Time : 3 hrs.   Full Marks: 70

Answer any **Five** questions

Answer should be brief and to the point

1. a) Using the two ray ground reflection model for mobile radio channel find out total E field expression at the receiving antenna.

   b) A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E field at 1 km from the transmitter is measured to be 1/1000 V/m. The carrier frequency used for this system is 900 MHz. Find the length and effective aperture of the receiving antenna. Find also received power at the mobile using the two ray ground reflected model assuming the height of the transmitting antenna is 50 m and receiving antenna is 1 m above ground.   [7+7]

2. a) With proper diagram explain knife edge diffraction model .

   b) Find Fresnel diffraction parameter from given geometry.
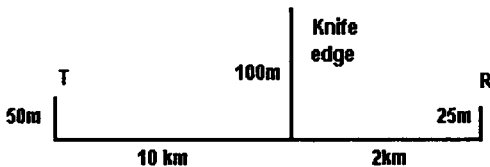
   c) Four received power measurements were taken at distances of 100m , 200m, 1km, and 3km from a transmitter ,and the measured power values are   0 dBm, -20dBm,   -35dBm, -70dBm respectively. Find the minimum mean square error estimate for the path loss exponent; also calculate standard deviation in respect of the mean value. Estimate the received power at 2 km using the Log distance path loss model.

                                                                                    [4+4+6]

3. a) What is the difference between radio path and mobile path? Define frequency selective fading.

   b) What is the relation between delay spread and coherence bandwidth? Discuss Okumara model for Outdoor propagation.

                                                                                    [8+6]

4. a) Discuss the advantages of satellite communication over terrestrial communication. What do you mean by geostationary orbit? Write down the advantages and disadvantages of 14/11 GHz system and 6/4 GHz system in Satellite communication. Describe briefly LEO,MEO, GEO.

b) Suppose you have a 11 GHz receiver with the following gains and noise temperature: Tin=50k , GRF =23dB , TRF=50k , Gm =-20 dB , Tm=500k, GIF =30 dB , TIF =1000k, calculate the system noise temperature?

[10+4]

5. a) Derive the expression of received power in terms of *Effective Isotropic Radiated Power (EIRP)*and path loss for satellite communication . What do you mean by input and output back off for satellite TWT amplifier?

b) An uplink operates at 14 GHz and flux density required to saturate the transponder is - 120 dB(W/m^2). The free space loss is 207 dB other propagation loss 2dB, calculate the earth station [EIRP] required for saturation. [9+5]

6. a) Why 800 MHz signal was chosen for the mobile radio cellular systems by FCC in its inception stage? Describe briefly with the help of timing diagram illustrating how a call to a mobile user initiated by a landline subscriber is established.

b) Discuss very briefly indicating various ways by which Coverage & Channel Capacity of a Cellular system can be improved.

[7+7]

7. a) What do you mean by frequency reuse? Derive the expression for Carrier to Interference ratio for an Omni-directional antenna.

b) If 20 MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 25 KHz RF bandwidth, find :

  a)   the number of duplex channels.

  b)   the total number of channels per cell site, if N=4 cell reuse is used.

[7+7]

8. Write short notes on of the followings: (any two)

  a) Cassegrain antenna.
  b) Fading effects in the Mobile Channel due to Multipath Time Delay Spread
  c) Transponders
  d) GSM Services, Features & System Architecture

[7+7]