Bengal Engineering & Science University, Shibpur

B. E. (ETC 7TH Semester) Final Examination, 2012

Subject: **WIRELESS AND MOBILE COMMUNICATION (ET 705)**

Time : 3hrs *Full marks: 70*

Answer any **five** questions

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

   (b) What are the differences between diffraction and scattering in mobile communication system?

   [10+4]

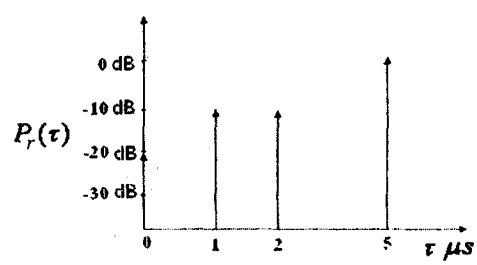
2. (a) With proper diagram explain multiple knife edge diffraction model .

   (b) Four received power measurements were taken at distances of 100 m , 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.

   (c) Discuss Okumara model for Outdoor propagation. Using this model find the median path loss in a suburban environment. Given transmitting and receiving antenna height 100m and10m, distance between two antenna 100km,free space median attenuation 50dB at 100 km and gain due to environment 10 dB. If the base station radiated an EIRP of 1 kW at a carrier frequency1 GHz, find the power at the receiver (Assume receiving antenna gain 10 dB).

   [4+4+6]

3. (a) Discuss Impulse Response model of a Multipath Channel. Compute mean excess delay, the RMS delay Spread and the maximum excess delay for the following multipath profile from the given figure, also Estimate the 50% coherence bandwidth of the channel.

   (b) Define Frequency selective fading and Flat fading.

   [8+6]

4. (a) Write down the advantages of satellite communication over terrestrial communication. What do you mean by geostationary orbit? Write down the advantages of 14/11 GHz system over 6/4 GHz system in Satellite communication.
   (b) What are the feed techniques used in earth station antenna? With proper figure explain Cassegrain reflector antenna.

(c) An earth station transmits at 5.62 GHz from an antenna of 6m. The transmitter generates an output of 8 kW. The satellite is 39920 km from the earth station. The efficiency of transmitting antenna being 0.7, calculate path loss transmitting antenna gain transmitting power in dBW, received power at the satellite, improvement in received power if the satellite uses a parabolic dish of 2.5m.

[5+5+4]

5. (a) Derive the expression of received power in terms of Effective Isotropic Radiated Power (EIRP)and path loss for satellite communication .

(b) What do you mean by input and output back off for satellite TWT amplifier?

(c) An uplink at 14 GHz requires a saturation flux density of -91.4 dBW/m^2 and an input Back Off of 11 dB . The satellite [G/T] is -6.7 dBk^{-1}, and receiver feeder loss is 0.6dB. Calculate carrier to noise density ratio.

[5+5+4]

6. (a) What do you understand by Interference & System Capacity in Cellular Radio System? Discuss briefly with suitable illustration how Co-channel Interference can be reduced.

(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 exponent is (a) n= 4, (b) n = 3 ? Assume that there are six co-channel cells in the first tier, and all of them are at the same distance from the mobile. Use suitable approximations.

[10+4]

7. (a) Why Spread Spectrum Multiple Access is chosen for wireless system design? What are the two main types of SSMA technology?
(b) Discuss briefly with suitable exhibits FHMA, CDMA and Hybrid spread spectrum technologies.
(c) If GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bits , and data is transmitted at 270.833 kbps in the channel , find: i) the time duration of a bit ii) the time duration of a slot and ii) the time duration of a frame. How long must a user occupying a single time slot wait between two successive transmissions?

[2+10+2]

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

(a) Trunking & Grade of Service in Cellular Radio System.

(b) Wireless Local Area Networks with special reference to IEEE 802.11 Wireless LAN standard.

(c) GSM Architecture.

(d) Handoff Strategies and its Prioritization in Cellular Radio.

[7+7]