a) FSM for the water tank system:

1. **States**:
   - **State 1**: `Water_On` : The water faucet is on, and the system is filling the tank.
   - **State 2**: `Water_Off` : The water faucet is off.
2. **Input Alphabet**:
   - The input is the water level h, with thresholds:
     - $h_{\min}$: Minimum water level for turning on the faucet.
     - $h_{\max}$: Maximum water level for turning off the faucet.
3. **Transitions**:
   - From `Water_On` to `Water_Off` : If $h \geq h_{\max}$, turn off the faucet.
   - From `Water_Off` to `Water_On` : If $h \leq h_{\min}$, turn on the faucet.
4. **Initial State**:
   - Start in `Water_Off` , assuming the tank begins with a water level above $h_{\max}$.
5. **Output**:
   - In `Water_On` , the output is "Faucet On".
   - In `Water_Off` , the output is "Faucet Off".

FSM Representation:

- **State 1: Water_On (Faucet On)**
  - Transition: If $h \geq h_{\max}$, move to State 2 (`Water_Off`).
- **State 2: Water_Off (Faucet Off)**
  - Transition: If $h \leq h_{\min}$, move to State 1 (`Water_On`).

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b) Is the FSM model pure or with conditional structures?

The FSM remains **with conditional structures**, as transitions between states depend on the conditions set by the water levels $h_{\min}$ and $h_{\max}$.

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c) Is the FSM model deterministic or nondeterministic?

The FSM is **deterministic**. The next state is uniquely determined by the current state and the water level h. There is no ambiguity in the transitions.

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d) Does the FSM model terminate (accept a state)?

The FSM does **not terminate**, as it cycles indefinitely between the `Water_On` and `Water_Off` states to maintain the water level.

In [ ]: