MET CS662 - Assignment #4

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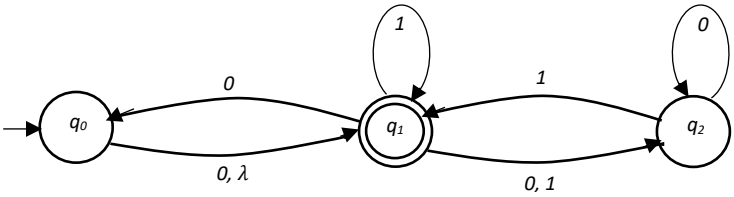
1. Convert the following nfa into an equivalent dfa.



Ans:

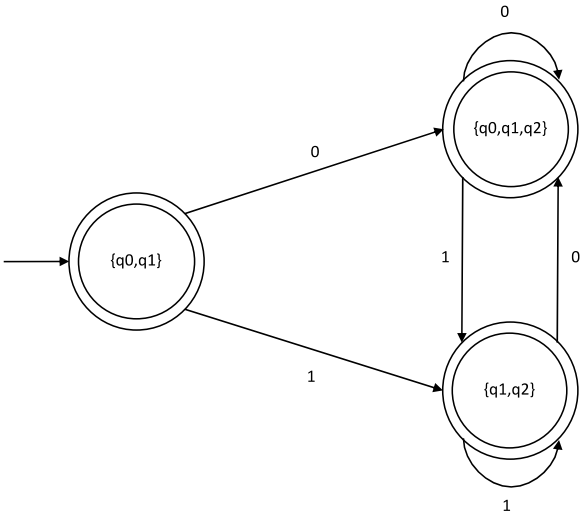
Transition function

$\delta(\{q_0, q_1\}, 0) = \{q_0, q_1, q_2\}$
$\delta(\{q_0, q_1\}, 1) = \{q_1, q_2\}$
$\delta(\{q_0, q_1, q_2\}, 0) = \{q_0, q_1, q_2\}$
$\delta(\{q_0, q_1, q_2\}, 1) = \{q_1, q_2\}$
$\delta(\{q_1, q_2\}, 0) = \{q_0, q_1, q_2\}$
$\delta(\{q_1, q_2\}, 1) = \{q_1, q_2\}$

Transition table

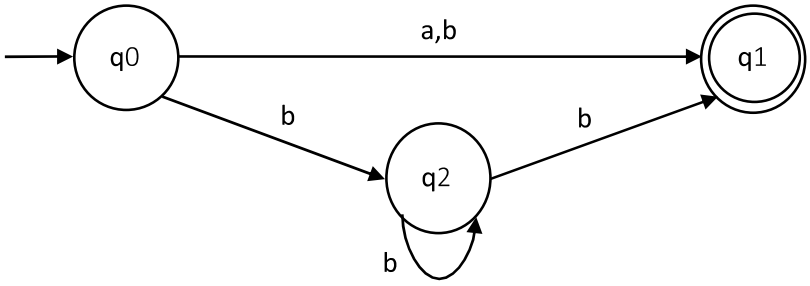
State	0	1
$\rightarrow * \{q_0, q_1\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
$* \{q_0, q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$
$* \{q_1, q_2\}$	$\{q_0, q_1, q_2\}$	$\{q_1, q_2\}$

DFA



2. Find an nfa without λ-transitions and with a single final state that accepts the set $\{a\} \cup \{b^n \mid n \geq 1\}$.

Ans:



3. Find a regular expression for the set $\{a^n b^m \mid (n+m)\ is\ even\}$

Ans:
$r = (aa)^*(bb)^* + a(aa)^*b(bb)^*$

4. Find a regular expression for

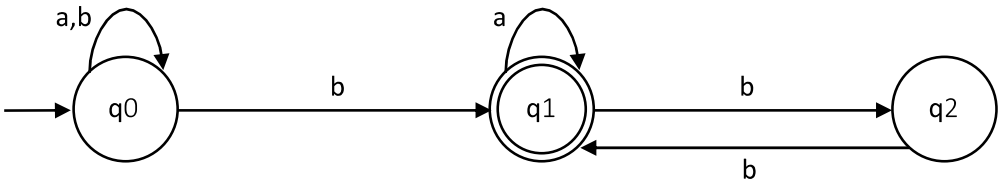
$$L = \{\omega \in \{0,1\}^* \mid \omega\ has\ exactly\ one\ pair\ of\ consecutive\ zeros\}$$

(Two 0's in a row appear exactly once: examples 1001011111010111 is OK, 10010001 is not)

Ans:
$r = (1+01)^*00(1+10)^*$

5. Give a nfa that accepts the language $L = ((a+b)^*b\ (a+bb)^*)$

Ans:



6. Find all strings in $L = ((a+b)^*b\ (a+ab)^*)$ of length three or less.

Ans:
$\{b, ab, bb, ba, abb, bbb, aab, bab, baa, aba, bba\}$

7. Find a regular expression for the following language defined on $\{a, b\}$.

$$L = \{\omega \mid n_a(\omega)\ and\ n_b(\omega)\ are\ both\ even\}$$

Ans:

$r = (aa + bb + abba + baab + abab + baba)^*$
