Roll No. ..... Total Pages : 04

BT-8/D-18 38010

WIRELESS AND MOBILE COMMUNICATION
ECE-402-E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Section.

Section I

1. (a) Briefly explain the factor that influence small scale fading. 5

   (b) If a transmitter produces 50 W of power, express the transmit power in unit of dBM and dBW. If 50 W is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBM at a free space dsitance of 100 m from the antenna. What is Pr (10 km) ? Assume unity gain for the receiver antenna 15

2. (a) Derive and explain the free space propagation model to determine the received power at a distance 'd' and relate this power to Electric field. **10**

(b) How the received signal strength is predicted using the free space propagation model ? Explain. **10**

Section II

3. (a) Find the average fade duration for threshold levels $\rho = 0.01$, $\rho = 0.1$ and $\rho = 1$, when the Doppler frequency. **14**

(b) For a Rayleigh fading signal, compute the positive-going level crossing rate of $p = 1$, when the maximum Doppler frequency is 20 Hz. What is the maximum velocity of the mobile for this Doppler freqeuncy if the carrier frequency is 900 MHz ? **6**

4. Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz. For a vehicle moving 60 mph, 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 transmitted signal ? **20**

Section III

5. (a) Explain the principle of cellular networks and various types of Handoff techniques. 5

(b) If a signal to interference ratio of 15 dB is required for satisfactory forward channel performance of a cellular system; what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponents is (i) $n = 4$ (ii) $n = 3$? Assume that there are 6 co-channel cells in the fires tiers, and all of them are at the same distance from the mobile. Use suitable approximation. 15

6. (a) What is an umbrella cell approach ? Explain. 5

(b) Explain cellular frequency Reuse concept ? 5

(c) What is channel assignment ? What are the types ? 5

(d) What are the techniques used to expand the capacity of cellular system ? 5

Section IV

7. (a) With network architecture, explain UMTS system. 10

(b) Explain GSM system architecture and various interfaces used in GSM. 10

8. Explain briefly the following :

(a) TDMA 5

(b) Okumara's model 5

(c) Spatial diversity 5

(d) Digital modulation in slow flat-fading channels. 5