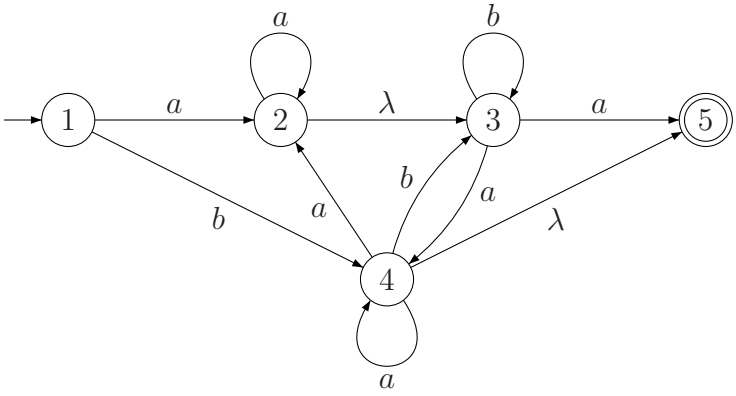
Spring 2014 **Exam #2** COSC 362

Name: _____

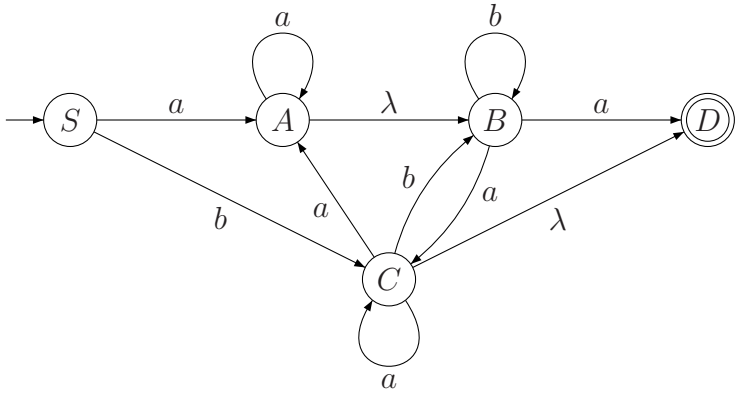
Write all of your responses on the exam paper or on the extra paper provided. Turn in all work and this exam paper.

1. (*20 Points*) Let $L_1 = L(ab^*b(ba)^*)$ and $L_2 = L((a+b)^*bba^*)$, construct NFAs for each of the following languages, L_1, L_2, $\overline{L_1}$, and $L_1 \cup L_2$.

2. (*20 Points*) Convert the following NFA to a regular expression.



3. (*10 Points*) Construct a right linear grammar for the following NFA.



4. (*10 Points*) Construct a regular grammar for the language $L(ab^*b(ba)^*)$.

5. (*10 Points Each*) For each of the following languages, determine if it is regular or not regular, justify your answer with a proof.

   (a) $L_1 = \{a^n b^q a^k \mid n = q \text{ or } q \neq k\}$

   (b) $L_2 = \{a^n \mid n = 2^k \text{ for some } k \geq 0\}$

(c) $L_3 = \{a^n b^q \mid n + q \geq 2\}$

(d) $L_4 = \{a^n b^q c^k \mid n + k \leq 7 \text{ and } n < q < k\}$

(e) $L_5 = \{w \in (a+b)^* \mid n_a(w) = 2n_b(w)\}$