SNS COLLEGE OFENGINEERING

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Department of Electronics and Communication Engineering

Academic Year: 2022-2023 (Even)

Subject : Wireless Communication

Subject Code : 19EC601

Class : III ECE

Staff in charge : D.VISHNU PRIYA, AP/ECE

Question Bank

UNIT I

FUNDAMENTALS OF WIRELESS COMMUNICATION

PART A

1. Define frequency reuse.
2. Differentiate between FDMA,TDMA and CDMA technologies.
3. What do you mean by forward and reverse channel?
4. Why is cellular concept used for mobile telephony?
5. In a cellular network, among a handoff call and a new call, which one is given priority? Why?
6. Define grade of service.
7. What is soft handoff in mobile communication?
8. What is a multiple access technique?
9. Define co-channel interference.
10. Define co-channel re-use ratio.
11. Mention few techniques used to expand the capacity of a cellular system.
12. What are the different modules of a basic cellular system?
13. What are the different types multiple access techniques?
14. Mention the significance of frequency reuse in cellular networks.
15. What is base station?
16. What is MSC?
17. State the difference between control channel and traffic channel.
18. Define cell.
19. What is a foot print?

20. What is channel assignment? What are the types?
21. State the characteristics of fixed channel assignment.
22. What is dynamic channel assignment?
23. What is handoff?
24. Define dwell time.
25. What is block call delay system?
26. Define cell splitting.
27. What is sectoring?
28. What is frequency division multiple access?
29. Define adjacent channel interference.
30. Define hand off?

PART B

1. Explain channel assignment strategies for GSM Systems.
2. Define following terms:
   i) Cluster ii) RSSI iii) MAHO iv) Channel Capacity v) Dwell Time.
3. Explain the concept of frequency reuse for cellular communication systems.
4. A cellular service provider decides to use a digital TDMA scheme which can tolerate a signal-to-interference ratio of 15 dB in the worst case. Find the optimal value of *N* for (a) omni directional antennas, (b) 120o sectoring, and (c) 60 o sectoring. Should sectoring be used? If so, which sectoring (120 o or 60 o) will be better? Assume a path loss exponent n=4.
5. Consider two different cellular systems that share the following characteristics. The frequency bands are 825-845 MHz for uplink and 870-890 MHz for the downlink. A duplex circuit consists of one 30 kHz channel in each direction. The systems are distinguished by the reuse factor, which are 4 and 19 respectively. For these systems, (i) Find the number of simultaneous communications that can be supported by a single cell in each system. (ii) Suppose that in each systems the cluster of cells (4, 19) is duplicated 16 times, find the number of simultaneous communications that can be supported by each system. (iii) Suppose the average user makes 6 calls per 24 hours and mean call duration is 6 minutes, estimate the total number of users that can be supported by each system.
6. A cellular system has 32 cells; each cell has 1.6 km radius and the system reuse factor of 7. The system is to support 336 traffic channels in total. Determine the total geographical area covered, the number of traffic channels per cell and total number of simultaneous calls supported by this system.
7. For a regular hexagonal geometry show that co-channel reuse ratio is Q= (3N)1/2, where N= i2+ij+j2
8. Suppose that a mobile station is moving along a straight smooth surface between base stations BS1 and BS2. The distance between BS1 and BS2 is 2000 m. Assume that the received power in dBm at a Base station is given by Pr = P0 - 10*n*log (d/d0), where d is

the distance between mobile station and base station in meters. P0 is the power at distance d0 from the mobile. Assume that P0=0 dBm and d0 = 1 m. Let n denote path loss exponent which is 2.9. Given that the minimum usable level of signal is -88dBm and the mobile is currently connected to BS1, determine the hand-off margin if hand-off time is 4.5 second and the mobile speed is 100 km/hr.

9. Calculate the worst case carrier to interference ratio for a mobile receiver located at the boundary of its serving cell if it is under the influence of interfering signals from two nearest co-channels cells in a cellular system. Assume 3-sectors per cell and a reuse pattern of 4.
10. For an identical received power at the boundaries of original larger cell with radius R0 and the new split cell with half the radius of the original cell, show that transmitter power of any of the new split cell must be 12 dB less than the original large cell.
11. Explain the following terms with respect to wireless networks:
    i) Frequency Reuse (ii) Co-channel interference (iii) handoff (iv) Umbrella cell approach v) Dwell time vi) Cell dragging
12. Explain (i) Concept of frequency reuse (ii) 2G and 3G wireless networks.
13. Why is hexagonal cell shape preferred over square or triangular cell shape to represent the cellular architecture
14. Calculate the total available channels for a cellular system having a total bandwidth of 60MHz which uses two 50 kHz simplex channels to provide full duplex voice and control channels. Assume that the system has nine cell reuse pattern and 1 MHz of the total BW is allocated for control channels, determine an equitable distribution of control channels. Also calculate the number of the control channels and voice channels/cell. Assume the area of the cell is 9 Sq Km and the area of the entire system is 3630 Sq Km. If the cluster size is reduced to 4, what is the system capacity. Comment on this.
15. Prove that for a hexagonal symmetry, the co-channel reuse ratio is given by $Q=\sqrt{(3N)}$.
16. Illustrate the principle of cell splitting in a cellular system. Prove that the transmit power of the microcell must be reduced by 12 dB in order to fill in the original coverage area with microcells, while maintaining the S/I requirement for the path loss exponent n=4.
17. Discuss the fixed channel allocation, Channel borrowing and dynamic channel allocation techniques in cellular systems.
18. Compare the S/I ratio for a mobile radio for the following cases of cellular system with frequency reuse factor of 7 for (i) Omni directional antenna (ii) 1200 Directional antennas
19. What is meant by Hand off and explain different Hand off strategies How handoff operation is performed while mobile moves into a different cell while a conversation is in progress. Discuss the cases for proper and improper handoff situations.
20. How co-channel interference and system capacity are related?
21. If 20 MHz of total spectrum is allocated for a duplex wireless cellular system and each simplex channel has 25 kHz RF bandwidth, find:

    i) The number of duplex channels

    ii) The total number of channels per cell site ,if N=4 cell reuse is used

22. For a seven cell reuse pattern and hexagonal cell geometry show that 120 sectoring improves signal to interference ratio by about 5 dB.
23. Explain in details about various channel assignment strategies.
24. Derive the expression for S/I ratio for adjacent channel interference for cellular systems.
25. Compare cell splitting and sectoring techniques.
26. Assuming six co-channel interfering cells, find the S/I ratio for path loss co-efficient of n=3 and n=4. Consider cluster size N=7. In which case 15 dB requirement is met? what needs to be changed to meet the same condition in second case?
27. Explain the concept of Umbrella cell.
28. 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 channel available per cell if a system uses (a) four-cell reuse ,(b) seven-cell reuse , and (c) 12 –cell reuse. If 1MHZ of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each for each of the three systems.
29. Explain the difference between co-channel interference and adjacent channel interference. Derive the equation for the signal to interference ratio.