

39

Roll No.

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**BT-8 / M-17
WIRELESS AND MOBILE
COMMUNICATION
Paper-ECE-402E**

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt five questions with at least one question from each section.

Section-I

1. (a) Discuss role of fading. Distinguish between flat fading and frequency selective fading. 5
- (b) Define Coherence time and highlight it's relationship with mobility. 5
- (c) What is the need for predicting and estimating the path loss during wireless link design? 5
- (d) Find the far-field distance for an antenna with maximum dimension of 1m and operating at a frequency of 900 MHz. 5
2. (a) Distinguish between large scale fading and small scale fading. Derive an expression for the path loss using the 2-ray ground reflection model and highlight under what conditions it may be used. Using the above path loss model explain how you will go about deriving the wireless link power budget, including all the relevant factors. 10

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(2)

- (b) Define Coherence bandwidth and Coherence time. 5
- (c) Explain the Clarke's model for multipath flat fading channel. 5

Section-II

3. (a) Explain working of RAKE receiver. What is m branch RAKE receiver? 10
- (b) Highlight the different factors that affect the capacities of FDMA, TDMA and CDMA techniques when applied in cellular mobile communication systems. 10
4. (a) How does the near/far effect influence TDMA systems? What happens in CDMA systems? What are countermeasures in TDMA systems, what about CDMA systems? 10
- (b) In a single-cell CDMA system using spatial division multiple access (SDMA), determine the number of simultaneous users that can be supported at an average probability of error of 10^{-3} when a processing gain of $R_c/R_b = 500$ is used. Assume 15 dB gain beam patterns may be formed and that perfect power control is used. Neglect voice activity. 10

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(3)

Section-III

5. (a) 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 $n = 3$. Assume that there are 6 co-channel cells in the first tier and all of them are at the same distance from the mobile. Use suitable approximations wherever needed. 10
- (b) Define the terms: Grade of service, Traffic intensity. 10
6. (a) If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone system which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell if a system uses
- (i) 4-cell reuse
- (ii) 7-cell reuse 10
- (b) Show that the frequency reuse factor for a cellular system is given by k/S , where k is the average number of channels per cell and S is the total number of channels available to the cellular service provider. 10

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Section-IV

7. (a) Draw the architecture of GSM and explain each block. Compare IS-95 and DECT GSM. 10
- (b) Looking at the HLR/VLR database approach used in GSM-how does this architecture limit the scalability in terms of users, especially moving users? 5
8. Explain the following :
- (a) Handoff 5
- (b) Erlang Capacity 5
- (c) FDM/TDM 5
- (d) Frequency Reuse 5

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