#1 (points 30)

A mobile traveling at a speed of 100 km/h transmits at GSM 1900 (MHz), which uses a bandwidth of 200 KHz channel. The rms delay spread is observed to be 1.4 μs while receiving or transmitting data at the rate of 64 kbps.

a) Calculate the Doppler shift in frequency in the received signal.
b) Calculate the Coherence Time and the Coherence Bandwidth.
c) What kind of symbol distortion will be observed?
d) What type of fading will be experienced?
e) Find the condition for which the GSM 1900 system remains a flat fading system.

#2 (points 40)

A cellular area of 2800 km^2 uses a GSM system of two-way spectrum of 25 MHz with a channel spacing of 200 kHz. Each channel uses 8 voice channels. The base transmitters use omnidirectional antenna and the exponent factor of 4. The area is divided in a number of hexagonal cells each with an area of 4 km^2, with a reuse factor of 7. A subscriber in each cell generates on an average 2.5 calls per hour with an average call holding time of 90 seconds. Assume the overall GoS = 2%.

a) Find the number of clusters and the system capacity?
b) What is the traffic carried per cell in Erlangs?
c) Find the number of simultaneous subscribers in every cell.
d) Find the S/I ratio in dBs for this system.
e) What will you do to increase the capacity and what is the cost associated with it?

#3 (points 30)

A signal-to-interference ratio of 12 dB is required for satisfactory performance of the cellular system in an office environment. The noise + interference at 900 MHz is -115 dBm. The desired coverage radius for an access point is 50 m in an office building with four floors between the mobile and access point. Find the mobile terminal transmit power.