		Course Name:	Computer Architecture	Course Code:	EE204
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Student : Name:_____ Roll No._____ Section:_____

Question 1a [6]

What is Memory Hazard in reference to forwarding? Write pseudo-code to detect it!

Question 1b [4]

What are structural hazard? Provide an example and its solution!

Question 2 [10]

Consider the following program that will be executed on a **2-issue Superscalar MIPS** architecture with **Static Branch Prediction (BACKWARD TAKEN)**

Consider the following specification for our pipelined processor:

• Five stages MIPS pipeline with **three execution units 2 adders and 1 multiplier**. Adder takes 1 cycle in execution and multiplier takes 3 cycles.

• **Forwarding is implemented**

• Computation of PC and TARGET ADDRESS for branch & jump instructions anticipated in the **ID stage**

```
L1: lw R2, 50 (R4)
    addi R2, R2, 4
    lw R3, 150 (R4)
    addi R3, R3, 8
    mul R5, R2, R3
    sw R5, 250 (R4)
    addi R4, R4, 4
    bne R4, R7, L1
```

In-order issue and out-of-order execution and completion rules are applied. For each cycle, show which instructions is at which stage by filling the following table. You don't need to write complete instructions. Just write the instruction numbers from the code above.

Cycle No.	IF	ID	EX			MEM	WB
			+/-	+/-	*		
1							
2							
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