Homework II (due: 02/28/2017)

CIS 9590 Ad Hoc Networks

Name _____ Student Number _____

1. (MAC protocol)
Explain the role of RTS and CTS. Suggest possible action for a third party node when it hears (1) no RTS and no CTS, (2) RTS, but no CTS, (3) no RTS, but CTS, and (4) both RTS and CRS.

2. (Link reversal)
For a given directed graph with edge set E = {(m, r), (n, r), (v, m), (v, n), (w, n), (y, w), (x, w), (y, x), (y, z), (z, x)}, apply both full reversal and partial reversal. Assume node r is the root and link (n, r) is a broken link. Show all details including the number of rounds, the number of times nodes are involved in the reversal, and the number of times links are reversed. Note that (m, r) means a directed link from node m to node r.

2. (Connected dominating set)
For a given connected graph with edge set E = {12, 25, *27*, 28, 34, 36, 38, 45, 58, 67, 78}, where 25 represents an undirected link between nodes 2 and 5, find out the CDS using (1) marking process only, (2) marking process plus Rules 1 and 2, (3) marking process plus Rule k, and (4) replacement path. For each case, consider two situations (a) each node has 2-hop information and (b) each node has 3-hop information. 12 represents an undirected link between nodes 1 and 2. All methods can be found at

https://cis.temple.edu/~jiewu/research/publications/Publication_files/TC0904.pdf

and its references [4] and [19] for extra information if needed.

3. (Clustering)
For a given connected graph with edge set E = {12, 15, 23, 26, 34, 36, 37, 48, 56, 67, 68}. Show details how clusterheads and cores are selected using the traditional clustering method and core extraction method. Here node id is used as the priority: the smaller the id the higher the priority. Both methods can be found at

https://cis.temple.edu/~jiewu/research/publications/Publication_files/rout3.pdf

and its references [10] and [25] for extra information if needed.

4. (Proof)
- Prove that partial reversal always terminates in a finite number of steps.
- Given a connected graph G, prove that the length of a shortest path between any nodes after applying the marking process will not change. Note that after the marking process nodes and only the nodes in CDS can be used as intermediate nodes of a path. Prove the above claim still holds after applying Rule 1.
- Prove that clusterheads constructed from the traditional clustering method for a maximal independent set, but not necessarily maximum, while cores constructed from the core extraction method usually do not form an independent set.