NAME: _____ FLORIDA INT'L UNIV.

MAD 3512: Quiz #1 - Spring 08 TIME: 30 min.

Just write "TRUE" or "FALSE".

(10) 1(a) For any languages A and B, we always have $(B.A)^* = (B^*.A^*)$. _____

(b) If a regular expression E contains $\underline{1}^*$, then $L(E) \neq \emptyset$. _____

(c) If a CFG, $G \neq \emptyset$ has no useless productions then $L(G) \neq \emptyset$. _____

(d) Any ambiguous CFG is equivalent to an unambiguous CFG. _____

(e) If a DFA M has no inaccesible states and M has at least one accepting state, then $L(M) \neq \emptyset$. _____

Just write down the correct answer.

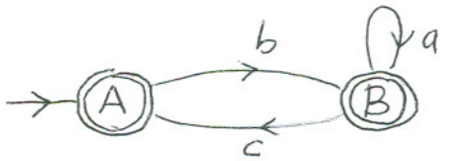
(18) 2(a) Find a *regular expression E* for the set of all strings in $\{a,b\}^*$ which contains at least three b's.

Ans: E =

(b) If $G = \{S \to bSAA, S \to \lambda, A \to a, A \to \lambda\}$, then

$L(G)$ =

(c) If M is the NFA below, then



$L(M)$ =

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

Ans: G =

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

Ans: M =

Use the back of this paper for question #3.

(12) 3(a) A regular expression over {0,1} is a string on ***which alphabet*** ?

(b) Define what is a ***leftmost derivation*** of a string from a CFG G.

(c) Define when two states of a DFA M are ***indistinguishable.***

(d) Define what is the ***extended transition function*** of an NFA M.

MAD 3512 - Theory of Algorithms — Florida Int'l Univ.

Solutions to Quiz #1 — Spring 2008

1. (a) FALSE. Take $A = \{a\}$ and $B = \{b\}$

(b) FALSE. Consider $\underline{0} \cdot \underline{1}^* \cdot \emptyset$

(c) TRUE (e) TRUE

(d) FALSE. If this was true inherently ambiguous CFLs wont exist.

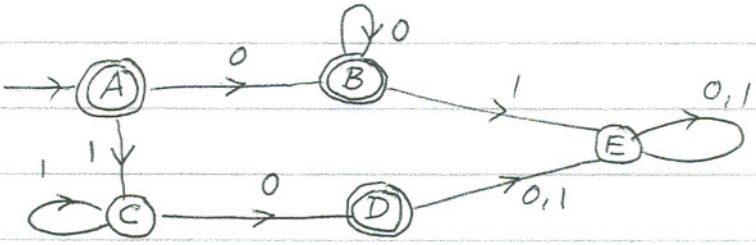
2. (a) $E = (\underline{a}+\underline{b})^* \cdot \underline{b} \cdot (\underline{a}+\underline{b})^* \cdot \underline{b} \cdot (\underline{a}+\underline{b})^* \cdot \underline{b} \cdot (\underline{a}+\underline{b})^*$

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

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

(d) $S \to aS \mid bA \mid cB$, $A \to bA \mid cB$, $B \to b$

(e)



3(a) A regular expression over $\{0,1\}$ is a string on the alphabet $\{\underline{0}, \underline{1}, \underline{\lambda}, \emptyset, +, \cdot, *, (,)\}$.

(b) A leftmost derivation of a string from G is a derivation from G in which the leftmost variable is being replaced at each step of the derivation.

(c) Two states p and q of a DFA M are said to be indistinguishable if for each $\varphi \in \Sigma^*$, $\delta^*(p,\varphi) \in A$ if and only if $\delta^*(q,\varphi) \in A$.
[Here Σ = input alphabet of M and A = set of accepting states in M.]

(d) The extended transition function of an NFA M is the function $\Delta^*: Q \times \Sigma^* \to \mathcal{P}(Q)$ defined by
$\Delta^*(p,\varphi) = \{q \in Q : \varphi \text{ can lead you from } p \text{ to } q\}$.