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]

	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 [2]

(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 [3]

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 << 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 `$s0`, `b` in `$s1`, `c` in `$s2` and `d` in `$s3` registers

(b) Write the MIPS code for following non leaf procedure. [5]

```
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 [5]

(b) Show the step-by-step simulation for multiplying `1001` with `1101` using the general multiplication algorithm [5]