# Faculty of Information and Communication Technology
# ICT First Years and Foundation Unit

Tshwane University of Technology
*We empower people*

**I declare that I am familiar with, and will abide to the Examination rules of Tshwane University of Technology**

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**Signature**

| Question | Mark |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| TOTAL | |
| Percentage | |

**FORMATIVE ASSESSMENT 3**

**Computational Mathematics and Discrete Mathematics (Extended) (Year 1)**

**COHF05D & DSMF06D**

| | | |
|---|---|---|
| 13 October 2022<br><br>Duration: 120 min<br>Total: 81<br>Full Marks: 80<br>Number of Pages: 13 | Examiner: MS Sediela<br>Moderator: C Coetzee | |
| | Number on Class List | |
| | GROUP | |

Student Number

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| Surname | Initials |
|---|---|
| | |

**Instructions:**

All questions must be answers on the question paper.
Only blue and black pens are allowed. Answers in pencil will not be marked.
Scientific, non-programmable calculators are allowed.
Cellular Phones are not allowed.
No sharing of calculators and/or stationary.
Round decimal answers to 2 decimal places**.**
Simplify fraction answers.
Show all calculations when requested.
Exponents in answers must be positive.

## Question 1 [35]

1.1 Given the following sets in descriptive, write the equivalent Set Builder notation and the Roster Method: (2)

| Descriptive Method | Set Builder Notation | Enumeration Method (Roster Method) |
|---|---|---|
| A set of whole numbers less than 5. | | |
| A set of positive even numbers less than 10. | | |

1.2 Given the following set: (4)

$$\boldsymbol{A = \{a, e, i, o\ u\}}$$

State whether the following statements are true or false:

| Statements | True | False |
|---|---|---|
| $\boldsymbol{\{u, o, i, e, a\} \subseteq A}$ | | |
| $\boldsymbol{\{u, o, i, e, a\} \subset A}$ | | |
| $\boldsymbol{\{\} \supset A}$ | | |
| $\boldsymbol{\{\} \subseteq A}$ | | |

Rough Work:

1.3 Given set C = { Lion, Tiger, Leopard }. Answer the following question about the subsets of set C. (4)

| | Question | Answer | |
|---|---|---|---|
| 1.3.1 | How many subsets of set C have zero elements (Empty subsets of set C)? | | (1) |
| 1.3.2 | How many subsets of set C have one element (singleton subsets of set C)? | | (1) |
| 1.3.3 | How many subsets of set C have two elements? | | (1) |
| 1.3.4 | How many subsets of set C have three elements? | | (1) |

1.4 Simphiwe own a spaza shop and sells Sphatlho to students. (6)

There are two sauces available for the Sphatlho: Tomato Sauce and Mustard Sauce.

$$\boldsymbol{Let\ S = \{Tomato\ , Mustard\}}$$

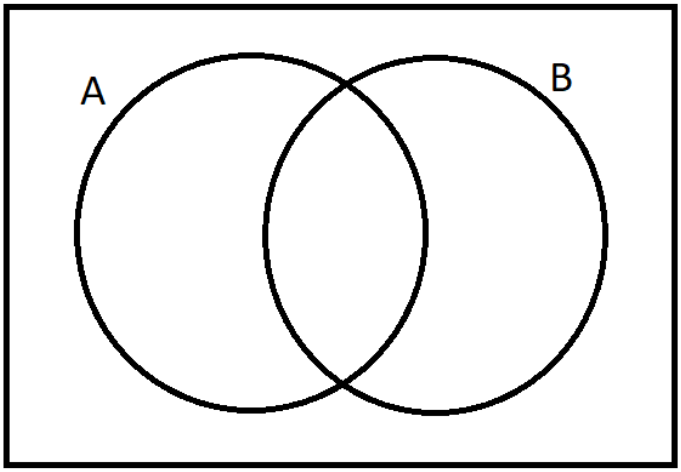
**Answer the following questions:**

| Question | | Answer | |
|---|---|---|---|
| 1.4.1 | n(S) = | | (1) |
| 1.4.2 | n(P(S))= | | (1) |

1.4.3 Use a binary table to determine all possible subsets of set S. (4)

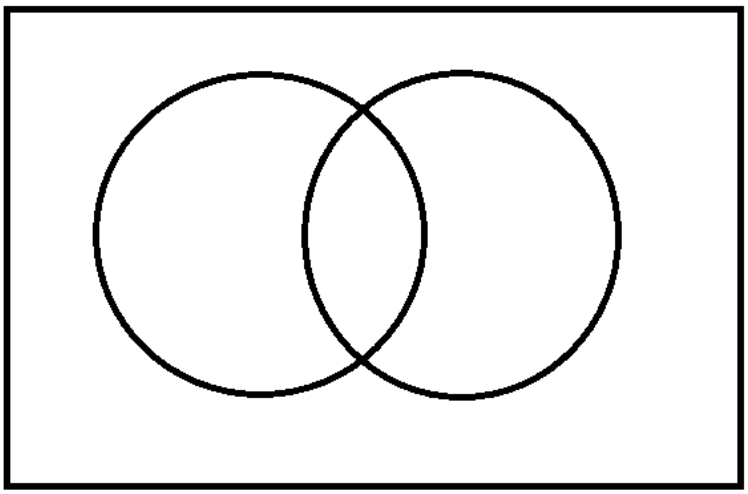
| Decimal Numbers | Binary Numbers | | Subsets |
|---|---|---|---|
| | Tomato | Mustard | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| | | |
|---|---|---|
| 1.5 | Consider the following sets:<br>$$\boldsymbol{A = \{2, 4, 6, 8, 10, 12\}}, \qquad \boldsymbol{B = \{3, 6, 9, 12, 15\}},$$<br>$$\boldsymbol{\mathcal{U} = \{2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 17\}}$$<br>Answer the following question: | (8) |

| | | |
|---|---|---|
| 1.5.1 | Populate the following Venn Diagram based on the given sets.<br>  <br> | (4) |
| 1.5.2 | $\boldsymbol{B - A =}$ | (1) |
| 1.5.3 | $\boldsymbol{A - B =}$ | (1) |
| 1.5.4 | $\mathbf{A} \cap \mathbf{B} =$ | (1) |
| 1.5.5 | $\overline{\mathbf{A} \cup \mathbf{B}} =$ | (1) |

| | | |
|---|---|---|
| 1.6 | The ICT 1st Years and Foundation Unit hosted competitions in the subjects that they offer. 150 students participated in the competitions.<br>• 70 students participated in COHF05D competition,<br>• 75 students participated in PPAF05D competition,<br>• 10 students neither participated in COHF05D or PPAF05D competition.<br><br>Let **C** be the set of students who participated in **COHF05D** competition.<br>Let **P** be the set of students who participated in **PPAF05D** competition.<br><br>**Answer the following questions (Show all steps):** | (9) |

| | | |
|---|---|---|
| 1.6.1 | How many students participated for **BOTH COHF05D and PPAF05D**?<br><br>**Solution:** | (3) |
| 1.6.2 | How many students participated for **COHF05D only**?<br><br>**Solution:** | (2) |

| | | | | |
|---|---|---|---|---|
| | 1.6.3 | Fill in the number of students in the Venn diagram below:<br>  | (4) | |
| 1.7 | Let C and D be 2 finite sets:<br>$If\ \boldsymbol{n(A) = 10\ and\ n(B) = 18\ and\ n(A \cup B) = 26}$, $\boldsymbol{determine\ n(A \cap B)}$.<br><br>**Solution:** | | | (2) |

## Question 2: Show your calculations. [26]

**2.1** Complete the following table: (4)

| **Indicate whether the following are statements or non-statements (Use 'X'):** | Statement | Non-statement |
|---|---|---|
| $\mathbf{7 + 2 = 4}$ | | |
| $\boldsymbol{Did\ you\ study\ for\ the\ test}$? | | |
| $\boldsymbol{You\ have\ to\ attend\ all\ class}$! | | |
| $\boldsymbol{The\ school\ bus\ alway\ arrive\ on\ time}$. | | |

**2.2** Given the following argument: (5)

$\boldsymbol{Since\ we\ have\ corvered\ all\ the\ learning\ units\ and\ there\ is\ loadshedding\ everyday, we\ are\ now\ having\ online\ classes}$.

Identify the premise and the conclusion:

**Premise:**

**Conclusion:**

**Translate the argument into standard form:**

| | | | |
|---|---|---|---|
| 2.3 | *Let the propositions $N$ and $J$ be defined as*:<br><br>$\boldsymbol{N}$: ***Nozipho attend the online class.***<br>$\boldsymbol{J}$: ***John watch the recording of the class.*** | | (10) |
| | 2.3.1 | Translate the symbolic form $\sim\sim\boldsymbol{N}$ in words:<br><br>**Solution:** | (2) |
| | 2.3.2 | Translate the symbolic form $\boldsymbol{N} \vee \sim\boldsymbol{J}$ in words:<br><br>**Solution:** | (2) |
| | 2.3.3 | Translate the following sentence in a well-formed symbolic form:<br><br>***Nozipho did not attend the online class if and only if John did not watch the recording of the class.***<br><br>**Solution:** | (2) |
| | 2.3.4 | Translate the following sentence in a well-formed symbolic form:<br><br>***Nozipho attend the online class and John watch the recording of the class.***<br><br>**Solution:** | (2) |

| | | | | |
|---|---|---|---|---|
| | 2.3.5 | What is the inverse of the following conditional statement in words:<br><br>$$\boldsymbol{if\ Nozipho\ attend\ the\ online\ class, then\ John\ watch\ the\ recording\ of\ the\ class.}$$<br><br>**Solution:** | (2) | |
| 2.4 | Identify the main operator in the following:<br><br>$\sim \boldsymbol{A} \leftrightarrow \boldsymbol{B} \vee \boldsymbol{C}$ — Main Operator: _____<br><br>$\boldsymbol{A} \wedge \boldsymbol{B} \vee \sim \boldsymbol{C}$ — Main Operator: _____ | | | (2) |
| 2.5 | Complete the truth table below to determine if the following statement is a tautology, a contradiction or contingency.<br>$\boldsymbol{L} \wedge \sim \boldsymbol{T} \longrightarrow \boldsymbol{T} \vee \sim \boldsymbol{L}$ | | | (5) |

| $\boldsymbol{L}$ | $\boldsymbol{T}$ | $\sim \boldsymbol{L}$ | $\sim \boldsymbol{T}$ | $\boldsymbol{L} \wedge \sim \boldsymbol{T}$ | $\boldsymbol{T} \vee \sim \boldsymbol{L}$ | $\boldsymbol{L} \wedge \sim \boldsymbol{T} \longrightarrow \boldsymbol{T} \vee \sim \boldsymbol{L}$ |
|---|---|---|---|---|---|---|
| T | T | | | | | |
| T | F | | | | | |
| F | T | | | | | |
| F | F | | | | | |
| **Marks:** | | **(1)** | **(1)** | **(1)** | **(1)** | **(1)** |

The statement is a _____

## Question 3: Show your calculations. [20]

| | | | |
|---|---|---|---|
| 3.1 | Given the number **$45_{10}$** : | | (6) |
| | 3.1.1 | Convert to Binary: | (2) |
| | 3.1.2 | Convert to Octal: | (2) |
| | 3.1.3 | Convert to Hexadecimal: | (2) |

| | | |
|---|---|---|
| 3.2 | Subtract the following unsigned binary numbers:<br>**$11011_2$ and $111_2$**<br>**Solution:** | (2) |
| 3.3 | Find **$+68_{10}$** and **$-68_{10}$** in sign and size code representation using 8 bits.<br>**Solution:** | (3) |

| | | |
|---|---|---|
| 3.4 | Find the product of **$11101_2$** and **$101_2$**<br><br>**Solution:** | (3) |
| 3.5 | Calculate the following by making use of the 2's complement:<br><br>$$\mathbf{01100110}_{\mathbf{2}} - \mathbf{01000100}_{\mathbf{2}}$$<br><br>**Solution:** | (6) |

**Space for rough work**