FIJI NATIONAL UNIVERSITY

Final Examination

College	Engineering, Science & Technollogy
School	Electrical & Electronics Engineering
Programme	Trade Diploma in Electrical Engineering
Trimester	I
Year	2016
Unit Code	EEE555
Unit Title	Computer Technology
Date of Examination	NA
Time	NA
Venue	NA
Duration	3 Hours *(extra 10 mins allowed to read the paper)*
Maximum Marks	100

Instructions

1. There are four (4) questions worth 25 marks each. Attempt all questions in the answer booklet.
2. Write your answers legibly in the answer booklet.
3. Write your student identification number on each page used.

Question 1 *(25 Marks)*

(a) Using the radix conversion algorithm, convert the following decimal integers into their 4 digit hexadecimal equivalents in the format 0xXXXX:

i. 3000 (2)

ii. 62500 (2)

(b) Represent the decimal value -123 as signed, 10-bit number using each of the following binary formats:

i. Sign-and-magnitude (2)

ii. 2's complement (2)

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

i. unsigned integer (2)

ii. 2's complement integer (2)

iii. sign-magnitude integer (2)

(d) Calculate the range of decimal values for 6-Bit two's complement binary values. (1)

(e) 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 overflow occurs.

i. $010110 + 001001$ (2)

ii. $011001 + 010000$ (2)

iii. $111111 - 000111$ (2)

(f) Convert the decimal floating point number 5.3125 to its IEEE single precision floating-point counterpart. (4)

Question 2 *(25 Marks)*

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

(b) Describe Harvard architecture? (1)

(c) Define the following:

i. CISC (1)

ii. RISC (1)

iii. MSI (1)

iv. VLSI (1)

(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)

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

(e) Calculate the number of bits needed to distinctly address 8 K words of memory? (2)

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

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

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

Question 3 (*25 Marks*)

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

(b) What is the difference between an 8-Bit and a 32-Bit microprocessor? (1)

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

i. Program Counter (2)

ii. Instruction Register (2)

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

i. AS (Address Strobe) (2)

ii. DS (Data Strobe) (2)

iii. READY (2)

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

Question 4 (*25 Marks*)

(a) What is an assembler? (1)

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

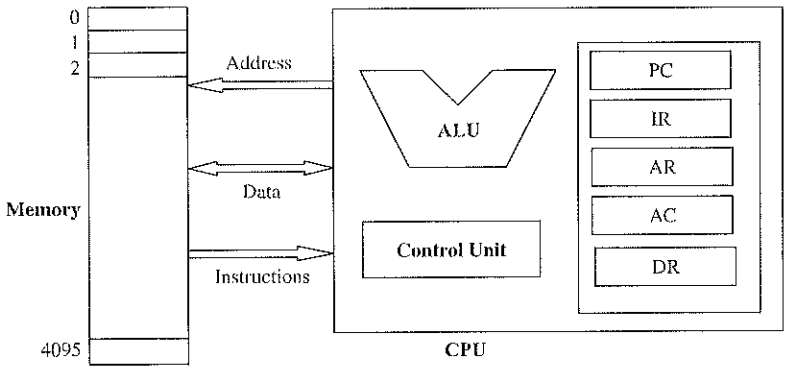

Figure 1: A simple machine

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

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 = 0

Figure 2: Instruction set for the simple machine

i. Write an assembly language program with descriptions that adds the contents of memory location 12 (0x00C), initialized to 100 and memory location 14 (0x00E), initialized to 44, and store the result in location 16 (0x010), initialized to 0. (12)

ii. Write an assembly language program with descriptions that subtracts the contents of memory location 20 (0x014), initialized to 250 from memory location 21 (0x015), initialized to 396, and store the result in location 22 (0x016), initialized to 0. (12)

The End

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FNU/E-5

EQP RECEIPT CHECKLIST FORM

Particulars		Details/Comments (To be filled by Unit Lecturer)	Tick if present on EQP (To be filled by exams staff)
Cover Page			
Fiji National University with Logo		✓	✓
College		✓	✓
School		✓	✓
Program		✓	✓
Unit Code		✓	✓
Unit Name		✓	✓
Examination Period		✓	✓
Duration of Examination		✓	✓
Instructions		✓	✓
Total Number of Pages		✓	✓
Other Pages			
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	Unit Code	✓ (Header)	✓
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The End		✓	✓
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Examination Requirements (FNU/E-1)		✓	✓
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