Problem

Show that ALL_{DFA} is in P.

Step-by-step solution

Step 1 of 2

Class P : P is a class of languages that are decidable in polynomial time on a deterministic single – tape Turing – machine.

$$\text{All}_{DFA} = \left\{ \langle A \rangle \, A \text{ is a } DFA \text{ that recognies } \Sigma^* \right\}$$

Comment

Step 2 of 2

$E_{DFA} = \left\{ \langle A \rangle \, A \text{ is a } DFA \text{ and } L(A) = \phi \right\}$ is determined by a Turing – machine (TM)

Let E be the Turing machine that determines E_{DFA}

Let R be the Turing machine that determines ALL_{DFA}

The algorithm of R is as follows:

$R = $"On input $\langle A \rangle$, where A is a DFA :

1. Construct a DFA B that recognizes $\overline{L(A)}$, by swapping accept and non – accepting states

2. Run the TM E on input $\langle B \rangle$, where E determines E_{DFA}.

3. If E accepts, then accept

4. If E rejects, then reject."

Clearly the TM, R determines ALL_{DFA} in polynomial time.

Therefore, ALL_{DFA} is in P.

Comments (4)