

Problem 4

Table 1: (a) 15 cycles

Code 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LD R3,0(R1)	IF	ID	EX	MEM	WB										
LD R4,4(R1)		IF	ID	EX	MEM	WB									
SUB R3,R4,R4			IF	ID	Sta	EX	MEM	WB							
ADD R3,R4,R3				Sta	Sta	IF	ID	EX	MEM	WB					
BEQ R3,TAG1							IF	ID	EX	MEM	WB				
BEQ R4,TAG2								IF	Sta	Sta	IF	ID	Ex	MEM	WB

Table 2: (b) 13 cycles

Code 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LD R3,0(R1)	IF	ID	EX	MEM	WB										
LD R4,4(R1)		IF	ID	EX	MEM	WB									
SUB R3,R4,R4			IF	ID	Sta	EX	MEM	WB							
ADD R3,R4,R3				Sta	Sta	IF	ID	EX	MEM	WB					
BEQ R3,TAG1							IF	ID	EX	MEM	WB				
ADD R3,R5,R5								IF	ID	EX	MEM	WB			
BEQ R4,TAG2									IF	ID	EX	MEM	WB		

Table 3: (c) 9 cycles

Code 3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LD R3,0(R1)	IF	ID	EX	MEM	WB										
LD R4,4(R1)		IF	ID	EX	MEM	WB									
BEQ R4,TAG1			IF	Sta	Sta	ID	EX	MEM	WB						