

PAN AFRICA CHRISTIAN UNIVERSITY

DIPLOMA IN INFORMATION AND COMMUNICATION TECHNOLOGY

END OF SEMESTER EXAMINATION

DEPARTMENT: COMPUTING AND INFORMATION TECHNOLOGY

COURSE CODE: DICT0114

COURSE TITLE: FOUNDATION MATHEMATICS

EXAM DATE: WEDNESDAY 4TH DECEMBER, 2019

TIME: 1400HRS-1600HRS

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.
- None programmable calculator permitted
- Calculators on phones, tablets and computers are NOT permitted in Theory Papers

SECTION A
(Answer ALL questions in this section)

Question 1:

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

i) 101.11011_2 to decimal equivalent

ii) 9.5625_{10} to binary number

iii) $AD3B_{16}$ to octal equivalent

b) Find an expression for the n^{th} term of **3, 7, 11, 15, 19, ...** sequence. **[3 Marks]**

c) Calculate the power set of $A = \{x, y, z\}$. **[3 Marks]**

d) A pair of dice is tossed. Find the number of elements in each of the following event:

i) Two numbers are equal **[2 Marks]**

ii) Sum is 10 or more **[2 Marks]**

e) Given Matrix A below.

$$A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$$

Find the inverse of A.

[4 Marks]

f) Let p be "It is raining" and let q be "The streets are wet". Give a simple verbal sentence which describes each of the following statements:

i) $p \wedge q$ **[1 Mark]**

ii) $p \rightarrow q$ **[2 Marks]**

g) Find x, y, z and t ;

$$\text{where } 3 \begin{bmatrix} x & y \\ z & t \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2t \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+t & 3 \end{bmatrix}.$$

[5 Marks]

h) Evaluate ${}^{30}P_2$ **[2 Marks]**

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

Question 2:

A survey on a sample of 25 new cars being sold at a local auto dealer was conducted to see which of three popular options, air-conditioning (A), radio (R), and power windows (W), were already installed. The survey found:

15 had air-conditioning (A), 12 had radio (R), 11 had power windows (W), 5 had A and W , 9 had A and R , 4 had R and W , 3 had all three options.

a) Fill in the correct number of cars in each of the regions on the Venn diagram.

[5 Marks]

b) Find the number of cars that had:

i) Only one of the options

[2 Marks]

ii) At least one option

[2 Marks]

iii) None of the options

[1 Mark]

Question 3:

a) Construct the truth tables for $(p \wedge \neg q) \rightarrow r$

[5 Marks]

b) Show that the proposition $(p \wedge q) \rightarrow p$ is a tautology.

[5 Marks]

Question 4:

a) Given the matrices A and B below:

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 0 & 2 \end{pmatrix} \quad \text{and} \quad B = \begin{pmatrix} 2 & 1 & 2 \\ 1 & 0 & 3 \end{pmatrix}$$

Find:

i) $A+B$

[2 Marks]

ii) BA

[3 Marks]

b) Calculate the determinant of matrix C below.

[5 Marks]

$$\begin{bmatrix} 1 & 3 & 2 \\ -3 & -1 & -3 \\ 2 & 3 & 1 \end{bmatrix}$$

Question 5:

a) Let $U = \{1, 2, \dots, 9\}$ be the universal set, and let
 $A = \{1, 2, 3, 4, 5\}$, $C = \{5, 6, 7, 8, 9\}$, $E = \{2, 4, 6, 8\}$,
 $B = \{4, 5, 6, 7\}$, $D = \{1, 3, 5, 7, 9\}$, $F = \{1, 5, 9\}$.

Find: i) $A \cup C$

[2 Marks]

ii) $(A \cap D) / B$

[2 Marks]

iii) $(A/E)^c$

[3 Marks]

iv) $(B \cap F) \cup (C \cap E)$

[3 Marks]

Question 6:

a) Evaluate the following:

[4 Marks]

i) $10!$

ii) ${}^{30}C_2$

b) Convert the following:

[6 Marks]

i) $94B_{16}$ to decimal equivalent

ii) 145_{10} to binary number

iii) 111010101011101111_2 to hexadecimal number

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