CENG 2032 Spring 2021 Midterm Take-Home Exam

PART 1: Find the Nth Fibonacci Number   (Objective - 4)

You will implement a function for finding the nth Fibonacci number using the MIPS assembly language. Following gives the definition of the Fibonacci Sequence. Your code should comply with the coding conventions described in the lectures.

Let F be the Fibonacci function:

F(0) = 0

F(1) = 1

For n > 1 F(n) = F(n-1) + F(n-2)

Example Output of Execution:

Enter the sequence number: 6

F(6) = 8

A - Loop Implementation (30 Points)

In a file named FiboLoop.asm, implement the above function using a loop.

B - Recursive Implementation (30 Points)

In a file named FiboRec.asm, implement the above function using a loop.

PART 2: Evaluating Execution Time (Objective - 1) (25 Points)

A) Complete the following table. Provide how many instructions of the given categories are executed while finding the F(6) for both loop and recursive functions, seperately. You should provide two tables, one for non-recursive the other for recursive function. (5 Points)

Category	Instructions	CPI(Clock Cycle per Instruction)	Instruction Count
A: Arithmetic and Comparison	add, addu, sub, slt, etc..	1	?
B: Memory	lw, sw	8	?
D: Branch and Jump	beq, bnq, j, jal	2	?

B) Then calculate the total clock cycles for each function (non-recursive and non-recursive), seperately. (10 Points)

C) Calculate how much faster would the functions be if a better data cache reduced the average memory operations time to 4 cycles? (10 Points)

PART 3: Representing Numbers (Objective - 3) (15 Points)

A) Show the two's complement representations and their hexadecimal forms for Maximum and Minimum integer values (5 Points)

B) Show the 32 bit floating point representation of decimal number -22.2$_{ten}$ (10 Points)

HOW TO SUBMIT

Your homework should be submitted to 2 environments. One is the bitbucket as described Section A. The other is DYS system. Note that both environments should contain your homework files. The files you should submit includes:

1.   FiboLoop.asm   (Loop implementation of GCD algorithm)

2.   FiboRec.asm   (Recursive implementation of GCD algorithm)

3.   Yourid.pdf   (A pdf file that contains answers for Part2 and Part 3 sections, if your id is 12345678 your document name should be 12345678.pdf)

Submission to DYS

Submit these 3 files to DYS system. You should be able submit your files under homework page in DYS.

Important Note: All work should be your own work. Plagiarism will be penalized.