

CS 465 – Fall 2018 – Homework 2
Prof. Daniel A. Menasce
Department of Computer Science
George Mason University

Team Allowed: maximum of two per team. The members of a team must be from the **same** CS 465 section.

State clearly the team member names and GMU IDs as comments in each page of the submitted report.

IMPORTANT:

- (1) Start to work on the homework early.
- (2) If you plan to do the homework with a classmate, make a determination early if your teammate is responsive.
- (3) The explanation for your answers is required. You will not get credit without explanation.**
- (4) Use a word processor to type your answers to part II and generate a pdf file from it.**
- (5) Do not share your solutions or partial solutions** on Piazza or any other platforms (electronic or otherwise) before the deadline. This assignment is individual to a group. If you want to ask questions about your solution, please ask the TAs or me.
- (6) Plagiarism is not permitted in any form. We enforce the university policy and honor code**

Late submissions are not accepted.

This assignment has two parts. Part I consists of MIPS programming. You need to submit a .asm file and a .txt file with the output of running the program. Part II consists of exercises. Use a Word processor for your answers to Part II questions.

How to submit: The submission will be made via a blackboard link available to you. You must submit a zip file answering all questions. For team projects, **only one member of the team should submit the ZIP file with all the files and the other should submit a one-page PDF file stating the names of both members of the team.** If you fail to submit the one-page PDF file you will not get any credit for the homework.

The zip file should consist of the following parts: X.asm, X.txt, X.PDF, where X is "cs465_hw2_LastName1_LastName2" (for 2-member teams), or "cs465_hw2_LastName1" (for 1-member teams). Do NOT submit the code as a .pdf file. As in all programming assignments, your code must be very well commented. A description of your algorithm must be included as part of your header comment. The X.PDF file submitted by one of the members of the team should contain the answers to Part II.

Part I:

Question 1 [60 points]: Write and implement a MIPS program that reads the size N of an array A . Assume that each element of A is an integer. After reading N , your program should initialize the values of the array as follows:

$$A[0] = 1;$$
$$A[i] = i * A[i-1] + 2^i \quad \text{for } i = 1 \text{ to } N-1$$

The program should print the values of each element of the array, one element per line, and the sum of its elements. You are not allowed to use a single loop to compute the values of $A[i]$, add them up, and print them. You need a loop for initializing the array with its values and another loop to print the values and compute the sum. You should print the sum after the second loop. Read the value $N = 8$. Your program should work for any value of N that does not cause overflow on $A[i]$. **You need to comment your program otherwise points will be taken.**

PART II:

Question 2 [15 points]: Consider that a beq instruction is stored at address $0xA09BB0$ and that the constant in the instruction is $0x0C10$. What is the target address, in hexadecimal, if the branch is taken?

Question 3 [25 pts]: Translate function `foo` into MIPS assembly language. You must follow MIPS register usage conventions discussed in the textbook. Consider that the arguments of a function are mapped by the caller to $\$a0$ - $\$a3$ in the order they appear in the function declaration. For example, `bar` always expects its parameters in $\$a0$ and $\$a1$. Also, assume that any function saves its arguments on the stack and then restores them before returning. Assume the function declaration of `bar` is “`int bar (int x, int y);`”. The code for function `foo` is as follows:

```
int foo (int a, int b, int c, int d){
    return bar(a,c) - bar(b,d)
}
```

You do not need to be concerned with the code for function `bar`, just its arguments and what it returns. **You need to comment your program otherwise points will be taken.**