ME CSE I/III Sem.2010-11

Algorithms and Complexity Assignment

1. Define and describe the following Complexity classes. How these classes are related with each other?
   $P, NP, NP-hard, NP-complete, PSPACE, EXPTIME$.
2. Show that clas P is closed under union, concatenation,and complimenting.
3. Design a two-tape TM that transform a unary number to binary number. Determine the time complexity of this machine.
4. Show that Traveling Salesman problem for undirected graph is NP-Complete.
5. Define PSPACE complexity and show that it is closed under union and complimenting.
6. Construct a two-tape TM with space complexity $O(log_2^{(n)})$ that accepts $\{o^i 1^i | i \geq 0\}$.
7. Show that any PSPACE complete problem is NP-hard.
8. Show that, if any NP-hard language is also PSPACE-hard, then PSPACE=NP.
9. Construct a TM which concatenates two lists made of alphabets $\{0,1\}$, using

   i. Standard TM.

   ii. Two-tape TM.
10. Explain the probabilistic TM. Discuss the various complexity classes associated with. Write a Quicksort algorithm which uses randomized/probabilistic TM. (Hint: The position of pivot is randomly selected.)

Note: To be submitted on 25-02-2011.