CSE3038 Quiz 2. (Spring 2021)

Q1. (30)

A *stuck-at-0 (stuck-at-1) fault* occurs when a signal is always 0 (1) regardless of what it should be. Consider the single-cycle datapath. Which instructions from the set {**add, sub, lw, sw, beq, j**}, if any, would not work correctly under the following conditions? (Consider each case separately). No explanation required.

a) RegDst is stuck at 0.
b) ALUSrc is stuck at 0.
c) ALUOp stuck at 00.

Answer:

a) add, sub

b) lw, sw

c) sub, (add), beq

(Note: Since 00 performs add, add will work even for this case)

Q2 (70)

Assume that we extend our single-cycle MIPS implementation so that it handles the "jri" instruction, where "jri" has I-type instruction format. Note that "rt" field is 0; and opcode of jri is 28.

Example: jri 200($s3) # unconditionally jump to the address given in $s3+200. PC← $s3+200

a. Explain briefly the required changes. In case of no change, explain it briefly.

b. For the jri instruction, write the values of all "control lines (as in Figure 4.18 at your cheat sheet) appropriately (i.e., 0, 1 or x for don't care). Include any new control signal(s) if needed.

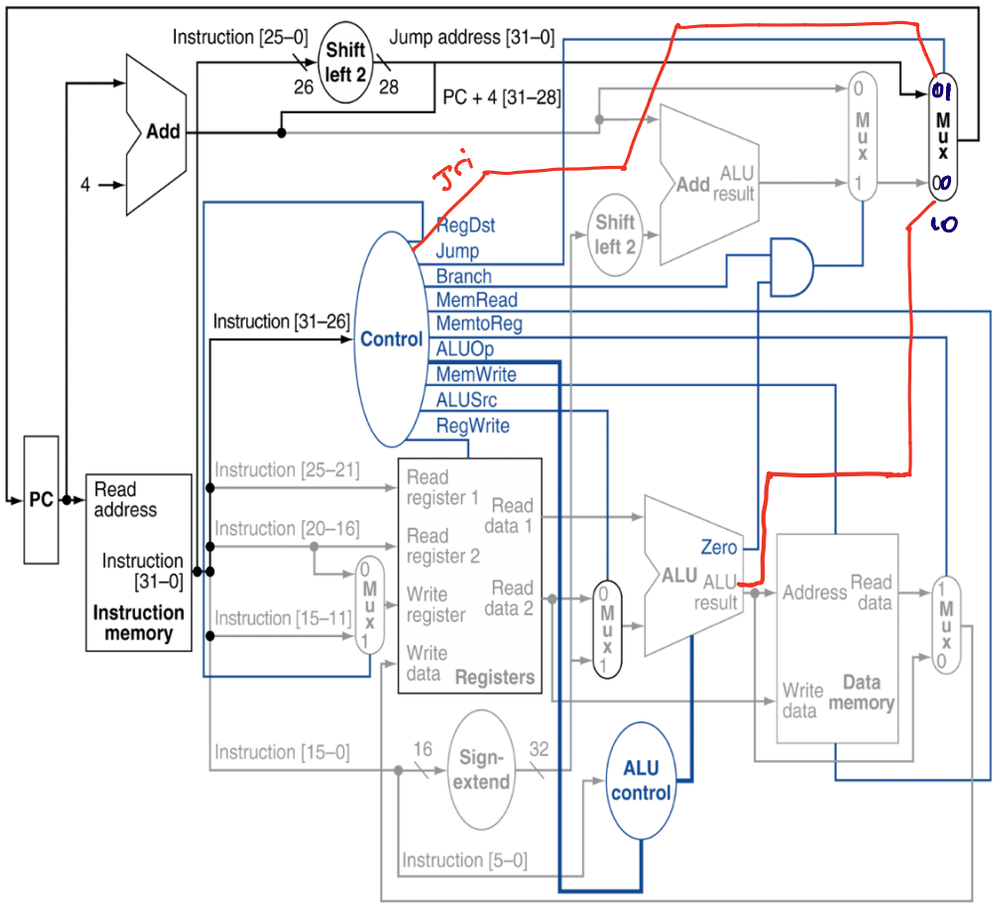

Figure 4.24

Solution was drawn on the chart.

RegDst	ALUSrc	MemtoReg	RegWrite	MemRead	MemWrite	Branch	ALUOp1	ALUOp0
X	1	X	0	0	0	0	0	0

Jump	Jri
0	1