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Total number of printed pages – 3

B. Tech
PEEC 5302

Sixth Semester Regular Examination – 2014

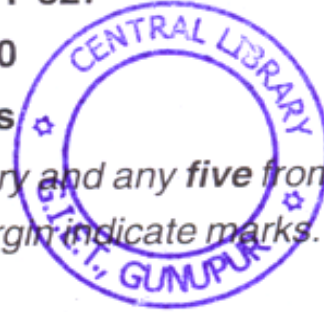
MOBILE COMMUNICATION

BRANCH(S) : EC, ETC

QUESTION CODE : F 327

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 marks.

1. Answer the following questions :

2 × 10

- (a) What do you mean by free space loss in mobile radio propagation ?
- (b) Calculate the reduction in the transmit power in dB when the radius of the new cell becomes half of that of the old cell assuming path loss exponent, $k = 4$.
- (c) In M-ary FSK modulation schemes how the transmitted signals are made orthogonal? Why is this needed ?
- (d) Find the far distance for an antenna with maximum dimension of 1 m and operating frequency of 1800 MHz.
- (e) What is the advantage of using hexagonal cell shape over square and triangle cell shapes for cellular communication ?
- (f) Define near-far problem. How it can be avoided in case of spread spectrum cellular systems ?
- (g) Explain how the frequency dispersion introduces distortion into the received signal in a wireless communication system ?
- (h) Define spectral efficiency of a cellular network. How it depends on the multiple access scheme used ?
- (i) What is the ambiguity in the decoded output in case of PSK systems ? How it is corrected ?
- (j) How the power delay profile of the channel is found for small scale channel modeling?

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2. (a) Calculate the magnitude of the electric field at the receiver antenna located 10 km from a 50 W transmitter for space propagation. Assume the carrier frequency is 900 MHz, transmitter and receiver antenna gains are 1 and 2 respectively. 5
- (b) What is the use of path loss models for a mobile communication system? Which path loss models are mostly used for microcellular areas? 5
3. (a) Discuss the performance of BPSK, DPSK and QPSK modulation schemes in fading multipath mobile channels. List the advantages and disadvantages of each modulation method. 5
- (b) Define carrier synchronization. Explain how it is achieved in coherent detection of QPSK signal. 5
4. Explain how the capacity of a cellular system is improved with the help of frequency reuse concept. Discuss various other mechanisms based on cellular layout and antenna design to increase the capacity of a cellular system with diagram. 10
5. (a) What causes fading to occur in mobile radio environment? Classify different types of small scale fading experienced by a signal considering the nature of the transmitted signal and the characteristics of the channel. 5
- (b) For what values of T-R separation distance and antenna height, the two ray model is used for predicting large scale signal strength? Derive the path loss for the two ray model with antenna gains. 5
6. (a) Given a cellular system with hexagonal cells of radius R each. The service area is partitioned into cell clusters and frequency reuse is used from cluster to cluster. The geometric relation between adjacent co-channel cells is described by two non negative integers i and j. With pictorial illustration determine the number of cells in each cluster and the distance between the centers of two adjacent co-channel cells. 5
- (b) What types of multiple access techniques are used to allow many mobile users to share a finite amount of radio spectrum simultaneously? Explain how these techniques can be grouped as narrowband and wideband systems. 5

7. (a) If 63 numbers of users share a CDMA system and each user has a processing gain of 511, then determine the average probability of error for each user. What are assumptions to be taken in determining the result? 5
- (b) What is slotted frequency hopping? Explain why this may not be a realistic scenario for many FH-SS systems? 5
8. Write short notes on any **two** of the following : 5×2
- (a) Cost 231 model
- (b) Multi carrier DS-CDMA systems
- (c) Interference in cellular communication
- (d) Wireless 4G networks.

