COMP3350 Spring, 2025
Lab 4

Important Notes:

- The submitted **lab report** should be **a single PDF file** unless otherwise mentioned. Texts of the reports are expected to be typed in for which you could use software programs like LaTeX, Microsoft Word etc. All screenshots (if any) should be included in this PDF file, clearly titled, and accompanied with adequate descriptions.
- The PDF file should be clearly formatted to help the TA/instructor to locate the answer to each corresponding question. If the student fails to label the answers with reasonable efforts or submit files with poor readability, the submission may only receive zero or partial score.
- Please use the following naming conventions for your submitted files.
    - Lab4report.pdf
- Students are encouraged to complete each task with best efforts. Even if the final outcome isn't fully correct, partial credit may be awarded if the instructor and TA recognize that the student demonstrates a certain level of understanding.
- Solutions turned in must be your own. Please, mention references (if any) at the end of each question.

Please Complete the Following Task(s).

- **Task A (7 points) Register Selection:** Please follow the instructions in L21_Datapath_Labsession.pdf until page 13 and complete the following tasks.
    - **1) Take screenshots of the Datapath before and after the execution of the add $t1, $t2, $t3 instruction. Take a screenshot of the REGISTERS Block, which shows the internal mux and N to 1 Decoder** (2 points).

- **2) How does the hardware of REGISTERS Block support selecting and reading registers $t2 and $t3?** (2 points).

- **3) How does the hardware of REGISTERS Block support WRITING DATA to register $t1?** (3 points)

  (Hint: Explain what the expected values of the input and outputs of the N to 1 Decoder are, and how the WRITING DATA can be passed to the register $t1**)**

Task B (8 points) Datapath of branch and jump instructions: Please follow the instructions in L21_Datapath_Labsession.pdf until page 18 and complete the following tasks.

- **1) Take screenshots of the Datapath after executing the beq and j instructions, respectively.** (2 points).

- **2) In each scenario, which control lines are active?** (2 points)

- **3) In each scenario, which of the following five stages are involved?** (2 points).
    - **Instruction Fetch, Register Read, ALU Operation, Data Access, Register Write**

- **4) For a subset of instructions including lw, sw, add, sub, AND, OR, slt, beq, and j, explain which of these require the ALU Operation stage and the Register Write stage** (2 point).