BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Quiz - 4
Duration: 25minutes

Semester: Fall 2024
Full Marks: 15

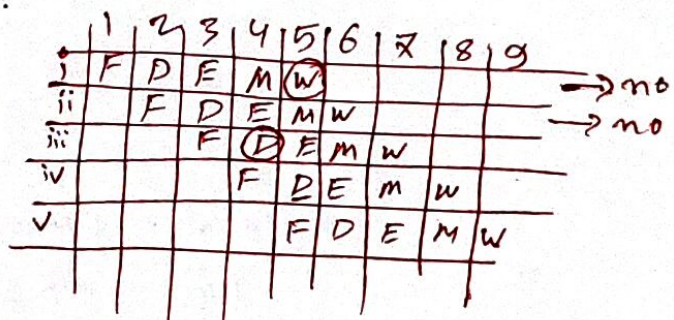
CSE 340: Computer Architecture

Name: Solution	ID:	Section:

1. Consider the code sequence given below.

LD X_{21}, 40(X_{22}) → no Hazard
ADD X_{25}, X_{22}, X_{20} → 4 4
SD X_{22}, 16(X_{21}) → Reg X_{21} updated on clock C-5; but Decode for 3rd line is in clock-C-6.
← SUB X_{23}, X_{21}, X_{20}
LD X_{23}, 32(X_{22})
No Hazard

5 cycle gap: W, D (no Hazard)



a. How many data hazards are there in the given code sequence? 1 [2]

b. Apply only stall + forwarding to overcome the data hazards. [5]

c. Calculate the total clock cycles and average CPI required after applying the method. [3]

b/

	cc1	cc2	cc3	cc4	cc5	cc6	cc7	cc8	cc9
LD	IF	ID	EX	MEM	WB				
ADD		IF	ID	EX	MEM	WB			
SD			IF	ID	EX	MEM	WB		
SUB				IF	ID	EX	MEM	WB	
LD					IF	ID	EX	MEM	WB

c/ total clock cycle = 9

Avg. CPI = $\frac{9}{5}$ = 1.8

2. The following table shows the different stages involved in executing instructions and the corresponding durations for each stage:

stages	Instruction Fetch	Register Read	ALU Op	Memory Access	Register Write
Duration	50ps	10ps	30ps	20ps	10ps

Given the above durations, determine the total time required to complete each of the following instructions:

	Instructions	Time to complete each instruction
i.	ADD X_{21}, X_{22}, X_{23}	50+10+30+10 = 100 ps
iv	ADDi X_{21}, X_{22}, 5	50 + 10 +30 +10 = 100 ps
v.	LD X_{21}, 22(X_{20})	50 + 10 +30 +20+10 = 120 ps
vi.	SD X_5, 22(X_{23})	50+10+30 +20 = 110 ps
vii	BEQ X_6, X_8, End	50 +10 +30 = 90 ps

Suppose the above instructions are being run in a **single cycle datapath**.

a. **Determine** the clock period of this system? [1]

Answer: 120ps.

b. **Calculate** the number of clock cycles needed to execute this instruction set. [2]

Answer: 5 / 7

b. What would be the total time to run this instruction sequence? [2]

Answer: 120 X 5 = 600 ps. / 120 X 7 = 840 ps.