FNU FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

TRADE DIPLOMA IN ELECTRICAL ENGINEERING

FINAL EXAMINATION -TRIMESTER 1, 2017

EEE 555 COMPUTER TECHNOLOGY

INSTRUCTIONS TO CANDIDATES

1. There are Two (2) sections (A & B). **All questions in both section 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 GSM mobiles or smartphones allowed during the examination.

A] **MULTIPLE CHOICES** **[20 Marks]**

1. *How many units does Von Neumann Architecture has?*

   a) 4

   b) 3

   c) 6

   d) 5

2. *What is the full form of ALU?*

   a) Arithmetic and Logical Unit

   b) Arithmetics and logic unit

   c) Arithmetic and Logic Unit

   d) Arithmetic and Logical Unit

3. *Which architecture is followed by general purpose microprocessors?*

   a) Harvard architecture

   b) Von Neumann architecture

   c) None of the mentioned

   d) All of the mentioned

9. *Which architecture involves both the volatile and the non-volatile memory?*

   a) Harvard architecture

   b) Von Neumann architecture

   c) None of the mentioned

   d) All of the mentioned

10. Convert 35 from hexadecimal to decimal.

a) 45
b) 53
c) 58
d) 59

11. Convert 1AA from hexadecimal to decimal.

a) 426
b) 429
c) 448
d) 450

12. What is the largest positive number that can be represented on 12 bits in two's complement representation?

a) 2047
b) 2048
c) 4095
d) 4096

13. Convert -199 from decimal to binary using two's complement notation.

a) 101111000
b) 110111010
c) 100111001
d) 100111000

14. Convert 13.5 to unsigned binary.

a) 111.101
b) 1001.1
c) 1101.11
d) 1101.1

15. The decoded instruction is stored in _____ .

a) IR
b) PC
c) Registers
d) MDR

16. The instruction -> Add LOCA,R0 does,

a) Adds the value of LOCA to R0 and stores in the temp register
b) Adds the value of R0 to the address of LOCA
c) Adds the values of both LOCA and R0 and stores it in R0
d) Adds the value of LOCA with a value in accumulator and stores it in R0

17. The internal Components of the processor are connected by _____ .

a) Processor intra-connectivity circuitry
b) Processor bus
c) Memory bus
d) Rambus

18. Assembly language is a Low Level Language because…

a) It uses symbolic addressing
b) It is very English like
c) It is a machine-oriented language the requires a good knowledge of machine architecture to code in.
d) All of the above.

19. Programs written in assembly language

a) Are not portable
b) Make use of mnemonics
c) Run faster and require less storage space than those written in HLLs
d) All of the above.

20. Advantages of using Assembly Language rather than an HLL include

a) Assembly programs are simpler to translate and occupy less storage space
b) Assembly are easier to code in.
c) Assembly language programs are portable.
d) Assembly is simpler to translate and easier to code in.

B] **Short answers** (Write **legibly** in the **answer booklet.**)

Question 1 (10 Marks)

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

(b) Consider the binary numbers in the following addition and subtraction problems to be signed 6-bit values in the 2's complement representation. Perform each of the following operations, specifying whether an over flow occurs.

i. 010110 + 010000 (2 mark)

ii. 011001 + 001001 (2 mark)

iii. 111111 - 000111 (2 mark)

(c) Convert the decimal floating point number – 0.75 to its IEEE single precision floating-point counterpart. (3 mark)

Question 2 (25 Marks)

(a) Outline the difference between a general purpose machine and a special purpose machine? (2 mark)

(b) Describe Von Neumann architecture? (1 mark)

(c) Define the following:

i. VLSI (2 mark)

ii. RISC (2 mark)

(d) Calculate the overall CPI and the 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 200 MHz. (4 mark)

(4)

Instruction category	Percentage of occurrence	No. of cycles per instruction
ALU	36	2
Load & store	14	3
Branch	45	4
Others	5	5

(e) Calculate the number of bits needed to distinctly address 64 K words of memory?

(f) With the aid of a diagram explain the stack push operation. (3 mark)

(g) With the aid of a diagram explain the sack pop operation. (3 mark)

(h) State and explain three addressing modes of a CPU with an example. (6 mark)

Question 3 (25 Marks)

(a) Draw a clearly labeled generalized microprocessor block diagram showing all the components. (12 mark)

(b) What is the difference between an 8-Bit and a 32-Bit microprocessor? (2 mark)

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

i. Memory Buffer Register (3 mark)

ii. Instruction Register (2 mark)

(d) What is the purpose of the following data transfer control lines in a microprocessor?

i. AS (Address Strobe) (2 mark)

ii. DS (Data Strobe) (2 mark)

(e) What is the purpose of a reset line in the external interface of a microprocessor? (2 mark)

Question 4 (20 Marks)

(a) What is an assembler? (2 mark)

(b) The block diagram showing a simple machine (microprocessor) is given in Figure1. 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.

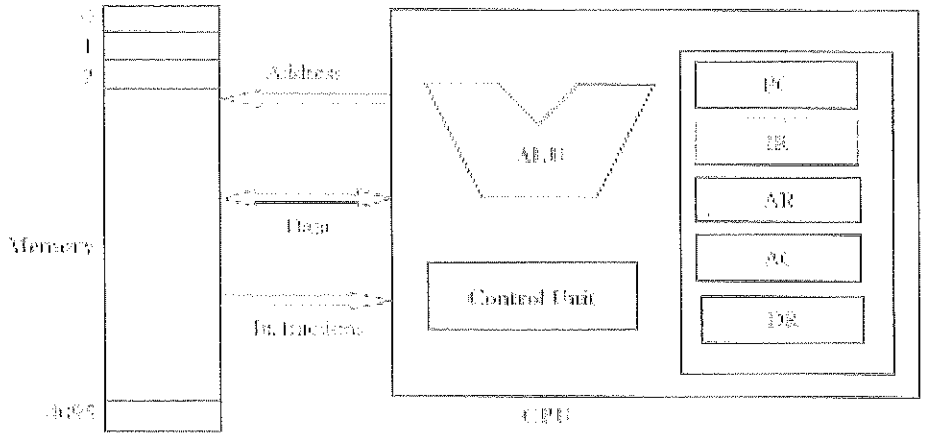

Figure 1: A simple machine

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

Figure 2: Instruction set for the simple machine

i) Write an assembly language program with descriptions that adds the contents of memory location 14 (0x00D), initialized to 50 and memory location 14(0x00F), initialized to 22, and store the result in location 16 (0x010), initialized to 0. (9 mark)

ii) Write an assembly language program with descriptions that subtracts the contents of memory location 21 (0x014), initialized to 25 from memory location 22(0x015), initialized to 396, and store the result in location 23 (0x016), initialized to 0. (9 mark)

##########The End##########