Ma2201/CS2022
Quiz 1001

Foundations of C.S.

Spring, 2021

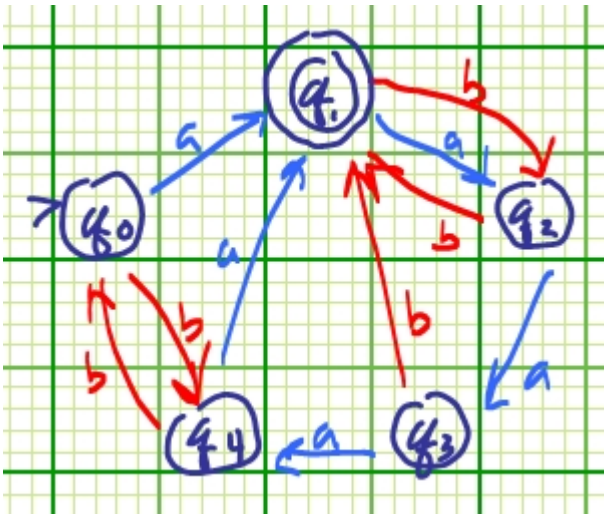
PRINT NAME: _____
SIGN: _____

1. (**3 pts**) Suppose that the output of the CYK algorithm is given below.

$$\begin{array}{ccccccccc} & & & S & & & & & \\ & & A & & B & & & & \\ & C & & D & & E & & & \\ F & & G & & H & & I & & \\ J & & K & & L & & M & & N \\ a & & b & & c & & d & & e \end{array} .$$

What are all the various S rules which G could have which justified placing S on top?
♣ *Each rules which could be used corresponds to a parenthesation:*
$(a)(bcde)$: $S \to JB$
$(ab)(cde)$: $S \to FE$
$(abc)(de)$: $S \to CI$
$(abcd)(e)$: $S \to AN$ ♣

2. (**3 pts**) Consider the following diagram of a Deterministic Finite Automaton.



Give 2 strings of length 4 in $L(M)$.
Write the transition function of L in tabular form.
♣ *First super-easy: abab and bbba.*
For tabular form, just be careful:

	a	b
q_0	q_1	q_4
q_1	q_2	q_2
q_2	q_3	q_1
q_3	q_4	q_1
q_4	q_1	q_0

♣

3. (**4 pts**) Design a deterministic finite automaton for the language of all strings on $\{a, b\}$ which have an even number of a's, start with an a, and in which the substring bb does not occur.

You may give your machine in tabular form, or as a diagram, either using incomplete determinism or not.

Make sure that you indicate your design principles.

♣ *There are lots of different approaches. These are the states I considered, and the method is very much like what we did for regular grammars:*

Q_0 - *Start State*

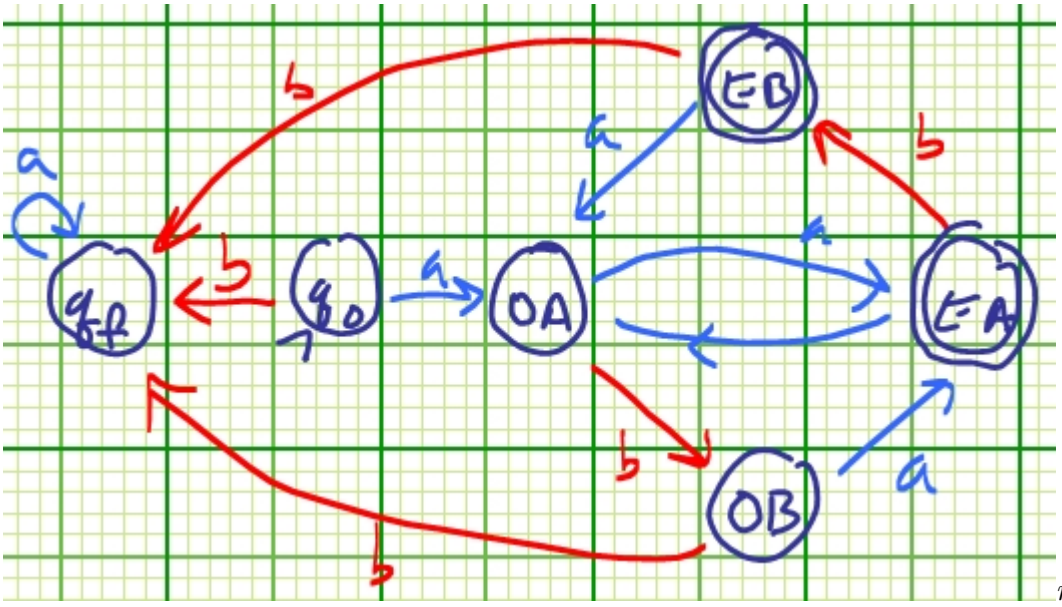
EA - *Even number of a's so far, and ends in a.*

EB - *Even number of a's so far, and ends in b.*

OA - *Odd number of a's so far, and ends in b.*

OB - *Odd number of a's so far, and ends in b.*

Q_f - *failure state.*



missing loop, sorry

♣