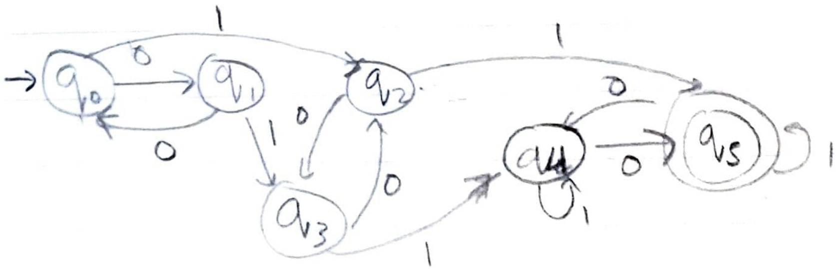
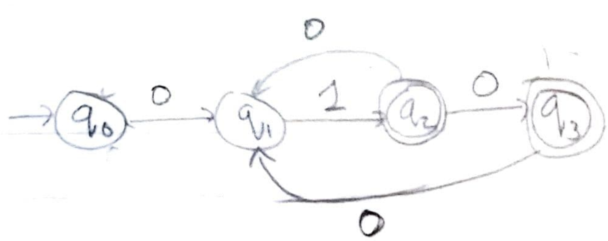
CSE 303 Midterm exam Michael Lee

1 $\{w \mid w \in (0+1)^*$, w has an even number of 0s and at least two 2s$\}$

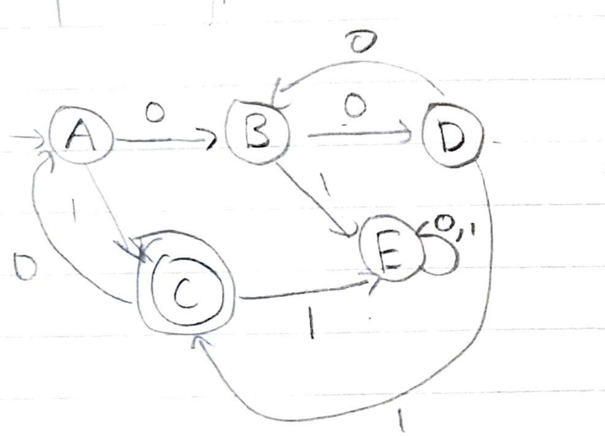


2



3.

		0	1
A	q_0	$\{q_2, q_3\}$	$\{q_2, q_1\}$
B	$\{q_2, q_3\}$	$\{q_0, q_4\}$	$\emptyset$
C	$\{q_2, q_1\}$	$\{q_0\}$	
D	$\{q_0, q_4\}$	$\{q_1, q_3\}$	$\{q_2, q_1\}$
E	$\emptyset$	$\emptyset$	$\emptyset$



4. a) $((0+1)^* 00 (0+1)^* 11 (0+1)^*) + ((0+1)^* 11 (0+1)^* 00 (0+1)^*)$

b) $1^* + 1^* 0 1^*$

c) $00(0+1)^*00 + 11(0+1)^*11 + 00(0+1)^*11 + 11(0+1)^*00$

5. a) If L is a regular language, there exists pumping lemma constant N, s.t. $|w| \geq N$ and $w = xyz$ where $y \neq \varepsilon$, $|xy| \leq N$, and for all $k \geq 0$, $xy^kz \in L$. Assume $\{0^n 1^m \mid 0 \leq n \leq 2m\}$ is regular. Then, substring xy must be 0s where $|xy| \leq n$. However, if we pump k infinitely big, $n > 2m$. Thus, L is not regular.

b) i) minimum is 4 as y (where it is to be pumped) is 1 and if pumped to length 1, string length is 4

ii) minimum is 1 as if the string starts with 0, $y = 0$ and 0 can be pumped. If string starts with 1, $y = 1$ and 1 can be pumped.