Determine your answers to the following questions, then submit them to the quiz interface of the Curator system by the posted deadline for this assignment. No late submissions will be accepted.

You will submit your answers to the Curator System (www.cs.vt.edu/curator) under the heading HW3.

All questions refer to the following MIPS datapath diagram:

The datapath supports the following instructions: add, sub, and, or, slt, beq, lw and sw.

For questions 1 through 12, use the following choices:

1) 0  
2) 1  
3) doesn't matter

1. If an and instruction is being executed, how should the control signal RegDst be set?
2. If an and instruction is being executed, how should the control signal Branch be set?
3. If an and instruction is being executed, how should the control signal RegWrite be set?
4. If an and instruction is being executed, how should the control signal MemRead be set?
5. If a lw instruction is being executed, how should the control signal RegDst be set?
6. If a lw instruction is being executed, how should the control signal MemtoReg be set?
7. If a lw instruction is being executed, how should the control signal ALUSrc be set?
8. If a lw instruction is being executed, how should the control signal MemWrite be set?
9. If a `beq` instruction is being executed, how should the control signal `RegDst` be set?

10. If a `beq` instruction is being executed, how should the control signal `Branch` be set?

11. If a `beq` instruction is being executed, how should the control signal `RegWrite` be set?

12. If a `beq` instruction is being executed, how should the control signal `MemWrite` be set?

For questions 13 through 20, use the following choices:

1) All the R-type  
2) `beq`  
3) `lw`  
4) `sw`  
5) All of them  
6) 1 and 2 only  
7) 1, 3 and 4 only  
8) 3 and 4 only  
9) 2, 3 and 4 only  
10) None of these

13. For which instruction(s) is the `Shift left 2` unit necessary?

14. For which instruction(s) is the `Sign-extend` unit necessary?

15. For which instruction(s) is the `Add` unit in the upper right corner of the diagram necessary?

16. For which instruction(s) is the `Mux` whose output goes into the `Write register` port on the register file necessary?

17. For which instruction(s) is the `Data memory` unit necessary?

18. Suppose that the `MemRead` signal was stuck at 1. Which instruction(s) would not execute correctly?

19. Suppose that the `MemtoReg` signal was stuck at 1. Which instruction(s) would not execute correctly?

20. Suppose that the `ALUSrc` signal was stuck at 0. Which instruction(s) would not execute correctly?

Note: By "necessary" I mean that the specified datapath feature is logically necessary in order for the instruction to be carried out correctly, not merely that the datapath feature is active during execution of the instruction.