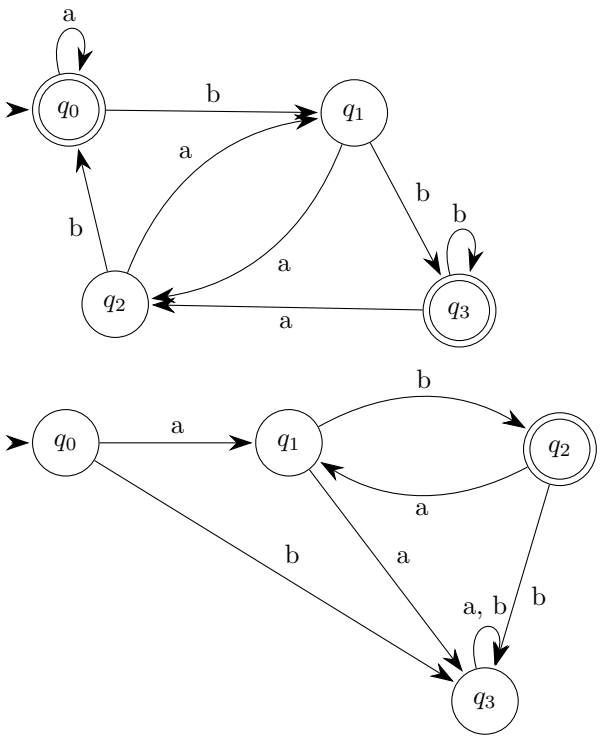
Answer the questions in two hours.

1. **(30 points)** Construct a DFA that accepts the set of all strings that start with no more than three consecutive $1s$ and contain at least two consecutive $0s$.

2. **(25 points)** Describe the equivalence classes ($\approx$) for the following languages:

   - $\{w \| \text{ the length of } w \text{ is odd and its middle symbol is a } 0\}$
   - $D = \{w \| w \text{ contains an even number of } a's \text{ and an odd number of } b's \text{ and does not contain the substring } ab\}$

3. **(20 points)** Please give the regular expressions for the complement languages ($\overline{L} = \Sigma^* - L$) of the following DFAs:



4. **(25 points)** Considering the following grammar with the given productions:
   $S \to aT$, $T \to bT$, $T \to a$, $T \to aW$, $W \to e$, $W \to aT$.

   - Construct a DFA that accepts the language of the grammar.
   - Write a regular expression that generates the language of the grammar.