Midterm #1 (CS3186)

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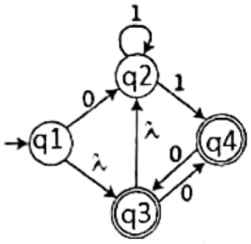
SHOW ALL THE STEPS TO RECEIVE FULL CREDIT FOR EACH OF THE FOLLOWING:

i) Given the following NFA



(i) (2 points) Give two strings of different lengths that are accepted by the above NFA:

λ, 0, 01

(ii) (6 points) Convert the NFA to an equivalent DFA (Include a trap/dead state if necessary to completely describe the DFA). Describe the state diagram and label the new states using new labels A,B,C,D,E,.... (as needed)

q	0	1	λ
→ 1	2	∅	3
2	∅	2,4	∅
★ 3	4	∅	2
★ 4	3	∅	∅

⇒

q	0	1	
→ 1	2,3	D	A
★ 2,3	2,4	2,4	B
★ 2,4	3	2,4	C
★ 3	2,4	D	E
D	D	D	

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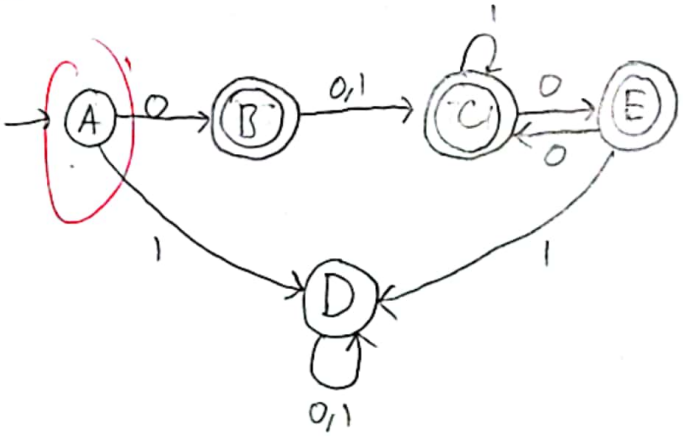
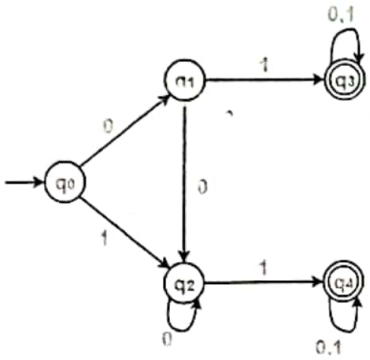
9 initial state can be q_1, q_2, q_3



II) Given the following DFA



0 equiv : {0,1,2} {3,4}

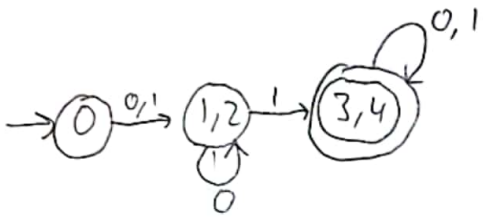
1 equiv : {0,1,2} {3,4}

2 equiv : {0} {1,2} {3,4}

3 equiv : {0} {1,2} {3,4}

q	0	1
0	1	2
1	2	3
2	2	4
3	3	3
4	4	4

(5 points) Convert to an equivalent minimal DFA. Show the partitioning steps.



How many states are in the minimal DFA: 3

III) (5 points) Use any proof technique to prove the statement: "if m and n are both odd integers, then m + n is an even integer." (State the proof technique being used and show the work)

Contradiction; if m & n are both odd, then m+n is odd ; if P, then ~q

let $m = 2k+1$ & $n = 2j+1$; ie odd #s

$\therefore\ m+n = 2l+1$

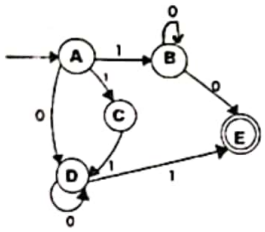
$(2k+1)+(2j+1) = 2l+1$

$2(k+j+1) = 2l+1$

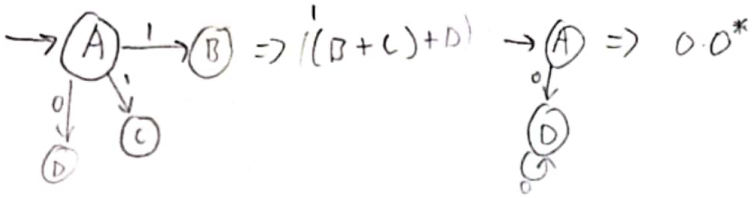
$2P = 2l+1$; $k+j+1$ is a Constant; $P = k+j+1$

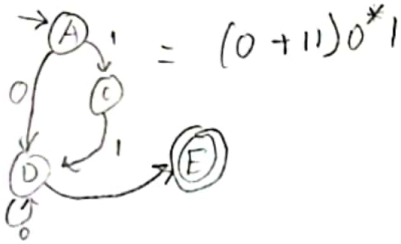
in this case, the left hand side states that it is even, however we assumed the result must be odd. Therefore, it is impossible for m+n to be odd if m & n are both odd m+n must be even

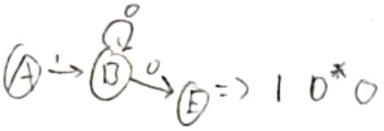
IV) Given the Following NFA



(i) (6 points) Derive an equivalent regular expression. Create a new start state (s) and a new final state (f). Show step by step eliminating one state at a time in deriving the regular expression.







$(((0+11)0^*1)+(10^*0))$.

-1

(ii) ((6 points) From above NFA, write an equivalent regular grammar as (V,T,P,S)

$V = \{A, B, C, D, E\}$; $T = \{0, 1\}$, $P = A$,

$S = \{$

$A \rightarrow 1B \mid 1C \mid 0D$

$B \rightarrow 0B \mid 0E$

$C \rightarrow 1D$

$D \rightarrow 0D \mid 1E$

$E \rightarrow \lambda$

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