CS3311 Homework 7 Due date: Wednesday, October 22, 2014, in class

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The answers must be the original work of the author. While discussion with others is permitted and encouraged, the final work should be done individually. You are not allowed to work in groups. You are allowed to build on the material supplied in the class. Any other source must be specified clearly.

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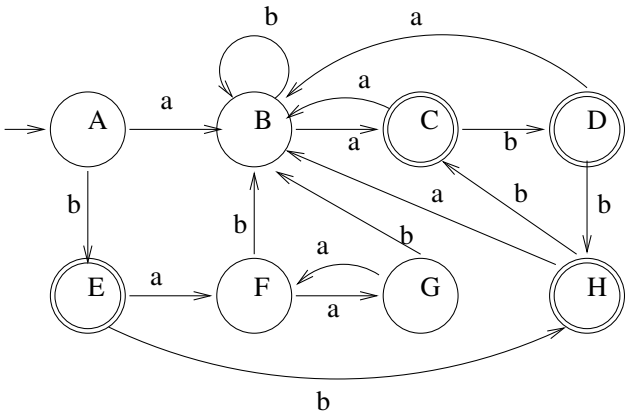
1. *(50 points)* Consider the DFA below.



(a) Construct a two dimensional table where the row and column headers are the states of the above DFA. Mark each cell with a '1' (or a higher number representing the iteration number) if the states are "different." Unmarked cells will represent indistinguishable states.

(b) Construct a minimized DFA by collapsing (groups of) indistinguishable states into single states.

2. *(20 points)* Consider the following grammars G_1 and G_2:

G_1 :
$S \rightarrow xAx$
$A \rightarrow Aa \mid Ab \mid c \mid d$

G_2 :
$S \rightarrow xAx$
$A \rightarrow c \mid d \mid cB \mid dB$
$B \rightarrow aB \mid bB \mid a \mid b$

(a) Give a derivation sequence for string $xcabx$ in G_1. Give the derivation tree of the sequence.

(b) Give a derivation sequence for string $xcabx$ in G_2. Give the derivation tree of the sequence.

Please turn the page over.

3. *(30 points)* Consider the following grammar G_1:

$$S \to aSb \mid A$$
$$A \to cA \mid d \mid \lambda$$

(a) Give a derivation for a **terminal string** such that the $S \to aSb$ rule is used exactly twice, the $A \to cA$ rule is used exactly three times, and the $A \to d$ rule is used once during the derivation.

(b) Give a derivation for a **terminal string** such that the $S \to aSb$ rule is used exactly once, the $A \to cA$ rule is also used exactly twice, and the $A \to \lambda$ rule is used once during the derivation.

(c) Use set notation to define the language generated by the grammar.