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B. Tech
CPEC 5404

Eighth Semester Examination – 2007

MOBILE COMMUNICATION

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.

The figures in the right hand margin indicate full marks for the questions.

1. Answer the following questions : 2×10
- (a) What is a pager ? Why battery life of a pager is better than a cell phone ?
 - (b) What is mobile assisted handoff ?
 - (c) A cellular service provider has decided to maintain a minimum S/I of 18 dB. Find the minimum cluster size. Assume the path loss exponent $n = 4$.

P.T.O.

(d) Assume the received power at a reference distance d_0 km is equal to 1 microwatt, and $f = 1800$ MHz, $h_t = 40$ m, $h_r = 3$ m, $G_t = G_r = 0$ dB. Compute, compare and plot the exact two ray ground reflection model with the approximate expression.

(e) A channel has 30 kHz bandwidth and operates at 40 dB SNR. Determine the maximum theoretical data rate the channel can support.

(f) Each user of a single base station average five calls per hour, each call lasting on average of 5 minutes. What is the traffic intensity for each user?

(g) In CDMA, the system capacity is maximized if each mobile transmitter power level is controlled. Yes or No? Justify your answer.

(h) A Cellular TDMA system uses a 48.6 kbps data rate to support three users per frame. Each user occupies two of the six time slots per frame. What is the raw data rate occupied for each user?

(i) Derive an expression for the Doppler frequency.

(j) Find percentage of error in a CDMA system where there are 40 users with a processing gain of 255.

2. (a) Explain the concept of frequency reuse in mobile communication. If a cluster size is 7, find frequency reuse factor. 4

(b) Determine the analog channels per cell for the case of $n = 3$ propagation path loss.

where the minimum acceptable $C/I = 14$ dB.
What is the appropriate cluster size for the system ? Assume the simplex channel bandwidth is 30 KHz and the total spectrum allocation is 20 MHz. 4

(c) What is channel assignment ? Discuss merits of dynamic channel assignment. 2

3. (a) Derive an expression for the receiver power in free space. A transmitter produces 100 Watt of power and is applied to a unity gain antenna with 900 MHz carrier frequency. Find the received power if the gain of the receiver antenna is unity. 3+2

(b) Explain large-scale path loss. What is multipath? Discuss a suitable model to find large-scale path loss. 1+1+3

4. (a) Discuss different types of fading based on multipath time-delay spread. Explain factors influencing small scale fading. 4+2

(b) Four received power measurements were taken at distances of 100 m, 200 m, 1 km and 2 km from a transmitter. The measurement values at these distances are -0 dBm, -25 dBm, -35 dBm and -38 dBm respectively. Find the transmitter power. 4

5. (a) With a suitable diagram discuss working of a $\pi/4$ QPSK receiver. Why is $\pi/4$ QPSK advantages than QPSK and OQPSK techniques ? 5

(b) What is GMSK ? Write its features. How it is useful in mobile communication ? 5

6. (a) What is a narrowband system ? 2
- (b) Derive an expression for the frame frequency of a TDMA system. 2
- (c) In an omni directional (single cell, single sector) CDMA cellular system, $E_b/N_0 = 20$ dB is required for each user. If 100 users, each with a baseband data rate of 13 kbps are to be accommodated, determine the minimum channel bit rate of the spread spectrum chip sequence. Ignore voice activity considerations. 6

7. (a) With a suitable diagram analyze the working of a decision feedback equalizer. Compare its advantages over linear equalizer. 5
- (b) Explain X.25 protocol with respect to mobile communication systems ? Explain traffic routing in mobile communication. 5

8. (a) What is space diversity ? Explain selection diversity and its use in mobile area. 1+3
- (b) Write the frame structure in GSM. What are the channel types in GSM ? Write features of GSM. 2+2+2