

Homework II (due: 04/29/2015)
CIS 5636 Ad Hoc Networks

Name _____ Student Number _____

1. (The car-panel problem)

- Consider a circle track (or 1-D ring) with circumference 4 that is densely covered with sensors having frequency 1. In addition, there are 1) a sensor with frequency 2 at position 0, 2) a sensor with frequency 4 at position 0.25, 3) a sensor with frequency 4 at position 0.5, and 4) a sensor with frequency 2 at position 0.75. To simplify our discussion, we assume the maximum speed to be one unit distance per unit time for each MC. What is the minimum of MCs needed? Show the corresponding optimal schedule.

2. (The banana-eating camel problem)

- A farmer grows 6013 bananas to sell at market 1100 miles away. He can get there only by means of a camel. This camel can carry a maximum of 1000 bananas at a time, but needs to eat a banana to refuel for every mile that he walks. The camel has to come back eventually to the village (from the market). What is the maximum number of bananas that the farmer can get to market? Show the detail schedule.

3. (The delegation forwarding problem)

- Suppose node 1 and node 8 are source and destination nodes, respectively. We assume that the node ID is also the priority of the corresponding node. The following is the contact time of node pairs: Time slot 1 : (1, 2), (2, 6), and (1, 4); time slot 2 : (2, 6), (2, 7), (3, 4); time slot 3 : (3, 7), (2, 5), (1, 3); time slot 4 : (2, 3), (7, 8), (4, 6), and (1, 5). Show how copies of the message at 1 are distributed to all other nodes, and eventually to destination 8. Write down the number of copies for epidemic routing and delegation forwarding. It is assumed that a node that has a copy does not accept extra copies.

4. (Routing in evolving graphs)

- In a 5-node evolving graph, node pair contacts are the following: (1, 2) : 2, 4 (i.e., nodes 1 and 2 contact in time slot 2 and 4); (1, 3) : 2, 3; (2, 3) : 4; (2, 4) : 2, 4; (3, 4) : 4; (3, 5) : 5; and (4, 5) : 3, 4. Find all journals from node 1 to node 5. Determine (and show details of your derivation process) (1) earliest completion path, (2) minimum span path, and (3) minimum hop-count path.

5. (Node disjointed paths in hypercubes)

- In a 5-dimensional hypercube, suppose the source is 10010 and the routing coordinate sequence is {2, 3, 1, 5, 4}, show all five node-disjointed paths from source 10010 to destination 01101 based on rotating the given coordinate sequence. Provide a brief proof that all these paths are node-disjointed through coordinating sequence rotation.