CSC 320 Midterm Exam

June 17, 1997

1. [30 marks] Use the construction described in class (which is the same as the one in the text) to convert this NDFA to an equivalent DFA:



State	Symbol			Next state
Start state:				

Final states:

A picture of your final DFA:

- 2.(a) [10 marks] State the pumping lemma for regular languages (as presented in class, Exercise 2.6.4 of the text).
- (b) [10 marks] Let $w = a^n b^m c^{n+m}$. Describe precisely by giving several cases all possible ways of choosing x, y, z such that w = xyz, and $y \neq \varepsilon$.
- (c) [10 marks] Apply the pumping lemma to $w = a^n b^m c^{n+m}$ to prove that $L = \{a^n b^m c^p : p \le n + m\}$ is not accepted by a DFA with 2 * n + 2 * m states.
- (d) [10 marks] A more judicious choice for w would have made the argument for (c) much simpler. Suggest a better choice for w. How does this simplify the argument you gave for (c)?
- Circle True or False and justify your answer. No marks will be given unless there 3. is a correct justification.
 - $[6 \text{ marks}] \phi^* = \phi$ (a) True
 - (b) [6 marks] Every regular language has a **unique** regular expression that represents it. True

False

False

- (c) [6 marks] Every subset of a regular language is regular. False True
- (d) [6 marks] If $x \notin L_1$ and $y \notin L_2$ then $x y \notin L_1 \cdot L_2$. True False
- marks] If $L = \{w \in \{a, b\}^* : w = a^n b^n, n \ge 0\},\$ (e) [6 then $\bar{L} = \{w \in \{a, b\}^* : w = a^n b^m, n > m\}$ $\cup \{w \in \{a, b\}^* : w = a^n b^m, n < m\}.$

True

False