Theory of Automata and Formal Language

Lecture-19

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Determination of regular expression from finite automata

The following assumptions are made regarding the transition system:-

(i) The transition graph does not contain $\epsilon - move$.
(ii) It has only one initial state, say q_1.
(iii) Let all the states are q_1, q_2, q_3,................,q_n,
(iv) Let α_{ij} denotes the regular expression representing the set of labels of edges from q_i to q_j. When there is no such edge, $\alpha_{ij} = \phi$.

Regular Expression

In this process to find regular expression, initially we make n equations as the following:-

$$q_1 = q_1\alpha_{11} + q_2\alpha_{21} + q_3\alpha_{31} + \ldots\ldots\ldots\ldots\ldots + q_n\alpha_{n1} + \epsilon$$

$$q_2 = q_1\alpha_{12} + q_2\alpha_{22} + q_3\alpha_{32} + \ldots\ldots\ldots\ldots\ldots + q_n\alpha_{n2}$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

$$q_n = q_1\alpha_{1n} + q_2\alpha_{2n} + q_3\alpha_{3n} + \ldots\ldots\ldots\ldots\ldots + q_n\alpha_{nn}$$

We solve these equations by using ARDEN's theorem . The regular expression will be the union of regular expressions corresponding to each final states.
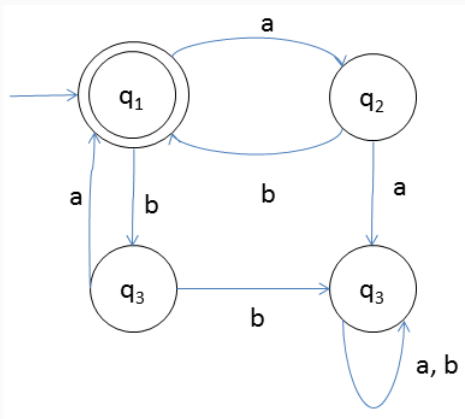
Some Examples

Example: Find the regular expression corresponding to the following finite automata:-
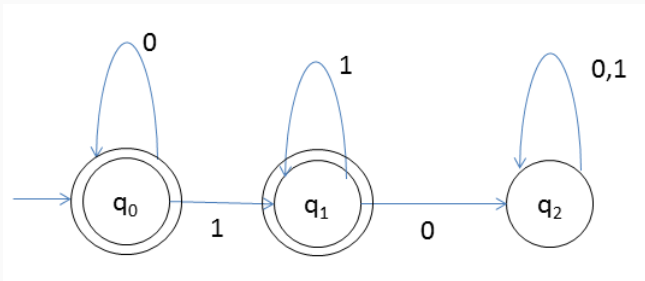
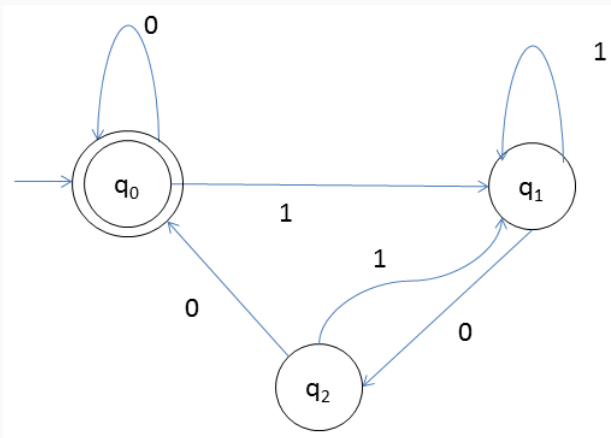**Example:** Find the regular expression corresponding to the following finite automata:-

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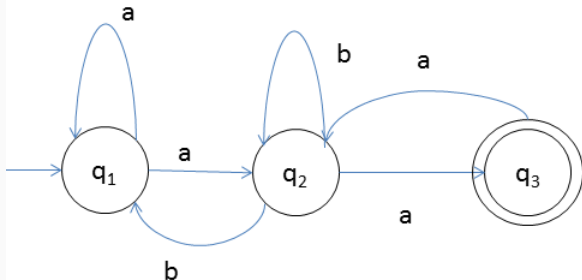
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