mathematics, 10 Physics and Mathematics and 15 none of the three subjects.

i. Find the number of students that like all the three subjects. **[4 Marks]**

ii. Find the number that like Mathematics only, Physics only and Chemistry only.

[4 Marks]

Question 3:

a) Convert the following: **[6 Marks]**

i. 1001.1101_2 to decimal equivalent

ii. 17.5625_{10} to binary number

iii. $E94B_{16}$ to octal equivalent

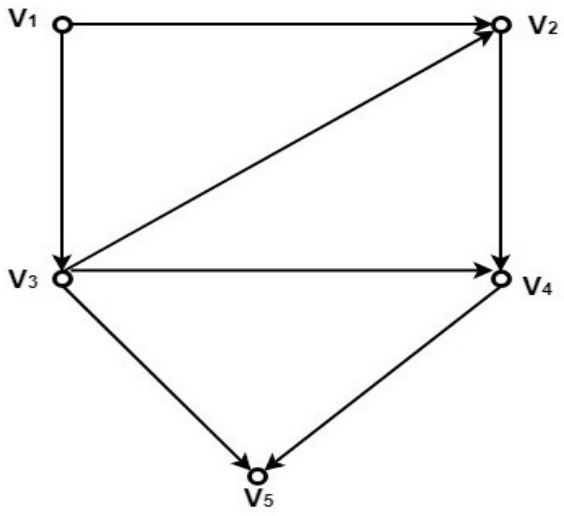
b) Perform the following

i. $(110101)_2 - (100010)_2$ **[2 Marks]**

ii. $(-1101)_2 + (-1110)_2$ **[2 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) Prove that the proposition (p ∧ ¬ q) ∨ (¬ p ∧ q) is a tautology. **[4 Marks]**

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