

NAME: \_\_\_\_\_

FLORIDA INT'L UNIV.

MAD 3512: Quiz #1 - Fall 09

TIME: 25 min.

Just write "TRUE" or "FALSE"

- (10) 1(a) For any language A on  $\{0,1\}$ , we always have  $(A^*)^R = (A^R)^*$ . \_\_\_\_\_  
(b) The set of all co-finite languages on  $\{a,b\}$  is countable. \_\_\_\_\_  
(c) If a regular expression E contains  $a^*$ , then  $L(E) \neq \emptyset$ . \_\_\_\_\_  
(d) If all states in a DFA M are accessible, then  $L(M) \neq \emptyset$ . \_\_\_\_\_  
(e) If G is a CFG with a production of the form  $S \rightarrow ASA$  and G has no useless production, then  $L(G)$  is infinite. \_\_\_\_\_

Just write down the correct answer.

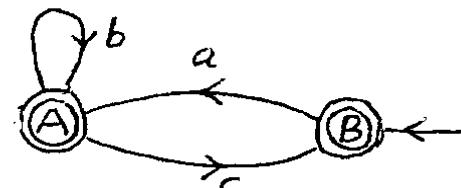
- (18) 2(a) Find a regular expression E for the set of all strings in  $\{0,1,2\}^*$  which contains at most two 1's.

Ans:  $E =$

- (b) If  $G = \{S \rightarrow aSBB, S \rightarrow aa, B \rightarrow b, B \rightarrow \lambda\}$ , then  
 $L(G) =$

- (c) If M is the NFA on the right, then

$L(M) =$



- (d) Find a RLG G for  $b^* \cdot \underline{a^*} \cdot \underline{b} \cdot a$

Ans:  $G =$

- (e) Find a DFA M with  $L(M) = (\underline{0^*} \cdot \underline{1}) + (\underline{1^*})$

Ans:  $M =$

Use the back of this paper for question #3.

- 2) 3(a) A regular expression over  $\{a,b,c\}$  is a string on which alphabet?  
(b) Define what is an ambiguous context-free grammar G.  
(c) Define when two states of a DFA M are indistinguishable.  
(d) Define the extended transition function of an DFA M.

- 1 (a) TRUE ,  $(A^+)^R \ni (\alpha_1, \alpha_2, \dots, \alpha_k)^R = (\alpha_k^R, \alpha_{k-1}^R, \dots, \alpha_2^R, \alpha_1^R) \in (A^R)^*$
- (b) TRUE ,  $\mathcal{L}_{\text{Cof}}\{\alpha, b\} \sim \mathcal{L}_{\text{FIN}}\{\alpha, b\}$ ,  $\mathcal{L}_{\text{FIN}}\{\alpha, b\} = \bigcup_{k=0}^{\infty} L_k$  with  $|L_k| = k$
- (c) FALSE , Consider  $\emptyset, (\underline{q})^*$
- (d) FALSE , Consider a DFA with no accepting states
- (e) FALSE , Consider  $S \rightarrow A\$A, S \rightarrow b, A \rightarrow \lambda$ .

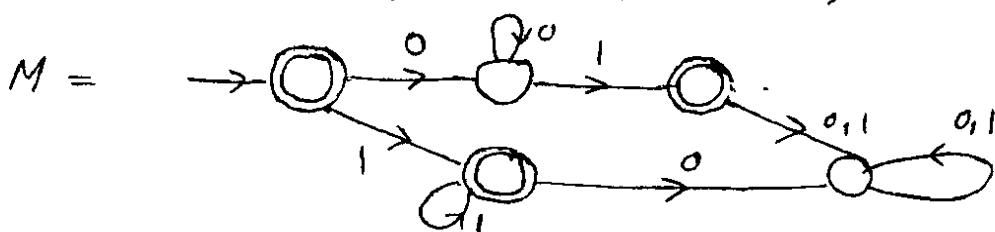
2 (a)  $E = (\underline{0} + \underline{z})^* + (\underline{0} + \underline{z})^* \cdot \underline{1} \cdot (\underline{0} + \underline{z})^* + (\underline{0} + \underline{z})^* \cdot \underline{1} \cdot (\underline{0} + \underline{z})^* \cdot \underline{1} \cdot (\underline{0} + \underline{z})^*$

(b)  $L(G) = \{a^{n+2}b^k : n \geq 0, 0 \leq k \leq 2n\}$

(c)  $L(M) = (\underline{a} \underline{b}^* \underline{c})^* + \underline{a} \cdot (\underline{b} + \underline{c} \underline{a})^*$

(d)  $S \rightarrow bS, S \rightarrow A, A \rightarrow aA, A \rightarrow bB, B \rightarrow a$

(e)



3 (a) A regular expression over  $\{a, b, c\}$  is a string on the alphabet  $\{\underline{a}, \underline{b}, \underline{c}, \underline{\lambda}, \emptyset, +, \cdot, ^*, (), ()\}$

(b) A CFG is ambiguous if it generates a string which has 2 or more left-most derivations

(c) The states  $p$  and  $q$  in a DFA are indistinguishable if for each  $w \in \Sigma^*$ ,  $\delta^*(p, w) \in A \iff \delta^*(q, w) \in A$ . [Here  $\Sigma$  is the input alphabet and  $A$  is the set of accepting states.]

(d) The extended transition function of a DFA is defined recursively as follows:  $\delta^*(q, \lambda) = q$  and  $\delta^*(q, \varphi a) = \delta(\delta^*(q, \varphi), a)$ . [Here  $q \in Q$ ,  $\varphi \in \Sigma^*$ , and  $a \in \Sigma$ .]