

Homework I (due: 02/07/2017)

CIS 9590 Ad Hoc Networks

Name _____ Student Number _____

1. (Wireless Communication: Nyquist's Theorem and Shannon's Theorem)
 - Given channel bandwidth $B = 10$ GHz and noise level $SNR = 40$. Determine the maximum data rate C using Shannon's theorem.
 - In order to theoretically reach the above rate, use Nyquist's theorem to determine the minimum number of discrete signal levels/voltage values used.

2. (Channel Reuse: Cluster and Cochannel Reuse Ratio)
 - Use both simple explanation and mathematical proof to show that hexagon is better than square for a cell.
 - Show that cluster size N have to satisfy $I^2 + IJ + J^2$ for integers I and J .
 - Verify cochannel reuse ratio for $N = 9$ and $N = 12$. You are required to show the topology of the cluster and the overall layout of clusters.

3. (Location Management: location update and paging)
 - Describe location update and paging, discuss pros and cons of location update and paging, and provide tradeoffs between location update and paging.

4. (Channel Assignment: Graph Coloring)
 - Given a 7-cell graph with edge set $\{(A,B), (B,C), (B,F), (C,D), (D,E), (D,F), (F,G)\}$.
 - If the channel reuse distance is $r = 2$, determine the minimum number of colors needed to color the given graph. Show the color assignment and briefly describe why the coloring scheme uses the minimum number of colors.
 - If the channel reuse distance is $r = 3$, transfer the given graph to another graph with $r = 2$, and then, repeat the above step. Show all work.
 - Repeat the above step for $r = 4$.