**Assignment 2**

**Task: JTAG Operation Simulation**

**Objective:** Simulate a JTAG operation.

**Answer**

JTAG Operation Simulation Objective: Simulate a JTAG operation. Steps: Draft a JTAG TAP controller state diagram. Simulate instruction register loading. Observe state changes, record results.

**1. JTAG TAP Controller State Diagram**

The JTAG TAP controller operates through several states, controlled by the TMS (Test Mode Select) and TDI (Test Data Input) signals. Here’s a simplified state diagram for a typical JTAG TAP controller:

**Test-Logic Reset (TLR):** This state initializes the TAP controller and the associated test logic.

* **Run-Test/Idle (RTI):** In this state, the TAP controller is idle and ready for the next instruction.
* **Select-DR Scan (SDR) and Select-IR Scan (SIR):** These states select either the Data Register (DR) or the Instruction Register (IR) for shifting data.
* **Capture-DR (CDR) and Capture-IR (CIR):** These states capture data from the selected register.
* **Shift-DR (SDR) and Shift-IR (SIR):** In these states, data is shifted into or out of the selected register.
* **Exit1-DR (EDR) and Exit1-IR (EIR), Pause-DR (PDR) and Pause-IR (PIR), Exit2-DR (EDR) and Exit2-IR (EIR):** These states provide additional flexibility during the shifting process.
* **Update-DR (UDR) and Update-IR (UIR):** These states update the content of the selected register with the shifted data.

**2. Simulate Instruction Register Loading**

To simulate the loading of the Instruction Register (IR):

* **Initialize TAP Controller:** Start from the Test-Logic Reset (TLR) state.
* **Transition to Select-IR Scan (SIR):** Move to this state by applying the appropriate TMS sequence (typically TMS=1, TMS=0).
* **Load Instruction Register:** Apply the desired TDI sequence to load data into the IR.
* **Transition through Shift-IR (SIR) and Update-IR (UIR):** Shift the data into the IR and update it.
* **Observe State Changes:** Monitor the state changes of the TAP controller as you apply TMS and TDI signals.

**Record Results:** Note down the final content of the Instruction Register and any observed state transitions.

**3. Example Sequence**

Assume you want to load a specific instruction into the IR:

* **Initialize:** Start from TLR.
* **Select-IR Scan:** TMS=1, TMS=0 transitions to SIR.
* **Load Data:** Apply TDI signals corresponding to the instruction you want to load.
* **Shift Data:** Continue shifting data if necessary (using TMS=0 transitions to SIR).
* **Update IR:** Apply TMS=1, TMS=1 to update the IR content.
* **Final State:** Return to RTI or transition as needed based on the simulation requirements.

**4. Observations and Recording**

* **State Transitions:** Note each state transition and the corresponding TMS and TDI signals applied.
* **IR Content:** Record the final content of the Instruction Register after loading.
* **Simulation Logs:** Document the entire simulation process, including any unexpected behavior or errors encountered.