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Class id: 738

CSE/EEE 230 Spring 2020
Assignment 8

Submit your work online. Be sure that your name and class ID is on your work.
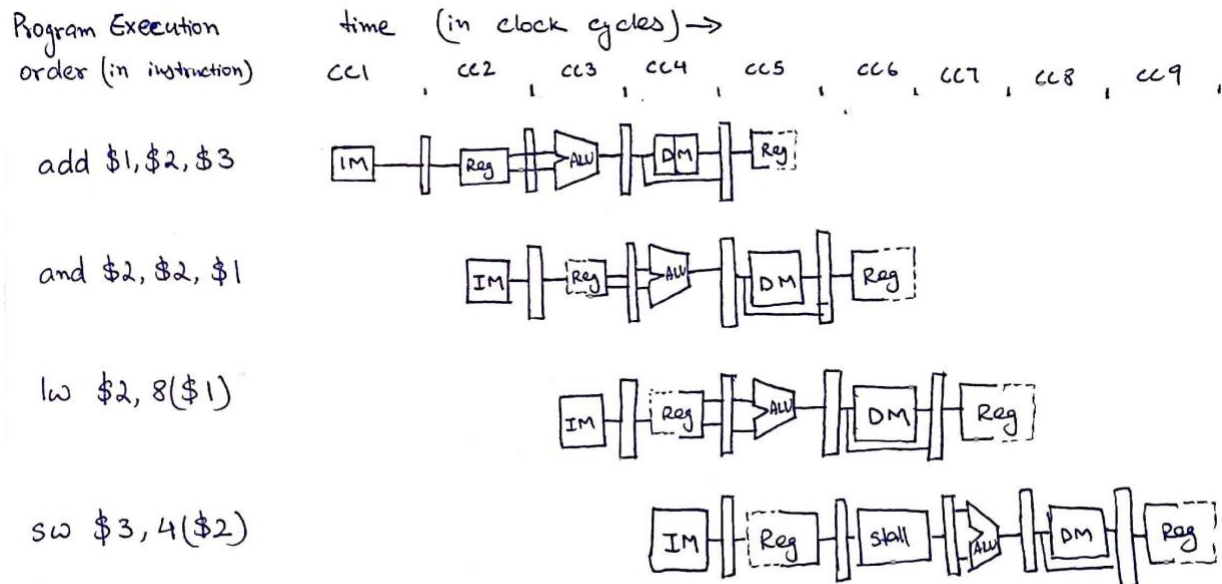
1. Draw the pipelining resource diagram for the code below if both stalling and forwarding is done.

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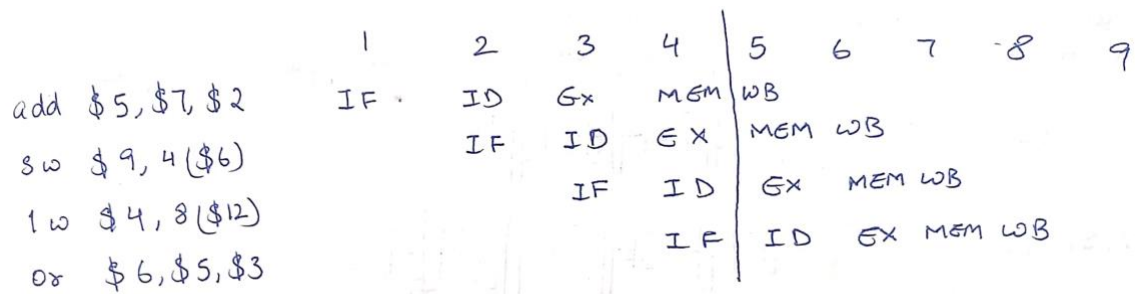   and $2, $2, $1
        lw $2, 8($1)
        sw $3, 4($2)

    Use this code for questions 2 and 3.
        add $5, $7, $2
        sw $9, 4($6)
        lw $4, 8($12)
        or $6, $5, $3

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           1    2    3    4  | 5   6   7   8   9
add $5,$7,$2    IF.  ID   Gx   MEM|WB
                     IF   ID   EX |MEM  WB
sw  $9,4($6)              IF   ID |EX  MEM WB
lw  $4,8($12)                 IF|ID  Gx  MEM WB
or  $6,$5,$3                    IF| ID  EX  MEM  WB
```

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	0x00400110	0x0040010C	0x00400108	
Read data 1		0x0000000C		
Read data 2		0x00000004	0x00000009	
Sign Extend		0x00000008		
Zero			0	
ALU Result			0x0000000A	0x00000009
Read data				0x00000005

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	0	1	1	1	1	0	0	0	0
EX/MEM	X	1	X	0	0	1	0	0	0
MEM/WB	1	0	0	1	0	0	0	1	0