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Student : Name:_____ Roll No._____
Section:_____

Question 1a [8]

What is the difference between stalling an instruction and flushing an instruction? Suppose an exception occur in execution stage. How that exception will be handled? Write procedure to stall/flush different instructions.

Question 2 [12]

Consider the following MIPS assembly language code. Assume that we run this code on the five stages pipelined data path. Multiplication consumes 2 cycles in execution.

1. **L1: lw R2, 50 (R4)**
2. **addi R2, R2, 4**
3. **lw R3, 150 (R4)**
4. **addi R3, R3, 8**
5. **mul R5, R2, R3**
6. **sw R5, 250 (R4)**
7. **addi R4, R4, 4**
8. **bne R4, R7, L1**

a) Add stalls in the above code to remove all data and control hazards. Assume full forwarding (Exe to Exe, Mem to Exe, Exe to Dec, Mem to Mem) is implemented.

b) Rearrange the code to remove as many stalls as possible.