1) A cellular service provider uses two 25 kHz. simplex channels to provide full-duplex service. The company has 1.4 MHz of bandwidth. It has divided the area into 200 cells and uses 7-cell frequency reuse. If each client, on the average, makes five calls per day and each call lasts 3 minutes, find the total number of clients that the system can support if the required GOS is 2%. (8 Marks)

2) A base station located at a height of 40 m transmits to a user at a distance of 5 km at a frequency of 900 MHz. The height of the receiver is 2 m. If transmitter's power is 10 W and the gains of transmitter and receiver antennas are 10 dBi and 3 dBi, respectively. Find the received power in dBm using the two ray model. (3 Marks)

3) A cellular company wants to cover a city with an area of 3000 km^2. It uses GSM in the 1800 MHz. band. The base stations use 10W transmitters and omni-directional antennas with 20 dB gain. The mobile receivers use 3 dBi gain antennas. Assume that the path loss model is log-normal with $n = 4$, $\sigma = 8$ and $d_0 = 1$ km. Assume that it is required that the signal level be greater than –90 dBm for 90% of the time.
   a) Find the cell radius. (5 Marks)
   b) Find the number of cells required to provide forward link coverage to all parts of the city. (3 Mark)

4) A mobile system operates with a SNR of 25 dB over 100 kHz. of bandwidth. Find the theoretical maximum bit rate. (3 Marks)

5) A communications system uses QPSK modulation with raised cosine pulse with a rollof factor of 0.25. If the bit rate is 184 kbps find the required RF bandwidth. (3 Marks)