Homework 1 Solutions

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Question 1: Vending Machine Automaton

Determine the accepted words for reaching state 25.

```
accepted_words_vending_machine = [
    "55555",
    "55510",
    "55105",
    "51055",
    "10555",
    "10105"
]
```

Any sequence of 5s and 10s summing to 25 is accepted.

Question 2: Turnstile Automaton

Describe accepted words via a regular expression.

```
regular_expression_turnstile = r"pay (pay | push pay)*"
```

Explanation:

- `pay` must be the first input to unlock the turnstile.

- Additional `pay` keeps it unlocked.

- `push pay` locks and then unlocks, repeating indefinitely.

Question 3: Binary Language Classification

Determine which words belong to L1, L2, and L3.

```
binary_language_classification = {
    "10011": {"L1": False, "L2": False, "L3": False},
    "100": {"L1": False, "L2": False, "L3": False},
    "10100100": {"L1": True, "L2": True, "L3": True},
    "1010011100": {"L1": True, "L2": False, "L3": True},
    "11110000": {"L1": False, "L2": True, "L3": True}
}
```

Question 4: DFA Accepting States

Determine which words end in the accepting state q1.

```
dfa_accepting_states = {
    "0010": True,
    "1101": True,
    "1100": False
}
```

Words "0010" and "1101" end in q1, while "1100" does not.