DETERMINISTIC FINITE AUTOMATA

Theory of Computation

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1. Construct a deterministic finite automaton accepting all and only strings in the language represented by the following regular expression:

$$((aa \cup bb)c)^*$$

$$M = (K, \Sigma, \delta, s, F)$$

$$K = \{q_0, q_1, q_2, q_3, q_4, q_5\}$$

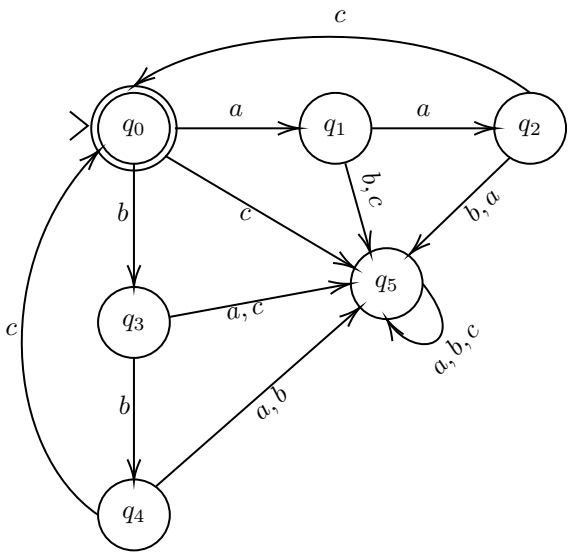
$$\Sigma = \{a, b, c\}$$

$$s = q_0$$

$$F = q_0$$

$$\begin{array}{lll} \delta(q_0, a) = q_1 & \delta(q_1, a) = q_2 & \delta(q_2, a) = q_5 \\ \delta(q_0, b) = q_3 & \delta(q_1, b) = q_5 & \delta(q_2, b) = q_5 \\ \delta(q_0, c) = q_5 & \delta(q_1, c) = q_5 & \delta(q_2, c) = q_0 \end{array}$$

$$\begin{array}{lll} \delta(q_3, a) = q_5 & \delta(q_4, a) = q_5 & \delta(q_5, a) = q_5 \\ \delta(q_3, b) = q_4 & \delta(q_4, b) = q_5 & \delta(q_5, b) = q_5 \\ \delta(q_3, c) = q_5 & \delta(q_4, c) = q_0 & \delta(q_5, c) = q_5 \end{array}$$



2. Consider the deterministic finite automaton $(K, \Sigma, \delta, s, F)$ where $K = \{p, q, r\}, \Sigma = \{a, b, c\}, s = p, F = \{q\}$ and δ is given by the following chart:

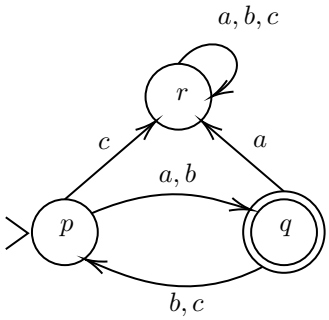
x	y	$\delta(x, y)$
p	a	q
p	b	q
p	c	r
q	a	r
q	b	p
q	c	p
r	a	r
r	b	r
r	c	r

Find a regular expression for the language recognized by this automaton.

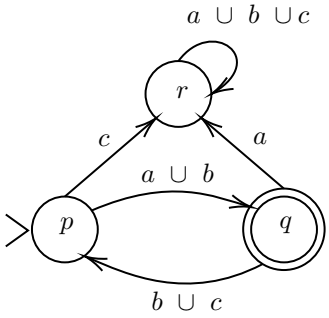
Answer:

$$(a \ \cup \ b)((b \ \cup \ c)(a \ \cup \ b))^*$$

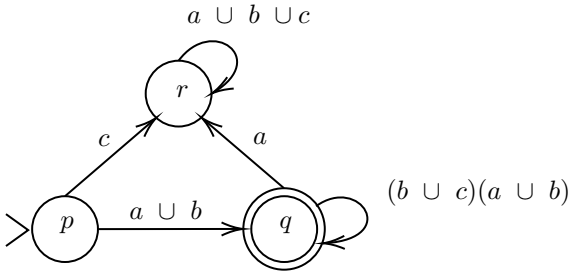
Step 1:



Step 2:



Step 3:



Step 4: