This homework is based on the chapter 5 of the text and focuses primarily on datapath and control path in single and multi-cycle implementations.

Consider the single-cycle datapath (and control) presented in your book (and reproduced in the appendix for your ease of use). We would like to enhance this processor to handle “unknown op-codes”. The functionality we would like to implement is something along the lines of

\[
\text{If ( Unknown(\text{OP}) ) \{ \$32 = \text{PC}; \text{PC} = 0x4000 \}}
\]

Viz., if the OP section of the instruction was unknown (not a R,I,J,Load,Store etc.) type of an instruction, we want to store the PC in $32 and then “jump” to a static address of 0x4000.

(1): Modify the single cycle implementation described in Fig. 5.29 to handle this feature. Describe any additional control lines as well as changes in the datapath. Pay special attention to the instruction fetch unit.

(2): Modify the multi-cycle implementation in 5.33 to handle this feature. Besides describing the control and datapath, make sure you describe the modifications to the state diagram for the finite state machine (Fig. 5.42).

Figure 5.29: Single cycle datapath and control
**Fig 5.33: Multicycle datapath and control**

**Fig. 5.42: Complete finite state machine for multi-cycle machine**