10 (a) For any language $A$ on $\{0,1\}$, we always have $(A^*)^* = (A^*)^*$. 
(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 $S-ASA$ and $G$ has no useless production, then $L(G)$ is infinite.

Just write down the correct answer.

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

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

(c) If $M$ is the NFA on the right, then 
$L(M) = \ldots$

(d) Find a RLG $G$ for $b^*a^n b a$

Ans: $G = \ldots$

(e) Find a DFA $M$ with $L(M) = (0^*1) + (1^*)$

Ans: $M = \ldots$

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, \((A^*)^k(x, x_2, \ldots, x_k)^k = (\alpha_1^k, \alpha_2^k, \ldots, \alpha_k^k, \alpha_k^k) \in (A^*)^k\)
(b) TRUE, \(\mathsf{L}_{\text{coF}} \{a, b\} = \mathsf{L}_{\text{FIN}} \{a, b\}, \mathsf{L}_{\text{FIN}} \{a, b\} = \bigcup_{k=0}^{\infty} L_k \text{ with } |L_k| = k\)
(c) FALSE, consider \(\emptyset, (\cdot)^*\)
(d) FALSE, consider a DFA with no accepting states
(e) FALSE, consider \(S \to ASA, S \to b, A \to \lambda\).

2 (a) \(E = (0+2)^* + (0+2)^* \cdot (0+2)^* + (0+2)^* \cdot (0+2)^* \cdot (0+2)^*\)
(b) \(L(G) = \{a^{n+2}b^k : n \geq 0, 0 \leq k \leq 2n\}\)
(c) \(L(M) = (ab)^* + a \cdot (bc)^*\)
(d) \(S \to bS, S \to A, A \to aA, A \to bB, B \to a\)
(e) \(M = \)

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

(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 \(q \in Q, \varphi \in \Sigma^*, \text{ and } a \in \Sigma\).]