

United International University Department of Computer Science and Engineering

CSE 313: Computer Architecture

Mid Term Examination

Time: 1 Hour 30 Minutes

1. (a) The following table shows the instructions of a program -

[2.5 + 2.5]

[2]

[3]

[5]

[5]

[5]

	Arithmetic	Load	Store	Branch
IC	50	28	16	10
CPI	4	14	17	7

Table 1: Program Instructions

Calculate the CPI_{avg} of the program. Determine the time that would be required to run this program on a machine with 2.4 GHz Processor.

- (b) Explain why MIPS is not a good performance indicator with proper examples
- (c) Calculate the overall speed up of the program if the CPI count is halved for both Load and Store instruction of the program instructions given in Table 1
- 2. (a) Translate the following C instructions to Machine Language binary code. [5]
 Hints: Write the corresponding MIPS codes first and then translate the MIPS code to
 Machine Language

```
a[0] = b \ll 2;

d = a[0] + c[2];
```

Instruction	Op Code	Funct
ADD	0	32
SLL	0	0
LW	35	-
SW	85	-

Table 2: MIPS Instruction Op Code & Funct Values

Assume variable a in \$50, b in \$51, c in \$52 and d in \$53 registers

(b) Write the MIPS code for following non leaf procedure.

int fibonacci(int n){
 if(n == 0) return 1;
 if(n == 1) return 1;
 else return fib(n-1) + fib(n-2);
}

Assume necessary variables. Write comment beside each line of MIPS code for necessary explanation.

- 3. (a) Explain the hardware components used in regular division algorithm with a block diagram
 - (b) Show the step-by-step simulation for multiplying 1001 with 1101 using the general multiplication algorithm