

HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY



FACULTY OF COMPUTER SCIENCE AND ENGINEERING
COURSE: COMPUTER ARCHITECTURE LAB (CO2008)

Lab 2

Branches and procedures

Ho Chi Minh City, October 2024



Contents

1	Introduction	2
2	Exercises	2
2.1	Exercise 1	2
2.2	Exercise 2	2
2.3	Exercise 3	3



1 Introduction

- **The main purpose of this session is to get familiar with conditional branch, unconditional jump instructions, and call procedures.**
- Students are also expected to be able to work with recursion in this lab.
- Students must submit their answers to the LMS system no later than the last period of the lab section. Then, the instructor will evaluate all students' work during the lab section's final period.

2 Exercises

2.1 Exercise 1

Write a MIPS program that does the following steps:

1. Declare a string and count the number of each character that appears in the string.
2. Print the characters and their number of appearance by ascending order (if the number of appearance is the same between some numbers, print the one that has the smaller ASCII code first).

For example, if the input string is **a, b, d, e, e, f, g, g, f, f** the output should be **a, 1; b, 1; d, 1; e, 2; g, 2; f, 3**.

2.2 Exercise 2

Write a MIPS program with the following requirements:

1. Declare an integer array of width 5 with data entered from the keyboard.
2. Check whether each element in the array is divisible by 4 or not.
3. If an element is not divisible by 4, change it to the number divisible by 4 that is closest to it (round down is prioritized). For example, if the number is 35, the result will be 36, if the number is 34 or 33, the result will be 32.
4. Print the result to the terminal.



2.3 Exercise 3

Write a MIPS program to find the second largest element in a 10-elements integer array. The program is also required to find all their indexes. Print the value and all of its indexes. The elements of the array must be inserted by the user after the prompt: "Please insert element 1:", "Please insert element 2:", etc.

For example, if the array is **1, 2, 7, -7, 3, 7, 4, 6, 8, 7** the output should be **Second largest value is 7, found in index 2, 5, 9.**