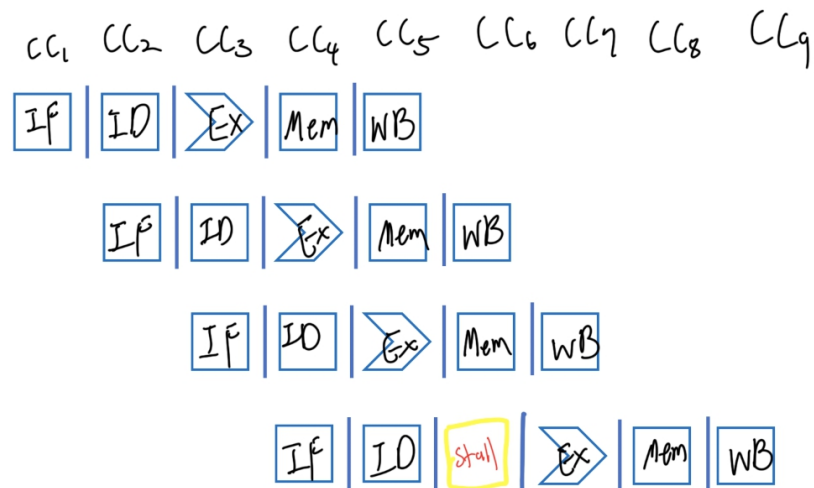


CSE/EEE 230 Spring 2020
Assignment 8

Submit your work online. Be sure that your name and class ID is on your work.

1. Draw the pipelining resource diagram for the code below if both stalling and forwarding is done.

- add \$1, \$2, \$3
and \$2, \$2, \$1
lw \$2, 8(\$1)
sw \$3,4(\$2)



Total cycles = 9

Use this code for questions 2 and 3.

- add \$5, \$7, \$2
sw \$9,4(\$6)
lw \$4,8(\$12)
or \$6, \$5,\$3

2. Assume that the code is stored starting at 0x00400100, all the values in the data memory are initially -1, and the register values are the same as the number (this means that \$5 holds the value 5). Using the pipelined diagram, give the contents of each internal register at the end of the 4th clock cycle. Be specific and give the actual values placed into the register. The gray area indicates that there is no value at that point. Show all values as 8 hexadecimal numbers (except zero which is 1 bit).

Register	IF/ID	ID/EX	EX/MEM	MEM/WB
PC	0x0040 0104	0x0040 0108	0x0040 010C	
Read data 1		2		

Read data 2		7	6	
Sign Extend		0x0040 0100		
Zero			0	
ALU Result			9	9
Read data				4

3. For the code, complete the control as it would be stored into the ID/EX, EX/MEM and MEM/WB registers at the end of clock cycle 4. If the control is **not** in that register, leave the control **blank**.

Instr	RegDest	ALUSrc	Mem to Reg	Reg Write	Mem Read	Mem Write	Branch	ALU Op1	ALU Op0
ID/EX	\$9							\$9	\$6
EX/MEM								\$7	\$2
MEM/WB	\$5		\$7+ \$2	\$5					