

IV B.Tech. I Semester Regular Examinations, November -2005
CELLULAR & MOBILE COMMUNICATION
(Electronics & Telematics)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Present the model of the mobile transmission medium and the fading characteristics?
(b) Explain in detail coherence bandwidth and delay spread? [8+8]
2. (a) Between the pager , a cellular phone and cordless phone which device will have the longest battery life between charging? Why?
(b) Explain the importance of $K = i^2 + ij + j^2$. [8+8]
3. (a) Illustrate the real time co channel interference measurement at the mobile radio transceiver?
(b) Discuss the diversity schemes for interference reductions at both mobile unit and cell site? [8+8]
4. (a) Discuss about the multi path propagation present the associated losses and place the problem?
(b) Discuss about the point to point and area to area prediction model for cell coverage? [10+6]
5. (a) Explain the fundamentals of antenna gain?
(b) Explain the concept of horizontally space diversity antennas [8+8]
6. Explain the following in detail concern to the mobile system
 - (a) Setup channel
 - (b) Accesses channel
 - (c) Paging channel
 - (d) Voice channel. [16]
7. (a) List and briefly define different performance metrics that may be used to make the handoff decision?
(b) If the number channels at the cell site $N=45$ the call holding time is 1.76minutes The number of originated calls per hour expressed as λ is 2270. The number of handoff calls attempted per hour is expressed as λ_2 is 80 Find the probability of the queuing handoff. calls but not the originated calls . Also find the probability of the queuing the originated calls but not the handoff calls?

[10+6]

8. Explain the different approaches to increase the coverage of a cellular system in a noisy environment. [16]

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1. (a) Explain the inefficient spectrum utilization based on the existing mobile systems MTS and IMTS
(b) Describe the special features in amps and compare these with now a days systems? [8+8]
2. (a) Explain about the maximum number frequency channels per cell?
(b) If the maximum number of calls per hour Q_i in one cell be 5000 and an average calling time T be 1.76 min The blocking probability is 2% Find the offered load. If Q_i is 35000 find the offered load Compare this with no of channels by using the Erlang B model [10+6]
3. Briefly explain the design of a directional antenna system in co-channel interference reduction. [16]
4. (a) From the signal coverage point of you explain ground incident angle, elevation angle, ground reflection and reflection point?
(b) If $h_1 = 50\text{m}$, $h_2 = 3\text{m}$, $d = 5\text{Km}$, $H = 100\text{m}$ use approximate method find incident angle, elevation angle, ground reflection and reflection point? [8+8]
5. Explain the following terms concern to the antennas
(a) Location of the antenna
(b) Set up channel antennas
(c) Space diversity antennas used at the cell site
(d) Umbrella pattern antennas
(e) Interference reduction antennas. [16]
6. The U.S AMPS system is allocated 50MHz of spectrum in the 800 Mhz range and provides 832 channels. 42 of those channels are control channels. The forward channel frequency is exactly 45MHz greater then the reverse channel frequency.
(a) If the AMPS system is simplex, half duplex or full duplex? What is the band width for each channel and how is it distributed between the base station and subscriber?
(b) Assume a base station transmits control information on channel 352, operating at 880.560MHz What is the transmission frequency of the subscriber unit on transmitting on channel 352?

- (c) The A- side and B - Side cellular carriers evenly split the AMPS channels. Find the number of voice channels and the number of control channels for each carrier?
- (d) let suppose you are chief engineer of a cellular system using seven cell reuse purpose a channel assignment strategy for a uniform distribution of user throughout your cellular system specifically , assume that each cell has three control channels (1200 sector is employed)and specify the number of voice channels you would assign to each control in your system?
- (e) For an ideal hexagonal cellular layout which has an identical cell coverage, what is the distance between the centers of two nearest co channel cells for seven cell reuse? For four cell reuse? [16]
7. (a) Explain clearly how to calculate δ and μ for single cell?
- (b) Why hand off is necessary for cellular systems Determine the two types of handoffs based on signal strength and C/I ratio? [8+8]
8. What do you mean by operational techniques? Why are these needed in cellular systems? Explain briefly different operational techniques. [16]

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2. (a) Derive the C/I in an omni directional antenna system?
(b) What is cell splitting and explain the two kinds of cell splitting techniques? [10+6]
3. Explain the designing of the omni directional antenna under the worst case conditions for $K = 7$, $K = 12$ and $K = 19$ with all the suitable values and explaining each of them? [16]
4. (a) Briefly explain the multiple knife edge diffraction?
(b) Explain about the scattering phenomena in mobile system? [8+8]
5. (a) Classify the mobile unit antennas?
(b) Explain about the sectorised cells? [6+10]
6. (a) Explain the channel assignment and hopping?
(b) Compare the radio aspects concern to the channel assignment in between analog and digital cellular system? [8+8]
7. (a) List and briefly define different performance metrics that may be used to make the handoff decision?
(b) If the number channels at the cell site $N=45$ the call holding time is 1.76minutes The number of originated calls per hour expressed as λ is 2270. The number of handoff calls attempted per hour is expressed as λ_2 is 80 Find the probability of the queuing handoff. calls but not the originated calls . Also find the probability of the queuing the originated calls but not the handoff calls? [10+6]
8. What are the adjusting parameters to operate the system with out any weak spots? [16]

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1. (a) Discuss analog cellular system (AMPS) in detail?
 (b) Discuss the mobile radio transmission medium? [8+8]
2. (a) Explain about the time division multiple accessing technique(TDMA).
 (b) What is the general formula to find the value of K and find out the frequency reuse distance with available K value? [8+8]
3. (a) If a Signal to interference ratio of 15db 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 the maximum capacity of the path loss exponent is
 - i. $n = 4$
 - ii. $n = 3$? Assume that there are six interfere cells in the first tier and all of them are at the same distance from the mobile use suitable approximations.
 (b) Explain the interference and system capacity? [6+10]
4. (a) Derive the equation for the Fehers delay spread in mobile environment?
 (b) What is the delay spread bound T_{\max} of a 220 MHz public land line mobile radio system.
 If $P_t = 1W$ (+ 30dBm) and $P_{\min} = - 90$ dBm How much T_{\max} if the sensitivity of the receiver is improved to $P_{\min} = - 100$ dBm Why does increased sensitivity of increased system gain $G_s = P_t P_{\min}$ lead to a higher delay spread bound?
[10+6]
5. (a) Discuss the characteristics of cell site antennas?
 (b) If the antenna heights are varying what are the effects you are getting at the time of operation of mobile system? [8+8]
6. Differentiate the fixed channel and non fixed channel assignment in detail? [16]
7. (a) What are the advantages and disadvantages of CDMA for cellular network in system?
 (b) Explain the difference between the soft handoff and hard handoff? [8+8]
8. Explain the following terms under operational techniques:

(a) Small cells

(b) Narrow beam concept.

[16]

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