FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

TRADE DIPLOMA IN ELECTRICAL ENGINEERING

FINAL EXAMINATION -TRIMESTER 1 – 2018

QUESTION PAPER
EEE 555

COMPUTER TECHNOLOGY

Maximum Marks 100

Instructions

1. There are Two (2) sections (A & B). **All sections are compulsory.**
2. Write your **answers legibly** in the **answer booklet** provided.
3. A **time of three (3) hours** is allowed to complete this paper. **Extra 10 minutes** allowed to read the paper.
4. You may **use blue or black ball pen** to write your answers.
5. **Insert all written foolscaps, graph paper, drawing paper, etc.** in their correct sequence and secure with string provided.
6. Write your **student identification** number on each page used.
7. **Begin each answer on a fresh new page** and **use both sides** of the sheets.
8. **No written or handwritten** examination support materials are permitted.
9. **No GSM mobiles or smartphones allowed** during the examination

Section A Multiple-Choice [15 Marks]

Q.1 Which **electronic components** are used in **First Generation Computers**?

A. Transistors
B. Vacuum Tubes
C. Integrated Circuits
D. VLSI

Q.2 For comparing performance of new system, users will simply compare execution time of its

A. Response Time
B. Execution time
C. Workloads
D. Multitasking

Q.3 An important measure of computer performance is clock cycles per instruction (CPI). Which one of the following three claims is most correct?

A. The CPI measure depends on the computer architecture.
B. The CPI measure depends on the application running on the computer.
C. The CPI measure depends on both the application and the computer architecture.
D. None of the above.

Q.4 The m-bit parallel adder consist of –

A. (m +1) full adder
B. m/2 full adder
C. (m-1) full adder
D. m full adder

Q.5 The weight of the LSB as a binary number is

A. 2
B. 1
C. 3
D. 4

Q.6 What is the resultant binary of the decimal problem 49+1 =?

A. 00110101
B. 01010101
C. 00110010
D. 00110001

Q.7 Convert the binary number 1001.0010 to decimal.

A. 90.125
B. 125
C. 12.5
D. 9.125

Q.8 Subtraction of two signed numbers is performed with

A. 1's complement
B. 2's complement
C. 9's complement
D. 10's complement

Q.9 How to represent -9 (negative nine) with signed 2's complement

A. 10001001
B. 11110110
C. 11110111
D. 11110011

Q.10 The word "FITNESS" requires this many bytes:

A. Two
B. Seven
C. Eight
D. Ten

Q.11 A microprocessor with 12 address lines is capable of addressing:

A. 1024 locations
B. 2048 locations
C. 4096 locations
D. 64K locations

Q.12 Two operands can be checked for equality using:

A. OR operation
B. AND operation
C. XOR operation
D. NOT operation

Q.13 Stack pointer is a reg. Which comes into use:

A. Whenever a data is read from the memory
B. Whenever a data is written in the memory
C. Whenever the Output variable is sent out of the CPU
D. Whenever an interrupt or high priority call comes from external devices.

Q.14 The result of MOV AL, 65 is to store

A. Store 01000010 in AL
B. Store 42H in AL
C. Store 40H in AL
D. Store 01000001 in AL

Q.15 Assembly language programs are written using

A. Hex code
B. Mnenonics
C. ASCII code
D. Binary coded Decimal

Section B Short Answer Questions [75 Marks]

Question 1. [20 marks]

a) Compute the decimal value of the binary number 1011 1101 0101 0110 if the given number represents:

I. Unsigned integer (2 marks)
II. 2's complement integer (2 marks)
III. Sign-magnitude integer (2 marks)

b) Write the 2's complement for each of the following 5-bit binary numbers:

I. 01001_2 (1 mark)
II. 01011_2 (1 mark)
III. 00111_2 (1 mark)
IV. 00001_2 (1 mark)

c) Represent the decimal value -16 as signed, 10-bit number using each of the following binary formats:

I. Sign-and-magnitude (2 marks)
II. 2's complement (2 marks)

d) Convert the decimal floating point number 0.92 to its IEEE single precision floating-point counterpart. (4 marks)

e) In 2's complement, what do all the positive numbers have in common? (1 mark)

f) Calculate the decimal range of decimal values for 8-bit two's complement binary values. (1 mark)

Question 2. [20 marks]

a) Calculate the overall CPI and MIPS rating for a machine for which the following performance measures were recorded when executing a set of benchmark programs. Assume that the clock rate of the CPU is 400 MHz.

Instruction category	Percentage of occurrence	No. of cycles per instruction
ALU	35	1
Load & store	15	3
Branch	45	4
Others	5	5

(4 marks)

b) Explain the following addressing modes of a CPU with an example:
   I. Immediate Mode (2 marks)
   II. Direct Mode (2 marks)
   III. Indirect Mode (2 marks)

c) Explain and illustrate the stack push operation. (4 marks)

d) Explain and illustrate the sack pop operation. (4 marks)

e) Calculate the number of bits needed to distinctly address 16K works of memory? (2 marks)

Question 3.[19 marks]

a) What is the difference between an 8bit, 16-Bit and a 32-Bit microprocessor? (3 mark)

b) What are the functions of the following registers in any microprocessor?

   I. Program counter (2 mark)
   II. Instruction Register (2 mark)

c) State simple execution cycle for any given instruction. (6 mark)

d) Draw a clearly labeled Central processor unit with main components and interconnection to memory and I/O. (6 mark)

Question 4.[24 marks]

a) The block diagram showing a simple machine (microprocessor) is given in Figure 3.1. This machine is an accumulator-based processor, which has five 16-bit registers: Program Counter (PC), Instruction Register (IR), Address Register (AR), Accumulator (AC), and Data Register (DR). The memory unit is made up of 4096 words of storage. The word size is 16 bits.

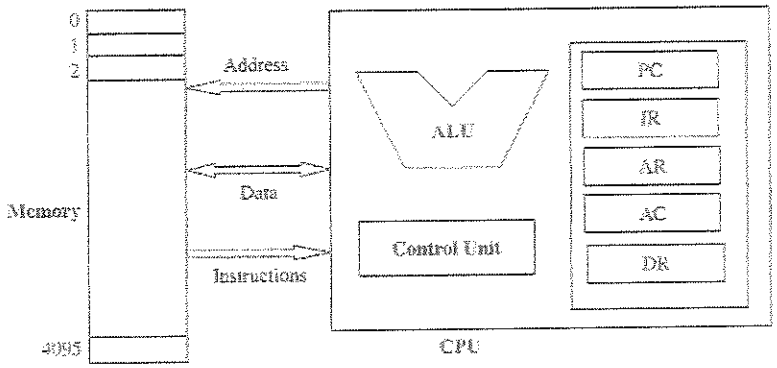

Figure 3.1 A simple machine

The instruction set of the simple machine is given in the following table

TABLE 3.4 Assembly Language for the Simple Processor

Mnemonic	Operand	Meaning of instruction
STOP		Stop execution
LD	x	Load operand from memory (location x) into AC
ST	x	Store contents of AC in memory (location x)
MOVAC		Copy the contents AC to DR
MOV		Copy the contents of DR to AC
ADD		Add DR to AC
SUB		Subtract DR from AC
AND		And bitwise DR to AC
NOT		Complement contents of AC
BRA	adr	Jump to instruction with address adr
BZ	adr	Jump to instruction adr if AC ¼ 0

I. Write a machine language program that adds the contents of memory location

12 (00C hex), initialized to 350 and memory location 14 (00E hex), initialized to 96, and store the result in location 16 (010 hex), initialized to 0.

(12 marks)

II. Write a machine language program that adds the contents of memory location 20 (0x014), initialized to 100 from memory location 21 (0x015), initialized to 300, and store the result in location 22 (0x016), initialized to 0.

(12 marks)

The End