MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

FIRST YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING

SCS100: COMPUTER ARCHITECTURE

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question one and any other two questions.

2. Mobile phones are not allowed in the examination room.

3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a. List and explain any three functions of a control unit. (3 marks)

b. Convert $AB17_{16}$ to base 8. Show your workings. (3 marks)

c. Registers are temporary memory locations that enhance the performance of CPU. Identify any three and explain their roles. (6 marks)

d. Using an example in each case, state any two types of Boolean laws. (4 marks)

e. Design a combination logic circuit that performs arithmetic operation for adding three bits. (7 marks)

f. Explain the role of an Instruction Set Architecture (ISA) in the working of a computer. (2 marks)

g. Use k-map to simplify the following equation $Y= A'B'+A'B+AB$ (2 marks)

h. If $F=A'B'C+A'BC'+AB'C+AB'C$, represent the equation using a truth table. (3 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a. Explain one advantage and one disadvantage of RISC and CISC processor types. (4 marks)

b. The Arithmetic and Logic Unit (ALU) of a computer performs two main functions. Use an example in each case to explain the functions. (4 marks)

c. Use the truth table below to design a minimized full adder circuit. (7 marks)

Inputs			Outputs	
A	B	C_{IN}	Sum	Carry
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

d. Convert the following

  i. 682_8 in to binary (2 marks)

  ii. $AF3D_{16}$ in to decimal (2 marks)

e. What is virtualization? (1 mark)

QUESTION THREE (20 MARKS)

a. Covert 185.6_{10} into IEEE 754 floating point notation. (show your working).   (8marks)

b. When we refer to RAM as volatile memory what does it mean.   (2 marks)

c. To improve performance of a computer, Solid State Disks (SSD) have been used. What reason do you think have led to this drastic change?   (3 marks)

d. It is believed that CPUs with inbuilt cache memory perform better than those without. Explain.   (2 marks)

e. Convert $(x'+y')(x+y)$ to short hand notation.   (3 marks)

f. Distinguish between a thin and fat client as used in desktop virtualization.   (2 marks)

QUESTION FOUR (20 MARKS)

a. Briefly describe how cache memory works with the CPU.   (2 marks)

b. Convert 456_{10} and 598_{10} in to binary and the 2's complement of the sum.   (5 marks)

c. Given a Boolean expression X=AB+ABC+AB'C'+AC'.

   i.   Draw the logic diagram of the canonical function.   (3 marks)

   ii.   Minimize the expression.   (4 marks)

   iii.   Draw the logic diagram of the minimized expression.   (2 marks)

   d. Using a diagram, explain how a multiplexer operates.   (4 marks)