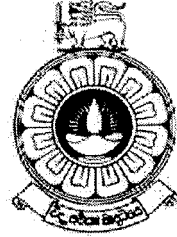


Diploma in Science in Laboratory Technology

EED3308 Introduction to Computer Systems
 Department of Electrical and Computer Engineering
 The Open University of Sri Lanka



Academic Year: 2023
 Examination: Final Examination
 Duration: 3 hours.

Date: 18th August 2024

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) Briefly explain the terms: Control Unit, Arithmetic-Logic Unit, Accumulator, Data Bus, Address Bus, Instruction Register, Program Counter, Flags.
- b) Draw the basic diagram of an **Accumulator Architecture** and explain how the above components work together in this architecture when executing the operation, "5 + 8". Assume that both values, 5 and 8, are stored in memory.

(12 Marks)

II.

- a) Briefly explain the Simple Instruction Format in computer architecture with the help of a diagram.
- b) Briefly explain the term "Addressing Mode" and state four basic addressing modes.

(6 Marks)

- III. Consider five numbers stored in memory locations: a, b, c, d, and e. You need to calculate the following expression using an accumulator architecture processor:

$$(2a + b - (c - d)) * e$$

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

Assume that the entire result of the multiplication operations can be stored in the registers/ memory locations.

(12 Marks)

Q2.

- I. Compare the features of Von Neumann Model and Harvard Model using a table. (3 Marks)
- II. Briefly explain the characteristics and advancements of fourth-generation computers in computer history (2 Marks)
- III. Convert the following binary number to decimal. Show the immediate calculation steps.
 - a) Convert 10101.101_2 to its decimal equivalent.
 - b) Convert 101111001011101_2 to its hexadecimal equivalent.
 - c) Convert 381.37_{10} to its binary equivalent.(5 Marks)
- IV. Perform the following binary operations. Show the immediate calculation steps.
 - a) 101.01×101
 - b) $10011 \div 101$(6 Marks)
- V. Find the 'x' of the following equation by using the 2's complement method. Show the immediate calculation steps.
$$x = 37 - 72$$
(3 Marks)
- VI. Convert -251.29_{10} number to IEEE 754 Single precision floating point format. Show the immediate calculation steps. (6 Marks)

Q3.

- I. Define the following terms in networking.
 - a) Domain Name Server (DNS)
 - b) Router
 - c) Protocol
 - d) Server
 - e) IP Address(5 marks)
- II. Explain the reason for using shielded twisted pair cables in networking instead of unshielded, untwisted pair cables. (2 marks)
- III. Name and briefly describe four fundamental network topologies. (4 marks)

IV.

- a) Briefly explain what OSI reference model is and describe how each layer functions in a computer network with the help of a diagram. (5 marks)
- b) With the help of a diagram, compare and contrast the TCP/IP model with the OSI reference model in **point form**, highlighting the key similarities and differences in their structure and functionality. (3 marks)

V.

- a) How do you know whether two IP addresses are on the same subnet? Explain using an example. (2 marks)
- b) Compare IP address Class A and Class C using a table, considering the following features: Decimal Range, Number of Networks and Hosts available, and Subnet Mask (4 marks)

Q4.

- I. Briefly describe the main steps you followed to assemble a personal computer from its components, in **point form**. (8 marks)
- II. Discuss the role of an operating system in managing hardware and software resources on a newly assembled computer. (5 marks)
- III. Describe how you set up a simple network between two computers using a network cable, in point form. Include the basic steps for configuring network settings. (7 marks)

Appendix A

Table 1: Accumulator Architecture Instructions

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

&