

## **Assignment - 2 Lab Assignment**

**CSL3020: Computer Architecture  
AY 2024-25, Semester – V  
Due on: 1-09-2024**

**Total:100 Marks**

### **General Instructions:**

- 1. Clearly mention the assumptions you have made, if any.**
- 2. Clearly report any resources you have used while attempting the assignment.**
- 3. Any submission received in another format or after the deadline will not be evaluated.**
- 4. Make sure to add references to the resources that you have used while attempting the assignment.**
- 5. Plagiarism of any kind will not be tolerated and will result in zero marks.**

### **Submission Guidelines:**

**1. Submit a single report depicting methods, results, and observations. Preparing a report is mandatory; failing it will lead to non-evaluation of the assignment.**

**2. Name your report as YourRollNo.pdf. And your program codes as yourRollNo.asm**

**3. There is no need to make a zip file. Just upload the report and program directly on the google-classroom, that is, submission will contain{YourRollNo.pdf, YourRollNo.asm}. Do not upload files in any other format.**

**4. Do not copy-paste screenshots, etc. in the report. The report should look like a technical document, containing plots, tables, etc. whenever necessary.**

**5. Adhere to the instructions given, failing them may result in a penalty.**

**6. Late submissions will be penalized with 25% per day after the deadline.**

## Objective:

The purpose of this lab assignment is to familiarize students with the basics of MIPS assembly language. You will write, execute, and debug simple MIPS programs that perform basic arithmetic operations like addition, multiplication, etc.

**You are expected to perform task - 1 of this assignment in the lab and task - 2 (which will be released soon) as a take-home assignment.**

## Instructions:

### 1. Software Installation:

- **MARS (MIPS Assembler and Runtime Simulator):**

1. Visit the official [MARS](#) website.
2. Download the latest version of MARS (MARS4\_5.jar).
3. Ensure you have Java installed on your system. If not, download and install Java from [here](#).
4. Run the MARS4\_5.jar file by double-clicking it or using the command line: `java -jar MARS4_5.jar`.

## Task - 1

**[40 marks]**

**Lab Tasks:** Write MIPS assembly programs to perform the following tasks:

- **Subtask 1: Addition:** [10]
  - Write a program that adds two integers and stores the result in a register.
- **Subtask 2: Multiplication:** [10]
  - Write a program that multiplies two integers and stores the result in a register.
- **Subtask 3: Subtraction:** [10]
  - Write a program that subtracts one integer from another.
- **Subtask 4: Input / Output:** [10]
  - Write a program that prompts the user with text for taking integer input and performs all the above arithmetic operations and prints the output.

## Task - 2

### Employee Payroll Calculator in MIPS

#### Objective

Imagine you are developing a payroll system for a small business using MIPS assembly language. The system needs to handle employee wage calculations and generate payroll reports. Your task is to create an assembly program that automates the payroll process by calculating gross salaries, deductions, and net salaries for employees.

You will be using MARS MIPS simulation software you can download it from [here](#)  
Requirements

- Your system must have Java (Java J2SE 1.5) installed.

**NOTE: You will be using MIPS ISA assembly language to complete this assignment.**

#### TASK - 2: [60 marks]

You are tasked with developing a simple payroll system that performs the following functions:

##### 1. Input Collection:

- Request the following details from the user for each employee:
  - The number of regular hours worked during the pay period.
  - The number of overtime hours worked.
  - The hourly wage of the employee.

##### 2. Payroll Calculations:

- Gross Salary Calculation:
  - Compute the regular salary by multiplying the number of regular hours worked by the hourly wage.
  - Calculate the overtime pay by multiplying the number of overtime hours worked by the hourly wage and a rate of 1.5 times the standard rate.
  - Add the regular salary and overtime pay to get the total gross salary.
- Deductions Calculation:
  - Calculate a  $x\%$  tax deduction based on the gross salary.  
*{ $x\%$  tax deduction has to be calculated based on your Roll No. by Last 2 digits of  $(YourRollNo. \bmod 30)$ : ex. If your roll no. is B21CS032 then  $x$  will be  $32 \bmod 30 = 2\%$ }*
  - Calculate a  $y\%$  insurance deduction based on the gross salary.  
*{ $y\%$  tax deduction has to be calculated based on your Roll No. by Last 2 digits of  $((YourRollNo. + 8) \bmod 30)$ : ex. If your roll no. is B21CS032 then  $x$  will be  $(32 + 8) \bmod 30 = 10\%$ }*

- Add these deductions to get the total amount to be deducted.
- Net Salary Calculation:
  - Subtract the total deductions from the gross salary to determine the net salary.
- 3. Output Results:**
  - Display the following to the user:
    - The gross salary before deductions.
    - The total amount deducted (sum of tax and insurance).
    - The net salary after all deductions.
- 4. Loop for Multiple Employees:**
  - After processing an employee's details, ask if the user wants to enter information for another employee.
  - Continue processing until the user decides to stop.
- 5. Program Termination:**
  - Exit the program gracefully once the user chooses not to enter more employees.

**A fully complete code should meet following requirements:**

- Ensure that the program accurately calculates and displays all required values.
- Use MIPS instructions to perform the necessary arithmetic operations, manage user input, and control the program flow.
- The program should loop to handle multiple employees efficiently.
- Properly format all outputs to be user-friendly.

**Deliverables:**

- MIPS assembly code (submitted as a .asm file).
- A brief report detailing the installation and usage of MARS, along with an explanation of how the program works and its functionality.
- Your report should contain the detailed summary of each section of your code which should reflect your understanding.

**Report should contain the following points:**

- Describe your experience with the MARS software.
- Provide a brief explanation of the MIPS code, focusing on its objective and key operations (e.g., salary calculation).
- Highlight any challenges faced and how you overcame them.
- Summarize the program's output.
- Reflect on what you learned from the assignment and the relevance of MIPS programming in real-world scenarios.

**Evaluation Criteria**

- Correctness: Accurate execution and analysis of the MIPS code.
- Comprehensiveness: Thorough analysis of output and methods
- Clarity: Clear and well-organized report presentation.
- Insightfulness: Depth of understanding and interpretation of performance data.

**Note:**

- You are required to submit a combined single report and code for both tasks before the deadline for the second task.
- Keep the code and screenshots of task one from the lab with you for adding it in the report.