

Candidate Name

Candidate Number

Centre Name

Centre Number

Paper 2: Fundamental Problem-solving & Programming Skills
(2 hours)

For Examination December 2023

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 the subjective section 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 Marks: 75**

Q1. A CPU manufacturer labels its older device with 32-bit registers and its newer device with 64-bit registers.

- a. What is the bit width of the registers in the more recent CPU? [1]
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- b. Provide **two reasons** for the expansion of register size, with specific reference to the fetch-execute cycle in your response. [4]
- i.
- ii.
- c. Explain the sequence of **the four stages** within the instruction cycle (fetch, decode, execute). [4]
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[Total: 9]

Q2. A company maintains information about its product inventory in a database table with the following structure.

PRODUCT	
Field	Data type
ProductID (primary key)	String
Description	String
Price	Decimal

- a. Compose an SQL query that retrieves the product description and price for products priced above 5000 dollars. [3]
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- b. Additionally, the database includes a CUSTOMER table and an ORDER table with the subsequent definitions.

CUSTOMER		ORDER	
Field	Data type	Field	Data type
CustomerID (primary key)	String	OrderID (primary key)	String
Name	String	CustomerID	String
Address	String	ProductID	String
Email	String	OrderDate	Date/Time

Elaborate on the concept of a **foreign key**, with reference to the three tables: PRODUCT, CUSTOMER, and ORDER, and clarify its significance. [2]

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- c. Create an SQL statement that can be employed to raise the prices of all items in the PRODUCT table by 5% in cases where the company decides to modify the product prices. [2]

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- d. Provide a fitting definition for a **new table** that enables the company to maintain a historical record of **product prices**, incorporating a **composite primary key**. [2]

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[Total: 9]

Q3. A computer programmer requires a data structure to store the subsequent data:

X		O
	O	

- a. Identify the data structure and explain the method to store this data. [2]

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- b. Compose pseudocode for verifying the grid and displaying a message in the event of a full row, column, or diagonal containing 'X'. [5]

[illegible]

[Total: 7]

- Q4. (a). Provide the name of a declarative programming language as an example. [1]

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- (b). Mention the name of an imperative programming language as an example. [1]

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- c. Give a concise explanation of the distinction between declarative and imperative languages, accompanied by an illustrative statement for each language category. [4]

[illegible]

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d. Java is a language that undergoes both partial compilation and partial interpretation.

i. Concisely describe the significance of this concept. [2]

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ii. Explain the reasons behind Java's combination of partial compilation and interpretation. [1]

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[Total: 9]

Q5. (a). The following are two rationales for utilizing CSS in a website. For each rationale, provide a brief interpretation of its significance. [2]

"Forgoing code duplication through CSS."

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"Using CSS makes it easier to maintain the content of a website."

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b. Describe how CSS facilitates the modification of an entire website with just one code adjustment. Provide an example to illustrate this concept. [4]

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[illegible][illegible][illegible]

[Total: 9]

Q7. The pseudocode provided below computes the average of a set of numbers.

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OUTPUT "Enter a list of numbers. Use -99 to end"
Count ← 0
Total ← 0
REPEAT
    INPUT Number
    IF Number <> -99
        THEN
            Count ← Count + 1
            Total ← Total + Number
        END IF
UNTIL Number = -99
OUTPUT "Mean is: "
OUTPUT Total / Count

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- a. Fill out the subsequent trace table for the sequence of numbers: 2, 6, 7, -99. [4]

Take note of the following:

- You are not required to re-enter values that remain unchanged.
- You might not need to utilize every row in the table.

Number	Count	Total	Output
	0	0	

- b. A single entry of -99 is permissible for the user.
 i. Identify the specific error that would subsequently arise. [1]

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- ii. Concisely explain the steps a programmer could take to avert this error. [2]

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[Total: 7]

Q8. (a). Provide a brief explanation of the distinction between the Internet and the World Wide Web. [2]

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(b). POP3 and SMTP are a pair of protocols employed by computer systems. Mention two characteristics of each protocol.

POP3: [2]

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SMTP: [2]

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[Total: 6]

Q9. Imagine a software development company that requires a flexible and efficient way to test their applications across various operating systems without having to purchase and maintain multiple physical computers.

- a. Provide a concise explanation of the concept of a **virtual machine** and include an **illustrative example of its usage**. [3]

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- b. Mobile devices like smartphones and tablets commonly utilize RISC processors rather than CISC processors. Provide **two rationales** for this preference. [2]

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- c. Elaborate on the significance of implementing pipelining in the architecture of a RISC processor. [2]

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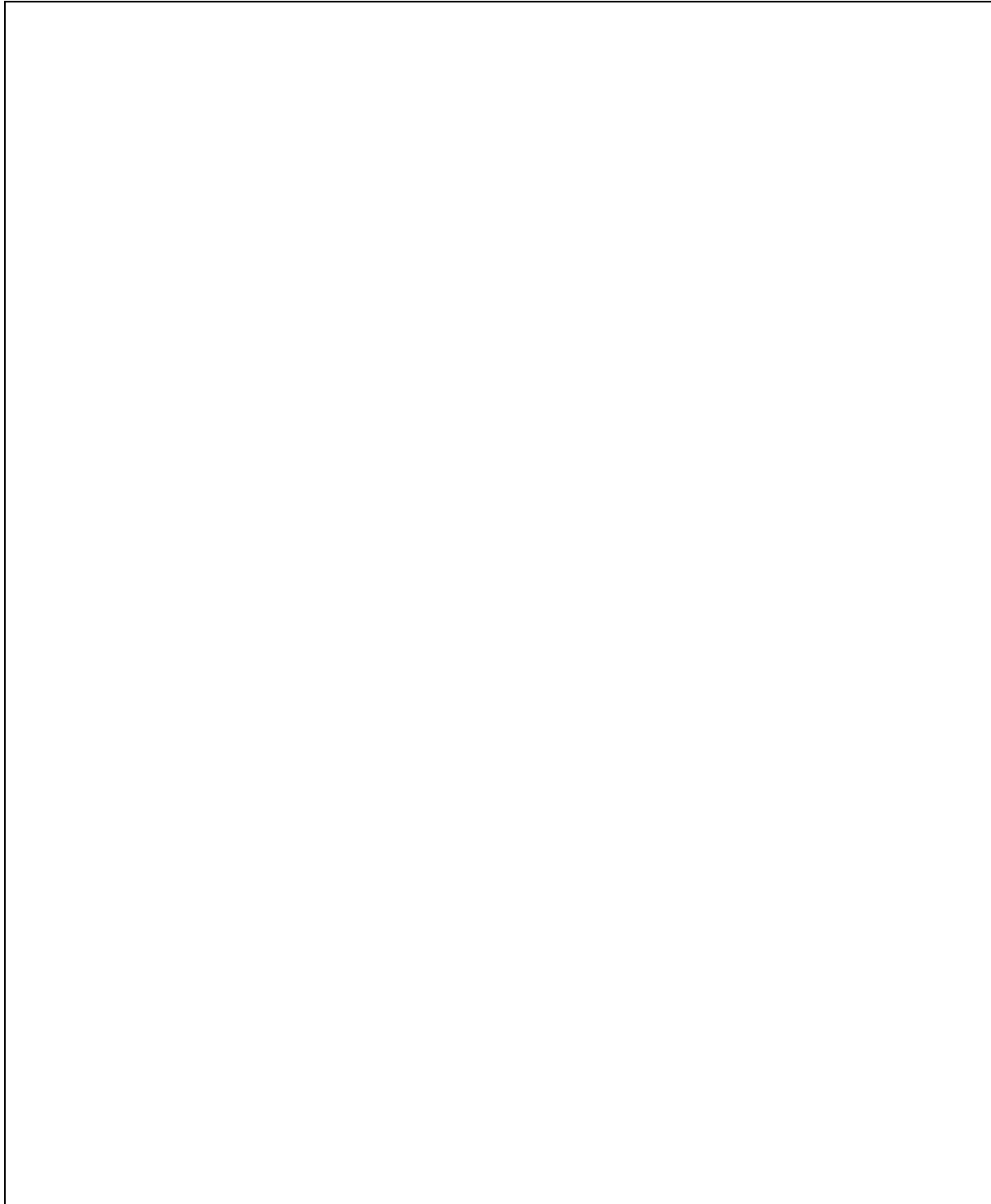
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[Total: 7]

Q10. A program is tasked to do following:

- Accept 50 integer values.
- Display the largest value among them.
- Display the average of all values, excluding the largest one.

Create a program flowchart to depict this algorithm. No need for variable declarations, and individual uniqueness checks for input values are not necessary. [6]



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