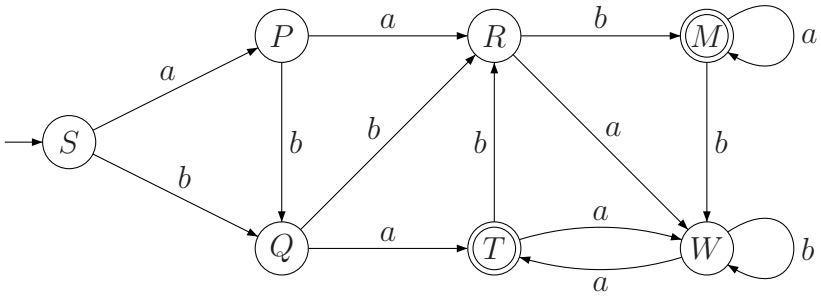
Spring 2012 **Exam #1** Math 362

Name: _____

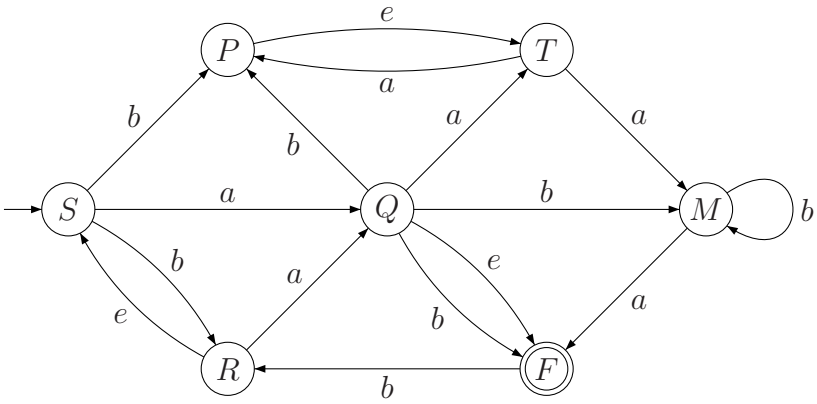
Write all of your responses on the extra exam paper provided. Turn in all work and this exam paper.

1. (*20 Points*) Consider the following DFA, A.



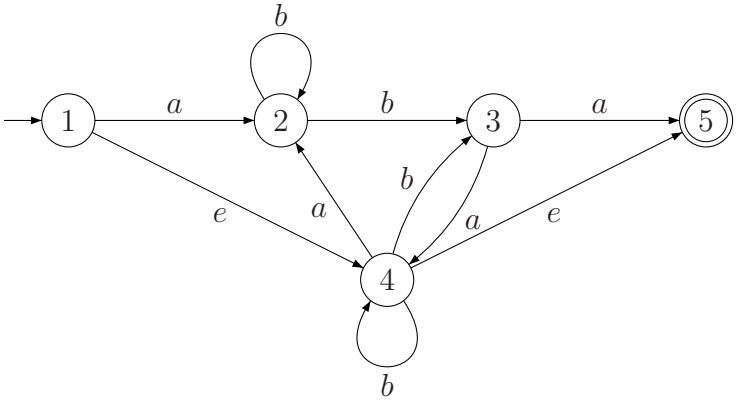
   (a) Determine if the automaton accepts the following words. Display the sequence of states for each word.
      i. *baabbba*
      ii. *aaaaa*
      iii. *aabaabb*
   (b) Is $L(bbaa(baba)^*) \subset L(A)$? Why or why not?
   (c) Is $\{b^n a^m \mid n, m > 0 \text{ and } n \text{ and } m \text{ are even}\} \subset L(A)$? Why or why not?

2. (*25 Points*) Consider the following NFA, A.

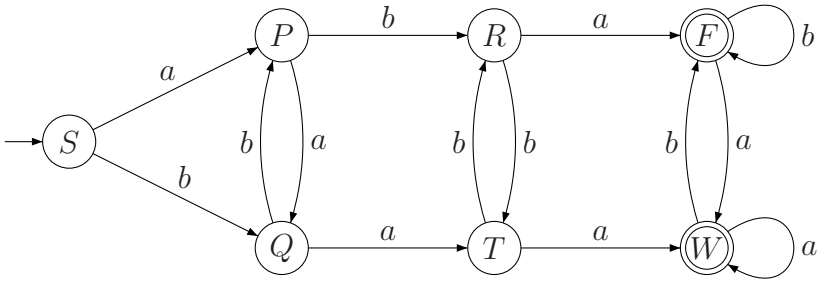


   (a) Determine if the automaton accepts the following words. If it does, display the sequence of states that drive the word to an acceptable state.
      i. *aababb*
      ii. *babba*
      iii. *baba*
      iv. *aaaaa*
   (b) Is $\{baaa(ba)^n \mid n > 0\} \subset L(A)$? Why or why not?
   (c) Convert this NFA to a DFA.

3. (*20 Points*) Convert the following NFA to a regular expression,



4. (*20 Points*) Minimize the number of states for the the following DFA,



5. (*25 Points*) Prove that the language $L = \{a^t b^n \mid n > 0, \text{ and either } t = n \text{ or } t = 2n\}$ is not regular. Make sure you verify all statements completely.