

NAME: _____

FLORIDA INT'L UNIV.

MAD 3512: Quiz #1 - FALL 2012

TIME: 25 min.

Answer each part of Qu.1 by writing "**TRUE**" or "**FALSE**" (2 pts each)

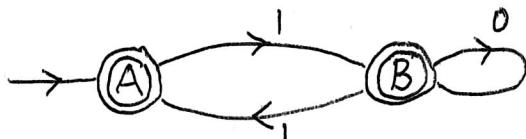
- (10) 1(a) The set of all finite languages on $\{a,b\}$ is countable. _____
- (b) If $L \neq \{\lambda\}$, then L^* will always be an infinite language. _____
- (c) If L is a language on $\{0,1\}$, we always have $(L^R)^C = (L^C)^R$. _____
- (d) If a DFA has no loops at any state, then $L(M)$ is finite. _____
- (e) If G contains the production $A \rightarrow aS$ and G has no useless productions, then $L(G)$ is infinite. _____

Just write down the correct answer. (3,3,4,4,4 points resp.)

- (18) 2(a) Find a regular expression E for the set of all strings in $\{0,1\}^*$ which contains no occurrences of the string 11.

Ans: $E =$

- (b) If M is the NFA below, then $L(M) =$



- (c) If $G = \{S \rightarrow ASB, S \rightarrow a, A \rightarrow a, A \rightarrow \lambda, B \rightarrow bb\}$, then $L(G) =$

- (d) Find a RLG G for $(\underline{1.0})^* . \underline{0.1.1}^*$.

Ans: $G =$

- (e) Find a DFA M with $L(M) = (\underline{b.a})^* + (\underline{a})^*$

Ans: $M =$

Use the back of this paper for question #3. (3 points each)

- (12) 3(a) Define what is a regular expression over the alphabet $\{\#, \$\}$.
- (b) Define what it means for a CFL L to be inherently ambiguous.
- (c) Define when two states p & q in DFA M are indistinguishable.
- (d) Define what is the extended transition function of an NFA.

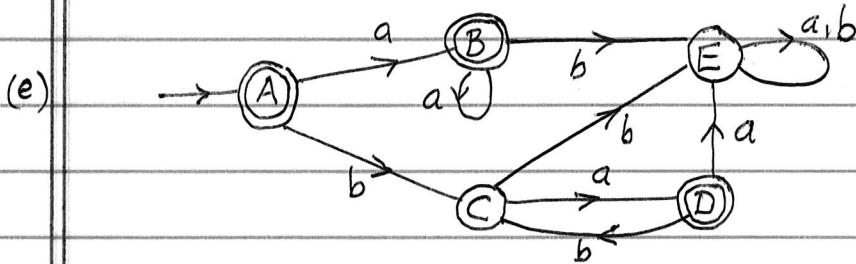
- 1(a) TRUE. $L_{FIN}(V)$ is countable - this is a result from class.
- (b) FALSE. Take $L = \emptyset$. Then $L^* = \{\lambda\}$ which is not infinite.
- (c) TRUE. You can prove this by showing $(L^R)^C \subseteq (L^C)^R$ & $(L^C)^R \subseteq (L^R)^C$.
- (d) FALSE. Take $M = \begin{array}{c} a \\ \rightarrow \textcircled{0} \xrightarrow{a} \textcircled{0} \xleftarrow{a} \end{array}$. Then $L(M) = \{a^{2k+1} : k \in \mathbb{N}\}$
- (e) TRUE. $S \Rightarrow \dots \Rightarrow \varphi A \psi \Rightarrow \varphi a S \psi \Rightarrow \dots \Rightarrow (\varphi a)^n S \psi^n$ which will terminate

2(a) $E = (\underline{0 + 10})^* + (\underline{0 + 10})^* \cdot 1$

(b) $L(M) = (\underline{10^* 1})^* + 1 \cdot (\underline{0 + 11})^*$

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

(d) $S \rightarrow 10S, S \rightarrow 01A, A \rightarrow 1A, A \rightarrow \lambda$.



- 3(a) A regular expression over $\{\#, \$\}$ is defined recursively as follows.

(i) $\#, \$, \lambda$ and \emptyset are regular expressions; (ii) If E and F are regular expressions, then so are $(E+F)$, $(E \cdot F)$, and (E^*) .

- (b) A CFL L is inherently ambiguous if it cannot be generated by any unambiguous CFG.

- (c) Two states p and q in a DFA M are indistinguishable if for each string $w \in \Sigma^*$, $\delta^*(p, w) \in A(M) \iff \delta^*(q, w) \in A(M)$. Here Σ = input alphabet of M & $A(M)$ = set of accepting states of M .

- (d) The extended transition function of an NFA M is the function

$\Delta^* : Q \times \Sigma^* \rightarrow P(Q)$ which is defined by

$\Delta^*(p, w) = \{q \in Q : w \text{ can lead you from } p \text{ to } q \text{ in } M\}$.