

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2485

Roll No.

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**B. Tech.**

(SEM. VI) THEORY EXAMINATION 2010-11

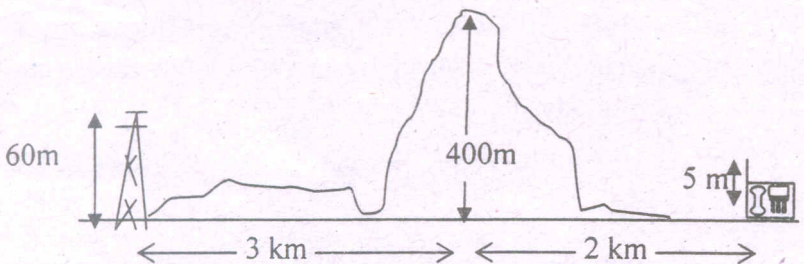
**WIRELESS COMMUNICATION**

Time : 2 Hours

Total Marks : 50

**Note :—**Attempt all questions.1. Attempt any **four** parts of the following :— (3×4=12)

- (a) What is the basic principle of operation of any mobile network ? Why hexagonal cells are taken for geographical coverage instead of rectangular and triangular shape ?
- (b) If  $P_t = 10$  W,  $G_t = 10$  dB,  $G_r = 3$  dB and  $L = 1$  dB at 900 MHz, compute the received power for the scenario depicted in figure below. Compare this value with the theoretical free space received power if an obstruction did not exist. What is the path loss due to diffraction for this case ?



- (c) A mobile is located 5 km away from a base station and uses a vertical  $\lambda/4$  monopole antenna with gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be  $10^{-3}$  v/m. The carrier frequency used for this system is 900 MHz.
- (i) Find the length and the effective aperture of the receiving antenna.
  - (ii) Find the received power at the mobile using the two rays ground reflection model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above ground.
- (d) What is small scale fading ? How it is different from path loss ? Name the factors influencing small scale fading. Plot different types of small scale fading as a function of baseband signal bandwidth.
- (e) State and explain any two indoor and outdoor statistical models for Multi-path fading channels.
- (f) Explain the theory of multi-path shape factor for fading wireless channels.

2. Attempt any **four** parts of the following :— (3×4=12)

- (a) Discuss spread spectrum sliding correlator channel sounding using suitable diagram. What are its advantages and disadvantages ?
- (b) State the relationship for capacity of Cellular CDMA system

In an omni-directional CDMA cellular systems,  $E_b/N_0 = 20$  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.

- (c) What is PN sequence and where is it used ? Explain showing its advantages.
- (d) Compare various algorithms for adaptive equalization.
- (e) State and explain the structure of a DFE.
- (f) How the time shifted versions of original signal is collected in a RAKE receiver ? What is purpose of this step ? Explain using an example.

3. Attempt any **two** parts of the following :— (6½×2=13)

- (a) Explain the specific PDF and ACF of speech signals. How these are suitable for coder designing ?
- (b) Explain the working of Linear predictive coders.
- (c) Draw and explain TDMA frame structure. Compare it with FDMA frame structure.

4. Attempt any **two** parts of the following :— (6½×2=13)

- (a) Consider a cellular system of 32 cells with cell radius of 1.6 km and total frequency bandwidth supporting 366 traffic channels with reuse factor of 7.
  - (i) What geographic area is covered ?
  - (ii) What is total number of supported channels ?

- (iii) If cell radius is reduced to 0.8 km, find out new channel capacity.
- (iv) Draw the coverage pattern for both the cases.
- (b) What is need of handoff ? Name different phases and types of handoff.
- (c) Draw a cellular system with 19-cell reuse. For this cellular system calculate :
  - (i) Distance between co-channel cells for unit cell radius
  - (ii) Co-channel reuse ratio
  - (iii) Capacity of the system.