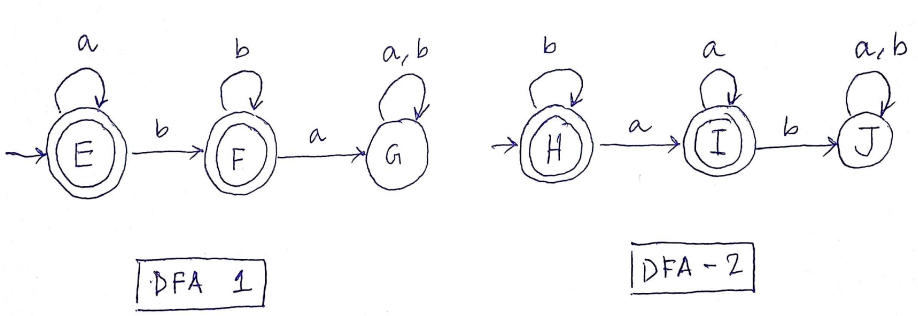
DFA, NFA, Grammar

Instructions : Write the answers to the problems neatly in loose sheets with your name and roll number. Submit to the TA at the end of the class.

1. Compute the product of DFA 1 and DFA 2.



2. Let A be the set of all strings that end with two consecutive a's or two consecutive b's. Draw an NFA for the language A. Convert the NFA into a DFA.

3. For any language L over Σ, the *prefix closure* of L is defined as

$$Pre(L) = \{x \in \Sigma^* \mid \exists y \in \Sigma^* \text{ such that } xy \in L\}$$

   Prove that if L is regular then so is $Pre(L)$.

4. Construct DFA for the following languages:
   (a) L is the set of all strings containing *bbab* as a substring
   (b) $L = \{a^n \mid n \geq 0, n \neq 4\}$
   (c) $L = \{ab^5wb^4 : w \in \{a, b\}^*\}$

5. Prove that $\forall L_1, L_2$, $(L_1L_2)^R = L_2^R L_1^R$.

6. Provide grammars for the following languages.
   (a) $L_1 = \{a^n b^m \mid n \geq 0, m > n\}$
   (b) $L_2 = \{a^n b^{2n} \mid n \geq 0\}$
   (c) $L_1 \setminus \overline{L}$ where $L = \{a^n b^{n-3} \mid n \geq 3\}$