NATIONAL UNIVERSITY OF SINGAPORE
Department of Electrical and Computer Engineering

CG2028 Computer Organization

Tutorial 4
Single Cycle Processor Design

Questions in this tutorial assume the instruction format (i.e., architecture) and microarchitecture described in Lecture 4.

1. Write the assembly language instructions (consider the extended formats given in slides 37-40) corresponding to the machine codes below.

    a. 0x0224201C
    b. 0x0024201C
    c. 0x0404001C
    d. 0x0804001C

2. Annotate the bit widths for all the connections of the microarchitecture given in Slide 28 of Lecture 4.

3. Modify the microarchitecture given in Lecture 4 to incorporate BNE instruction. Detail the datapath and control unit modifications required, including logic expressions for new control signals / existing control signals which need to be modified, if any.

4. What is the range of instructions from the current instruction we can jump to using a branch instruction? Suggest how the architecture can be modified to increase this range. Briefly discuss the microarchitectural implications as well (detailed implementation is not expected).