Question	1	2	3	4	Total
Maximum score	30	20	30	20	100
CLO	1	1	2	3,4	1,2,3,4

Please use EEEN474_ReferenceSheets.pdf with the equations, tables and charts that you may need for solving the questions.

Please use one solution page per question. Scan these pages in one pdf file, and sort the questions in the ascending order (from Q1 to Q4).

Question 1 (30 points)

Suppose that a total of 20 MHz is allocated to a particular FDD cellular telephone system that uses 50 kHz duplex channels and 7–cell reuse. The current capacity of the overall system is known to be 19200 channels.

a) Compute the signal-to-interference ratio (dB) assuming a path loss exponent of 4 and that there are 6 co-channels in the first tier, all of them being at the same distance from the mobile. (10p)

b) Suggest a new cluster size for this system to reduce the interference. Compute the new capacity. Compute the corresponding SIR (dB). (10p)

c) Has the capacity been increased or decreased with this new choice of cluster size? Explain why. (10p)

Question 2 (20 points)

In a *blocked-calls-cleared* trunking system with 35 channels, it is known that 500 users are supported at 5% GOS. Find the average number of calls that each user makes per hour, if each call lasts for 1.2 minutes on the average.

Question 3 (30 points)

A transmitting antenna with maximum dimension of 1 m and an operating frequency of 900 MHz is transmitting a power of 50 watts. The heights of the transmitting and receiving antennas are known to be 40 m and 5 m, respectively. By using Okumura's model, obtain an estimate of the received power at a distance of 1 km from the transmitter, in suburban area. (Assume that the transmitting and receiving antennas have unity gains, and L=1.)

Question 4 (20 points)

A channel has the power delay profile shown on the right.

a) Estimate the 50% coherence bandwidth. Is this channel suitable for GSM service (B_S = 200 kHz) without needing an equalizer? (10p)

b) Estimate the coherence time of the channel for a carrier frequency of 900 MHz and for a vehicle speed of 120 km/hour. Is the channel fast or slow fading for BPSK with R_b = 200 kbps? (10p)