

**Diploma in Science in Laboratory Technology**  
**EED3308 Introduction to Computer Systems**

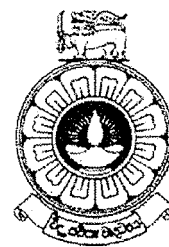
Department of Electrical and Computer Engineering  
 The Open University of Sri Lanka

Academic Year: 2024/2025

Examination: Final Examination

Duration: 3 hours.

Date: 03<sup>rd</sup> May 2025



Time: 09.30 – 12.30

Instructions:

- This question paper has four questions in four pages.
- **Answer all questions.**
- This is a closed-book type test.
- Do not use red colour pens for answering questions.
- Non-programmable calculators are allowed.

Q1.

I.

- a) Draw a diagram of an accumulator-based processor architecture and describe the functions of its main components. (07 Marks)
- b) Briefly explain the fetch-decode-execute cycle in a processor. (05 Marks)

II.

- a) What is an Instruction Set Architecture (ISA)? Explain its role in a computer processor (03 Marks)
- b) What is indirect addressing mode? Explain how it works with the help of an example. (03 Marks)

III. Consider five numbers stored in consecutive memory locations, starting from address 0x70. The numbers are A, B, C, D, and E. The following expression needs to be calculated to find the result X.

$$X = A * B + A (C - D/E)$$

- a) Write down the step-by-step process to perform this calculation in an accumulator-based processor. (07 Marks)
- b) Write the corresponding assembly instructions to execute this operation. Refer *table 1* in **Appendix A** for assembly instructions (*Accumulator Architecture Instructions*). (05 Marks)

Q2.

I. What is meant by computer architecture? Explain briefly.

(03 Marks)

II. What are the key advancements and changes in computer technology when transitioning from third-generation computers to fourth-generation computers?

(03 Marks)

III. Convert the following binary number to decimal. Show the immediate calculation steps.

- Convert  $11101.001_2$  to its decimal equivalent.
- Convert  $1011000110101101_2$  into its hexadecimal equivalent.
- Convert  $235.08_{10}$  into its binary equivalent.
- Convert  $101010011$  into its octal equivalent.

(04 Marks)

IV. Perform the following binary operations. Show the immediate calculation steps clearly.

- $110.01 \times 110$
- $10001 \div 110$
- Find the value of 'x' in the following equation using the 2's complement method. Show all the intermediate calculation steps.

$$x = 18 - 37$$

(09 Marks)

V. Convert  $-171.07_{10}$  number to IEEE 754 Single precision floating point format. Show the immediate calculation steps.

(06 Marks)

Q3.

I. Define the following terms in networking.

- IP Address
- Switch
- Protocol
- Host

(04 marks)

II. Name the main types of computer networks and briefly explain each.

(07 marks)

III. Explain how a Token Ring network operates, with the help of a diagram.

(04 marks)

- IV. Explain how communication happens in the OSI model, including how data moves between layers and how layers interact with each other. (05 marks)
- V. Define CSMA/CD and briefly explain how it works. (05 marks)

Q4.

- I. What are the important considerations when assembling a personal computer? List them in point form. (8 marks)
- II. Discuss how the operating system manages hardware and software on a new computer during the first setup. (5 marks)
- III. Describe the steps to connect two computers using a network cable and configure the necessary network settings. (7 marks)

Appendix A

Table 1: Accumulator Architecture Instructions

Mnemonic	Syntax	Operation	Description	Add Mode	Flags affected
Arithmetic instructions					
ADD	ADD AM x	Addition	Acc ← Acc + op	# & default	ZF, OF, SF, PF = 1
SUB	SUB AM x	Subtraction	Acc ← Acc - op	# & default	ZF, OF, SF, CF, PF = 1
MUL	MUL AM x	Signed multiplication	Acc (16 bit) ← Acc (8 LSBs) * op (8 LSBs)	# & default	ZF, SF, PF = 1, OF, CF = 0
DIV	DIV AM x	Unsigned division	Acc ← Acc / op2	# & default	ZF, SF, PF = 1, OF, CF = 0
LOADacc	LOADacc AM d	Copy the operand to the accumulator	Immediate: Acc ← op; Direct: Acc ← memory (op)	#, default	none
STOREacc	STOREacc AM d	Copy the accumulator to the memory address	Direct: Memory (op) ← Acc Indirect: Memory (memory (op)) ← Acc	default, &	none

Immediate operand is used as the jumping location

Contents of the implied return address is used as the jumping location

x- Memory Address or immediate value, d- Displacement

Addressing Modes: AM

Immediate

Direct

Indirect

#

default (blank)

&