1. Explain different types of pipeline hazards with examples (Structural, Control, Data hazards)
   Structural Hazards: Occur when hardware resources are not sufficient. For example, if a single memory port is used for both instruction fetch and data access, a conflict can occur.
   Data Hazards: Arise from dependencies between instructions.

   - Read After Write (RAW): An instruction depends on the result of a previous instruction. Example: ADD R1, R2, R3 followed by SUB R4, R1, R5.
   - Write After Read (WAR): An instruction writes to a register that a previous instruction has read. Example: MOV R1, R2 followed by ADD R2, R3, R4.
   - Write After Write (WAW): Multiple instructions are written to the same register. Example: MOV R1, R2 followed by MOV R1, R3.

   Control Hazards: Occur with branch instructions affecting instruction flow. Example: BEQ R1, R2, Label may cause incorrect instructions to be fetched if the branch is not resolved in time.

2. What are the ways to resolve different pipeline hazards? What are the pros and cons of these resolution techniques?
   Structural Hazards

   - Add More Resources: Increase the number of hardware units to avoid conflicts.
   - Resource Scheduling: Allocate resources to minimize conflicts.

   Data Hazards

   - Data Forwarding: Pass results directly between instructions to avoid delays.
   - Stalling: Insert no-operations (NOPs) to wait for data readiness.
   - Register Renaming: Use different registers to resolve conflicts.

   Control Hazards

   - Branch Prediction: Predict branch outcomes to pre-fetch instructions.
   - Branch Target Buffer (BTB): Cache branch targets for faster resolution.
   - Speculative Execution: Execute instructions based on predictions.
   - Pipeline Flushing: Cancel and restart instructions when predictions are wrong.

3. Identify the pipeline hazards in the below sequence of instructions. Explain why these instructions are resulting in pipelining hazards.
   a. SUB R1,R4,R3
      ADD R1,R2,R3
      This is an example of a data hazard of the category write after write.
   b. ADD R1,R2,R3
      SUB R4,R1,R3
      This is an example of a data hazard of the category read after write.
   c. SUB R4,R1,R3
      ADD R1,R2,R3
      This is an example of a data hazard of the category write after read.