

COMPUTER ARCHITECTURE. LAB 2.

LAB 2.

(a) No Forwarding

Cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LD	IF	ID	EX	MEM	WB										
ADDI			IF	ID	S	EX	MEM	WB							
SB															
ADDI															
DSUB															
BNEZ															

6 Instruction

10 stall

2 flush

$$6 + 10 + 2 = 18 \text{ cycles per iteration}$$

(b) With Forwarding

Cycle	1	2	3	4	5	6	7	8	9	10
LD	IF	ID	EX	MEM	WB					
ADDI			IF	ID	EX	MEM	WB			
SB										
ADDI										
DSUB										
BNEZ										

6 Instruction

1 stall

$$6 + 1 = 7 \text{ cycles per iteration}$$

single Cycle Delayed with Forwarding.

Cycle	1	2	3	4	5	6	7	8	9	
LD	IF	ID	EX	MEM	WB					
DADDI		IF	S	ID	EX	MEM	WB			
SD			IF	ID	EX	MEM	WB			
DADDI2				IF	ID	EX	MEM	WB		
ASUB					IF	ID	EX	MEM	WB	
BNEZ						Instruction	IF	ID	EX	MEM
NOP								IF	ID	EX

6 Instructions

1 stall

1 delay

$6 + 1 + 1 = 8$ cycles per iteration.