**EE451 Mobile Communication Systems**

**Homework 1 (CLO-1 & CLO-2)**

**Due Date: Oct 3, 2023 (in Class)**

**All assignments received after deadline will not be marked. This is the hard deadline.**

**Problem 1 (CLO-1)**:

(a) Compute the maximum system capacity in Erlangs when providing a 1% blocking probability with 4 channels, with 20 channels, with 40 channels?

(b) How many users can be supported with 40 channels at 1% blocking? Assume H=120s, A=2 call/hour.

(c) Using the traffic intensity per channel calculated in part(a), demonstrate the grade of service in a lost call delayed system for the case of delays being greater than 30 seconds. Assume that H=120s, and determine the GOS for 4 channels, for 20 channels, and for 40 channels.

**Problem 2 (CLO-1)**:

Distinguish between co-channel interference and adjacent channel interference. How can they be reduced in a cellular system?

**Problem 3 (CLO-1)**:

Suppose a Cellular Service Provider has a total of 78 channels. Suppose each user contributes 0.8 Erlangs of traffic.

(a) Compute the maximum number of users in one cell that can be supported with a 0.01 probability of blocking if 4-cell clusters are used?

(b) Compute the maximum number of users in one cell that can be supported with a 0.01 probability of blocking if 12-cell clusters are used?

**Problem 4 (CLO-2):**

A cellular service provider decides to design a system on the forward channel that can tolerate 15dB of worst-case carrier-to-interference ratio. Compute the optimal value of N for a) omni-directional antennas b) for 120-degree cell sectoring and c) for 60-degree cell sectoring. Should sectoring be used? If so, what case b) or c) should be used. Assume path loss exponent of 4.

**Problem 5 (CLO-2):**

If a measurement campaign shows that the path loss exponent is 3 instead of 4 in problem 2, how does your design change? Compare it.