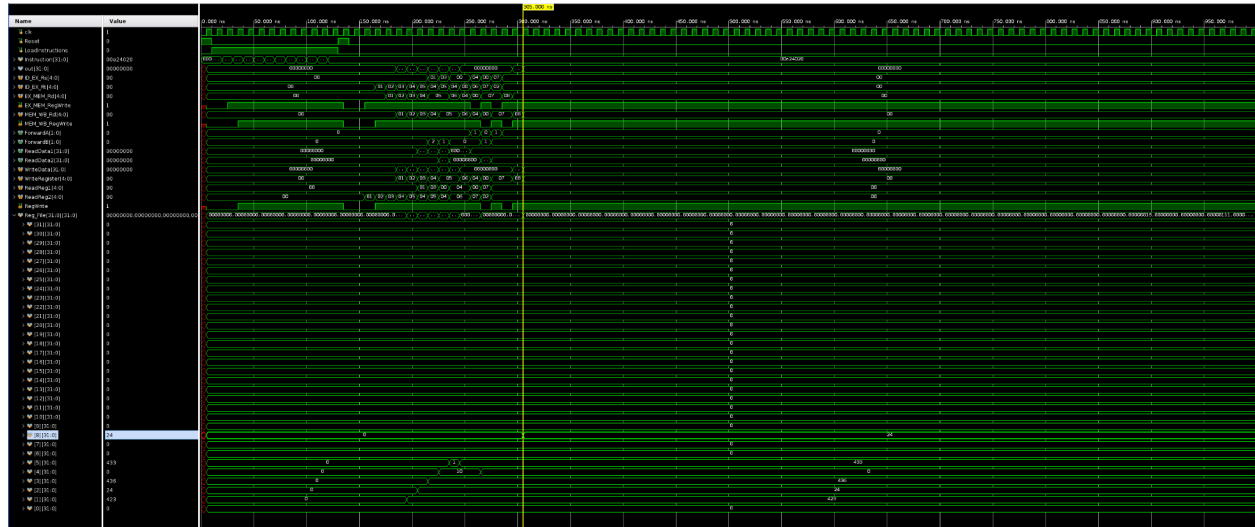


EC 413 LAB 9

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Waveform:



Check One: One Ahead

A one ahead hazard (read after write) occurs when the previous instruction is writing to a register that the current instruction is reading from — it essentially needs a value that a prior instruction has not written yet to the register. Contrary to the last lab, we aren't inserting nops to deal with the hazard but we are forwarding the data. To do this we have a mux input to our ALU that is selecting between the normal input, the one ahead value, and the two ahead value. To then select, the value we check if $EX_MEM_RegWrite$ is true. Then we check $EX_MEM_Rd \neq 0$ and we check the incoming registers to the destination registers in the EX/MEM stage. If the registers match, then this is a one ahead hazard. Depending on it the hazard is with the Rs (ForwardA) or Rt (ForwardB), Forward A select will be two and Forward B select will be one.

Check Two: Two Ahead

A two ahead hazard occurs when an incoming instruction depends on a register written to from two previous instructions. This is when an incoming instruction relies on an instruction in the memory stage. It essentially makes sure that the one ahead condition is not true, $MEM_Wb_RegWrite$ is true, $MEM_Wb_Rd \neq 0$ and $MEM_Wb_Rd == ID_EX_Rs$ or ID_EX_Rt . For a two ahead, when $MEM_Wb_Rd == ID_EX_Rs$, ForwardA = b'01. When $MEM_Wb_Rd == ID_EX_Rt$, ForwardB = 2'10.

For LW, fortunately the hazard unit was already implemented and a NOP was inserted. A forwarding unit cannot fix this problem because you need time for the register to update.