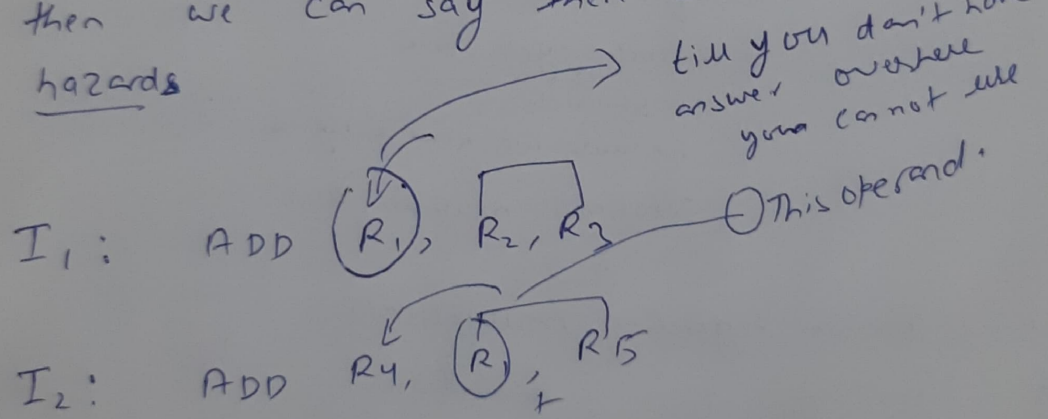
Data Hazards in Pipe line Structure

Data hazard means operand conflicts when we execute instructions.

in pipe line what we do!

we parallely execute the instructions

But as if first instructions is having few operands and second instructions is having few operands and as if operands dependency is there then we can say there is data hazards



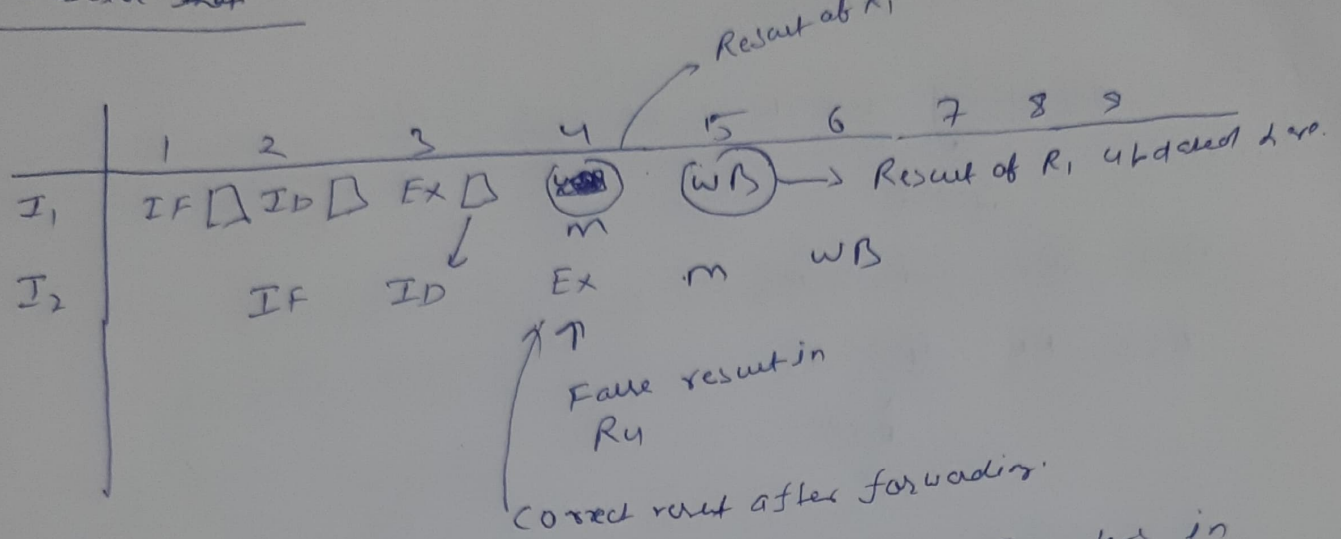
Considering 5 stage pipe line.

	1	2	3	4	5	6	7	8	9
I_1	IF	ID	EX	M	WB	Result R_1			
I_2		IF	ID	EX	M	WB			
			oldr R_1 Result						

output of first instructions is input to 2nd instructions

Result is depending in previous instructions

By operant forwarding we can resolve that.



in operand forwarding there will be buffer Registers in between the stages.

Execute is having result but it is updated the value of R_1 at WB stage.

The buffer register will be holding the value of Result.

In examination they can give statement like Here we are using operand forwarding. means by default there is no data hazard. but if it is not given we have to consider data hazard.

if data hazard is happening and operand forwarding is not given in that case we can not execute ID stage at 2nd clock. we will have to delay by this cycles and we have to start execution from 6th clock cycle. so if we start execution from 6th cycle means we have to stall preceding stages.

Data Dependency is RAW dependency

RAW → Read after write

in true dependency we will reading after write

writing

ADD (R1), R2, R3

ADD R4, (R1), R6

Reading

ADD R1, R2, R3

ADD R4, R1, R5

o/p i/p

How to calculate no of RAW dependency.

I/O (NI) ∩ O(I+) ≠ ∅

WAR

Write after Read (Anti dependency)

ADD R1, R2, R3

ADD R2, R1, R3

o/p I/o

I O{I+} ∧ O·O(NI} ≠ ∅

WAW - write after write (output dependency)

ADD (R1), R2, R3

ADD (R1), R4, R5

out

O O{I+} ∩ O·O{NI} ≠ ∅

WAW output dependency.