1. If a cellular mobile telephone system uses two 25khz simplex channel to provide full duplex Voice and control channel and having a total 36Mhz of bandwidth. Compute the number of Channels available/channel. If it uses 4 cell reuse. Determine equitable distribution of control channel and voice channel if the system has k=4 and 1Mhz of the allocated spectrum is dedicated to control channels. (Lab 1, Q 1)

Q) Define a cell, cluster and co-channel cell. Explain concept of frequency reuse pattern.

1. Consider geographical area of a cellular system is 480Km2. A total of 910 radio channels are available for traffic handling suppose, area of a cell is 8 Km2. How many times would the cluster size of 7 have to be replicated in order to cover the entire service area? Calculate the system capacity. If the cluster size is decreased from 7 to 4, comment on results (Lab 1, Q2 )

Q) Describe the concept of frequency reuse pattern and explain its need.

1. If a signal to interference ratio of 15dB is required for satisfactory forward channel performance of a cellular system, calculate frequency reuse factor and cluster size that should be used for maximum capacity if path loss exponent is ɳ=3 and ɳ =4. Assume cluster size N = 4 and 7. Comment on results. (Lab 2, Q1)

Q) What are the types of interferences experienced in a cellular system?

1. A cellular system has S/I ratio of i) 18 dB ii) 20 dB. The frequency reuse factor is N=7. Calculate the worst case for signal to co-channel interference ratio. Are the designs acceptable or rejected? Assume path loss exponent as 4. Comment on the results. (Lab 2, Q 2&3)

Q) What are the types of interferences experienced in a cellular system?

1. A hexagonal cell within a 4-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs and λ = 1call / hour, compute the following for an Erlang C system that has a 5% probability of a delayed call: (a) how many users per square kilometer will this system support? (a) What is the probability that a delayed call will have to wait for more than 10s? (c) What is the probability that a call will be delayed for more than 10 seconds? (Given Traffic Intensity A = 9 from Erlang C chart) (Lab 3, Q2)

Q) With respect to trunking theory describe following terms:

i) Busy Hour ii) traffic intensity A iii) Average call arrival rate & Average call duration H iv. Erlang B system & Erlang C system v. Trunking efficiency & GoS

1. Determine (a) The channel capacity for a cellular system service area comprised of seven macrocell with 16 channels per macrocell (b) Channel capacity if each macrocell is split into four minicells (c) Channel capacity if each minicell is further split into four microcells. Comment on results. (Lab 4, Q2)

Q) Demonstrate Cell Splitting to increase system capacity in cellular system.

1. Consider a cellular system with a radius of 2 Km which is split into smaller cells with a radius of 1 Km. Let each cell site be assigned 120 channels regardless of the cell size. How many times will the number of channels contained in a 6X6 Km2 area centered around small cell ‘S’ be increased with cell splitting as compared to without cell splitting? (Lab 4,Q3)

Q) List out the merits and demerits of Cell Splitting and explain how it improves system capacity.

1. A cellular system is designed with a directional antenna cellular configuration. A cluster pattern of 3 sectors, size 7 is deployed. Compute the worst case signal to cochannel interference ratio S/I at the mobile receiver. If the S/I value for a practical system requires 6 dB higher than the theoretical value of 18 dB then comment on the results obtained. Assume the path loss exponent as 4. Solve for 6-sector N=7. Comment on the result. (Lab 5, Q 1)

Q) Discuss sectoring and microcell zone concept to improve coverage and capacity in a cellular system.

1. Compare the number of traffic channels per sector in the following two different cellular systems employing312 traffic channels for use: N=7 pattern with 3 sector configuration, N=4 pattern with 6 sector configuration (Lab 5, Q3)

Q) Discuss practical HO consideration with umbrella cell concept and cell dragging concept

1. Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60mph, compute the received carrier frequency if the mobile is moving (a) directly towards the transmitter (b) directly away from the transmitter (c) in a direction which is perpendicular to the direction of arrival of the transmitted signal. (Lab 6)

Q) Solve the above numerical and explain Doppler Effect in cellular system.

1. Compute the path loss using the IMT 2000 and Cost 231 Suburban Area Models for the input parameters Centre frequency f = 1500-2000 MHz, f1 centre frequency f1 = 1800 MHz, Base station and Mobile station heights 50 km and 5 km respectively (Lab 7)

Q) Describe knife edge diffraction model.

1. For the given parameters calculate BER and analyze the results N=256, 64 and L=3 taps, 4 taps ( 0<=SNRdB<=25) (Lab 8)

Q) What is diversity and explain types of diversity.

1. Generate 4 bit Walsh codes using Hadamard matrix (Lab 10)

Q) Explain RAKE receiver.

1. GSM uses the RPE-LTP speech coder in which the encoding is done on blocks of samples of 20-ms duration (260 bits of coder output). The most significant first 50 bits (Class Ia) are appended with 3 CRC bits, the next 132 bits (Class Ib) are appended by 4 tail bits and concatenated with the first error-protected bits. This block is then convolutionally encoded with a rate 1/2 FEC coder, and then concatenated with last 78 bits (Class II). Show that the achievable gross channel data rate is 22.8 kbps. (Lab 11)

Q) Describe different channels in GSM.

1. Capacity of one carrier in a single-cell CDMA system: Given that the IS-95 CDMA digital cellular systems require 3 dB < Sr < 9 dB which employs QPSK modulation scheme and convolutional coding technique. The bandwidth of the channel is 1.25 MHz, and the transmission data rate is Rb = 9600 bps. Determine the capacity of a single IS-95 cell. (Lab 12)

Q) Explain IS-95 forward and reverse channel structure in detail.