

Candidate Name

Candidate Number

Centre Name

Centre Number

Paper 1: Theory

For Examination December 2023

(1 hour 45 minutes)

You must answer on this question paper.

It is necessary to respond on the answer sheets provided alongside this question paper. Additionally, you must have a soft pencil (preferably of type B or HB), a clean eraser and a dark blue or black pen.

INSTRUCTIONS:

- You must write your name, candidate number, centre name and centre number on the answer sheets in the designated spaces.
- Attempt all the questions from using a dark blue or black pen.
- It is important to follow the instructions provided on the answer sheets.
- Do not use correction fluid.
- Avoid writing on any bar codes.
- Maximum Mark: 75

Q1. Hexadecimal is utilized for MAC addresses, and a segment of a MAC address is provided as **97 – 5C – E1**. Each pair of digits is stored as binary in an 8-bit register.

- a. What does the binary register contain for each pair of the given digits? [6]

97							
5C							
E1							

- b. Provide the outcome of shifting the binary integer 0100 one position to the left using a logical operation. [1]

- c. Indicate the bit count allocated for each character in standard ASCII encoding. [1]

- d. Explain the concept of a MAC address. [4]

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- e. Joe must also save ten 8-bit color images for his project. Each image has dimensions of 500 pixels in width and 300 pixels in height. Calculate the combined file size in megabytes (MB) for all of Joe's images, and provide a step-by-step calculation. [3]

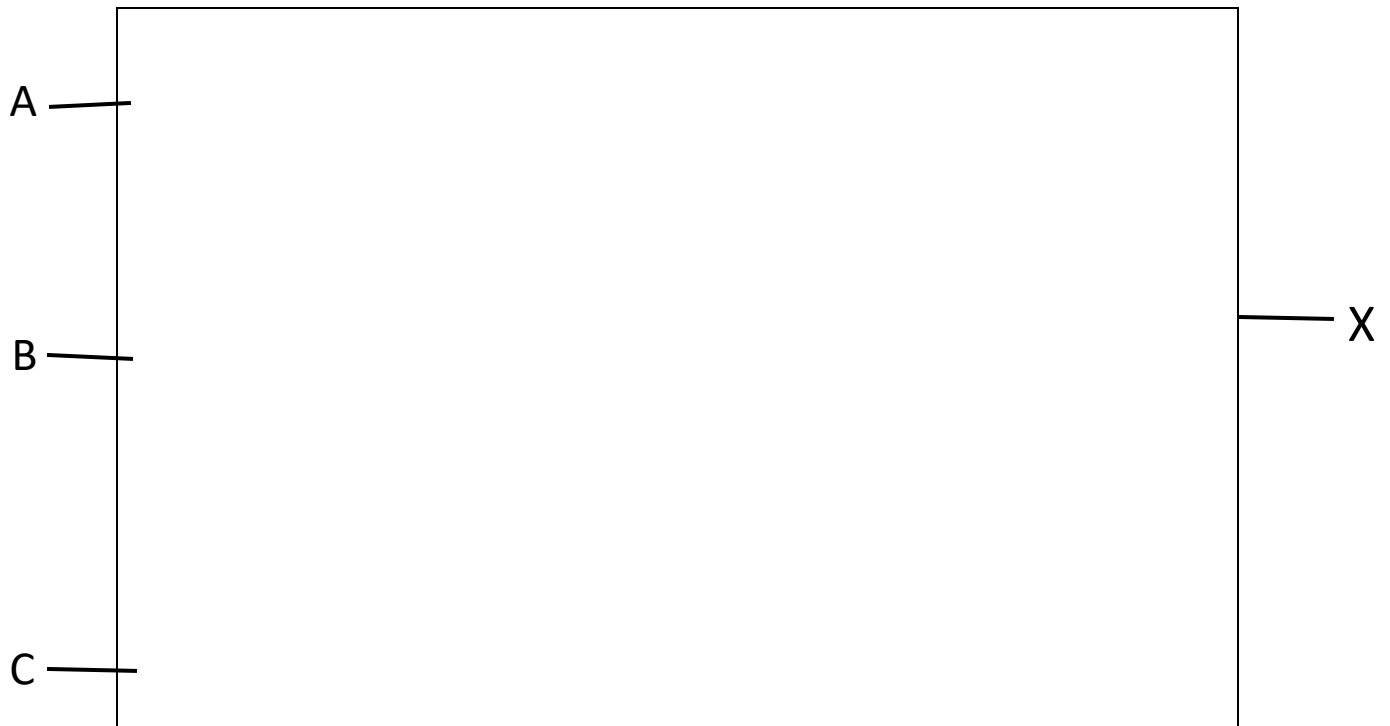
File size: ----- MB

Q1 TOTAL MARK: 15

Q2. Examine the following logic statement:

X equals 1 if ((A is 1 NOR C is 1) AND (B is NOT 1 NOR C is 1)) OR (A is 1 AND B is 1).

- (a) Create a logic circuit diagram that corresponds to the provided logic statement. Utilize logic gates with a maximum of two inputs for each gate. Do not attempt to simplify the logic statement. [6]



(b) Fill out the truth table for the provided logic statement.

[4]

A	B	C	WORKING SPACE	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Q2 TOTAL MARKS: 10

Q3. Imagine a large-scale manufacturing facility that produces electronic devices such as smartphones and laptops. The company is considering implementing an automated assembly line for their production process.

- a. Describe the four advantages and three disadvantages of introducing an automated system for this manufacturing scenario.

i. Advantages of Introducing an Automated System: [8]

	Advantages	Description
1		
2		
3		
4		

ii. Disadvantages of Introducing an Automated System:

[6]

	Disadvantages	Description
1		
2		
3		

Q3 TOTAL MARKS: 14

Q4. Imagine a modern manufacturing facility that produces high-tech consumer electronics such as smartphones and tablets. The factory has recently introduced a fleet of robotic arms to automate the assembly and quality control processes. These robotic arms are equipped with advanced sensors, precision actuators, and a robust feedback system.

- a. Describe the characteristics of a robot considering the specific attributes and features of these robotic arms and how they contribute to the efficiency and precision of the production line.

[8]

1. -----

2.

3.

4.

- b. High-level programming languages necessitate either an interpreter or a compiler for program translation. Use ticks (✓) to indicate which statements pertain to interpreters and which pertain to compilers in the table below, which contains various statements regarding language translators. [5]

Statement	Interpreter (✓)	Compiler (✓)
Translates the source code into machine code in a single step.		
Generates a machine code executable file.		
Executes a high-level language program sequentially, processing one instruction at a time.		
Once the translation is complete, the presence of the translator is not required for the program to execute.		
A file that can be executed is generated.		

Q4 TOTAL MARK: 13

Q5: a. The Central Processing Unit (CPU) is tasked with handling instructions. Alongside the decode stage, there are two other stages involved in processing instructions.

- (i) Please specify the two other stages of processing instructions: [2]

Stage 1 -----

Stage 2 -----

- (ii) Identify the CPU component responsible for instruction decoding. [1]

b. In a computer system following the Von Neumann model, there is a Central Processing Unit (CPU) that utilizes registers. Identify three registers that could be utilized: [3]

Register 1 -----

Register 2 -----

Register 3 -----

c. List four tasks performed by an operating system. [4]

1 -----

2 -----

3 -----

4 -----

d. Four validation checks and four corresponding descriptions are displayed. Connect each validation check to the appropriate description using lines. [3]

Range check

Checks that some data is entered

Presence check

Checks for a maximum number of characters

Length check

Checks that the characters entered are all numbers.

Type check

Checks that the value entered is between an upper value and a lower value.

Q5 TOTAL MARK: 13

Q6. Most programming languages incorporate fundamental data types. Ahmad is elucidating the basic data types he has employed. Indicate the data type that Ahmad is delineating in each sentence.

- a. Choose the data type from the following list of programming terms: [6]

Array	Boolean	Char	Constant
Function	Integer	Iteration	Procedure
Real	String	Alphanumeric	Variable

- i. A number with a fractional part that can be positive or negative and used in calculations

Data type: -----

- ii. A whole number that can be positive, negative, or zero and used in calculations

Data type: -----

- iii. A single number, symbol, or letter

Data type: -----

- iv. A sequence of characters

Data type: -----

- v. A data type with two values, True or False

Data type: -----

- vi. Typically used to represent text or a combination of letters and numbers in programming.

Data type: -----

- b. A pseudocode algorithm has been devised to collect the names and scores of 35 students. The algorithm records these names and scores in two arrays, Name[] and Mark[]. It then identifies the highest score achieved and calculates the count of students who received that score. Subsequently, both of these values are presented as output.

```

01 HighestMark ← 100
02 HighestMarkStudents ← 0
03 FOR Count ← 1 TO 35
04 OUTPUT "Please enter student name"
05 INPUT Name[Count]
06 OUTPUT "Please enter student mark"

```

```

07 INPUT Mark[Counter]
08 IF Mark[Count] = HighestMark
09 THEN
10 HighestMarkStudents ← HighestMarkStudents – 1
11 ENDIF
12 IF Mark[Count] > HighestMark
13 THEN
14 Mark[Count] ← HighestMark
15 HighestMarkStudents ← 1
16 ENDIF
17 NEXT Count
18 OUTPUT "There are ", HighestMarkStudents, " with the highest mark of ",
HighestMark

```

Identify the line numbers where the **four errors** are located in the pseudocode and propose a correction for each error: [4]

Error 1-line number -----

Correction -----

Error 2-line number -----

Correction -----

Error 3-line number -----

Correction -----

Error 4-line number -----

Correction -----

Q6 TOTAL MARK: 10