

AppC 1, 2, 3, 7

HW 3

Cl. a.)

X1	ld	addi	RAW
X1	addi	sd	RAW
X2	ld	addi	WAR
X2	sd	addi	WAR
X2	addi	sub.	RAW
X4	sub	bnz	RAW

b.) $X3 = X2 + 396$, $396/4 = 99$

Instns	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	IF	ID	EX	M	WB														
2		IF	S	S	ID	EX	M	WB											
3				IF	S	S	ID	EX	M	WB									
4							IF	ID	EX	M	WB								
5								IF	S	S	ID	EX	M	WB					
6									IF	S	S	ID	EX	M	WB				
1												IF	S	S	ID	EX	M	WB	

Total Cycles = $18 + 98(18-2) = 1586$

c.)

	1	2	3	4	5	6	7	8	9	10	11	12
1	IF	ID	EX	M	WB							
2		IF	ID	S	EX	M	WB					
3			IF	S	ID	EX	M	WB				
4				IF	ID	EX	M	WB				
5					IF	ID	EX	M	WB			
6						IF	ID	EX	M	WB		
1							IF/S	IF	ID	EX		

Total Cycles = $11 + 8(98) = 795$

HW 3

c) d)

	1	2	3	4	5	6	7	8	9	10	11	
1	IF	ID	EX	M	WB							
2		IF	ID	S	EX	M	WB					
3			IF	S	ID	EX	M	WB				
4					IF	ID	EX	M	WB			
5						IF	ID	EX	M	WB		
6							IF	ID	EX	M	WB	
1								IF	ID	EX	M	WB

$$\text{Total Cycles} = 11 + 98(7) = \boxed{697}$$

e)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	IF1	IF2	ID1	ID2	EX	EX2	M1	M2	W1	W2				
2		IF1	IF2	ID1	ID2	S	S	S	X1	X2	M1	M2	WB1	WB2
3														
4														
5														
6														

Can't fix it

19 cycles

$$\text{Total} = 19 + 98(19-9) = \boxed{999}$$

HW 3

C1 f.) $0.8\text{ns} + 0.1\text{ns} = 0.9\text{ns}$ - 5 stage

$0.8\text{ns} / 2 + 0.1\text{ns} = 0.5\text{ns}$ - 10 stage

g.) $d = 697$, $e = 999$

$697 / (99 \times 6) = \boxed{1.34\text{ns}}$ - d cycle time

$999 / (99 \times 6) = \boxed{1.68\text{ns}}$ - e cycle time

$1.34(0.9) = \boxed{1.206}$ - d avg exec time

$1.68(0.5) = \boxed{0.84}$ - e avg exec time

HW8

C2 a) $\text{speedup} = \frac{1}{1} (4) = 4$

$$\text{stalls} = 1(.01) + 2(.09) + .06 = 0.25$$

$$\text{speedup} = \frac{1}{1.25} (4.0) = 3.2$$

$$\text{speedup NoHazard} = 4 / 3.2 = 1.25$$

~~without branch~~

~~without~~ without branch hazards, 25% faster

b) $\text{stalls} = 4(.01) + 9(.09) + 8(.06) = \boxed{1.33}$

$$\text{speedup} = \frac{1}{2.33} (4) = \boxed{1.72}$$

$$\text{speedup NoH} = \frac{4}{1.72} = \boxed{2.33}$$

~~2.33~~

HW3

Q3 a) $2 + .1 = \boxed{2.1 \text{ ns}}$

b) $5/4 = \boxed{1.25 \text{ cycles/instr}}$

c) $\frac{7}{1.25(2.1)} = \boxed{2.67}$

d) $\frac{7}{.1} = \boxed{70}$

Q7 a) $\frac{6/5}{11/8(.6)} = \boxed{1.45}$

b) 5 stage = $6/5 + .2(.05)(2) = \boxed{1.22}$

12 stage = $11/8 + .2(.05)(5) = \boxed{1.43}$

Speedup = $\frac{1.22}{1.43(.6)} = \boxed{1.42}$