

**IV B.Tech II Semester Supplementary Examinations, May 2008**  
**CELLULAR AND MOBILE COMMUNICATION**  
 ( Common to Electronics & Communication Engineering, Computer Science  
 & Engineering, Information Technology, Computer Science & Systems  
 Engineering and Electronics & Computer Engineering)

Time: 3 hours

Max Marks: 80

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Discuss analog cellular system (AMPS) in detail?  
 (b) Discuss the mobile radio transmission medium? [8+8]
2. (a) Draw the general view of telecommunication and explain the function of the each unit?  
 (b) Distinguish between the permanent splitting and dynamic splitting? [8+8]
3. (a) Prove that for hexagonal geometry the co channel reuse ratio is given by  $Q = \sqrt{3N}$   
 Where  $N = i^2 + ij + j^2$ .  
 (b) Explain the co channel interference are from the mobile receivers based on test? [8+8]
4. (a) Explain the general formula of received power from real model based on shadow case, direct path and over the water condition in detail?  
 (b) Explain the mobile propagation obstructive path? [10+6]
5. Explain in detail the unique situation of the antenna with neat diagram? [16]
6. (a) Describe the grouping of the voice, setup and paging channels?  
 (b) Present the reuse partition scheme in overlaid cell system Mention the advantages associated with it? [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  $\lambda$  is 2270. The number of handoff calls attempted per hour is expressed as  $\lambda_2$  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 following special features in detail.
  - (a) SMS
  - (b) MMS

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**Set No. 1**

- (c) EMS
- (d) Call waiting
- (e) Call forwarding
- (f) Call diverting
- (g) Voice storage box
- (h) Call re routing.

[16]

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1. (a) Explain about the importance of the amplifier noise in cellular system?  
 (b) Explain the operation of the cellular system? [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. Describe briefly the importance of noise in the environment at the base station. Explain how location, height and configuration of antennas is selected. [16]
4. (a) Determine the maximum and minimum spectral frequency received from a stationary transmitter has a central frequency of exactly 1950MHz assume that the receiver is traveling at speeds of
  - i. 1Km
  - ii. 5Km
  - iii. 10Km
  - iv. 100Km?
 (b) Describe all physical circumstances that relate to a stationary transmitter and a moving receiver such that the Doppler shift at the receiver is equal to
  - i. 0Hz
  - ii.  $f_{dmax}$
  - iii.  $-f_{dmax}$
  - iv.  $f_{dmax}/2$ . [6+10]
5. (a) Derive the relation between the received power and electrical field of the antenna?  
 (b) Assume a receiver is located 10km from a 50W transmitter. The carrier frequency is 900MHz , assume free space propagation  $G_t = 1$  and  $G_r = 2W$ 
  - i. Find the power at the receiver
  - ii. The magnitude of the electric field at the receiving antenna
  - iii. The rms voltage applied to the receiver input assuming that the receiving antenna has purely real importance of 50 ohms and is matched to the receiver. [6+10]

6. (a) Write the procedure to allot the channels for the traveling mobile units?  
(b) Explain the channel assignment to the cell sites based on the adjacent channels? [8+8]
7. (a) What is meant by soft hand off? Give example.  
(b) What is meant by hard hand off? [8+8]
8. Explain the different approaches to increase the coverage of a cellular system in a noisy environment. [16]

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1. (a) Draw the schematic and the present the working of a cellular system?  
(b) Briefly explain the evaluation of the analog and digital cellular mobile system?  
[8+8]
  
2. What do you mean by cell splitting? How area is divided, and explain the different cell splitting techniques?  
[16]
  
3. (a) Compare the co channel interference performance of a directional antenna system for  $K=7$  and  $K = 4$ ?  
(b) What is tilting antenna? How can these antenna patterns reduce the co channel interference?  
[8+8]
  
4. (a) If  $P_r = 10W$ ,  $G_t = 0dB$  ,  $G_r = 0dB$  and  $f_c = 900MHz$ . Find  $P_r$  in watts at a frequency space distance of 1Km.  
(b) Prove that in the two ray ground model  $\Delta = d^2 - d^2 \approx 2h_t h_r / d$  when this holds as a good approximation  
[6+10]
  
5. Explain the following:
  - (a) Roof mounted antennas
  - (b) Glass mounted antennas
  - (c) Mobile high antennas
  - (d) Horizontally oriented space diversity 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 through out 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. How hand offs are made in the first generation analog cellular system and how they are made in the second generation systems. Explain. [16]
8. (a) Prove that sectoring decreases trunking efficiency with an example.
- (b) Explain how lowering the threshold level of a received signal increases the coverage area. [8+8]

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1. (a) Discuss analog cellular system (AMPS) in detail?  
(b) Discuss the mobile radio transmission medium? [8+8]
2. (a) Present the concept frequency reuse channels and frequency reuse distance?  
(b) Why cell splitting and explain the cell splitting? [8+8]
3. What are the different types of Non-co channel interference? Explain. [16]
4. (a) Explain olcmura model for predicting path loss in mobile environment.  
(b) Explain the effect of propagation of mobile signals over water. [8+8]
5. (a) Describe the effects of the cell site antenna heights and signal coverage cells?  
(b) Define the following concern to the antennas
  - i. ERP
  - ii. Equivalent aperture
  - iii. Null free pattern
  - iv.  $120^\circ$  Sector cell. [6+10]
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?
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- (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) How do you find the values of  $\delta$  and  $\mu$  related to the cell?  
(b) How do you reduce the dropped call rate and explain? [8+8]
8. Present the concept of the narrow beam sector. How does it increase the traffic capacity? Consider  $K = 7$ . [16]

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