

**(For Group 5)**

1. (**Hint:** see solution of 1.4(b) pg 84) Construct the minimized DFA and give the regular expression for the following language ( $\Sigma = \{a, b\}$ )  
 $\{w \mid \text{length of } w \text{ is at most } 5\}$
2. (**Hint:** Describe D more simply first) Let,  
 $D =$   
 $\{w \mid \text{contains an even number of } a\text{'s and an odd number of } b\text{'s and does not contain the substring } ab\}$   
  
( $\Sigma = \{a, b\}$ ). Give a DFA with **five states** that recognizes D and a regular expression that generates D.
3. Use pumping lemma to show that the following language is not regular  
 $\{w \mid w \text{ contains equal number of } 0\text{'s and } 1\text{'s not in any particular order}\}$
4. (**Hint:** see solution of 1.4(b) pg 84) Construct the minimized DFA and give the regular expression for the following language ( $\Sigma = \{a, b\}$ )  
 $\{w \mid w \text{ starts with } a \text{ and has odd length, or starts with } b \text{ and has even length}\}$
5. (**Hint:** see solution of 1.40 (a) pg. 113) A string  $x$  is a prefix of a string  $y$  if a string  $z$  exists where  $xz = y$ , and that  $x$  is a proper prefix of  $y$  if in addition  $x \neq y$ . Let,  $A$  be a regular language and we define a new language  $B$  as follows  
 $B = \{w \mid w \in A \text{ but } w \text{ is not a proper prefix of any string in } A\}$   
If  $M = (Q, \Sigma, \delta, q_0, F)$  is the DFA recognizing  $A$ , construct the DFA  $M'$  that will recognize  $B$ .
6. (**Hint:** see solution of 1.5(b) pg 84) Construct the minimized DFA and give the regular expression for the following language ( $\Sigma = \{a, b\}$ )  
 $\{w \mid w \text{ does not contain the string } aba\}$