

BITS, PILANI – DUBAI CAMPUS

Knowledge Village, Dubai

Semester I 2006 – 2007
IV Year (EEE)-Elective (makeup)

Test 1 (Closed Book)

Course No.: EA UC452

Course Title: Mobile Telecommunication Networks

Date: 19 .10.2006

Time: 50Minutes

M.M. = 20 (20 %)

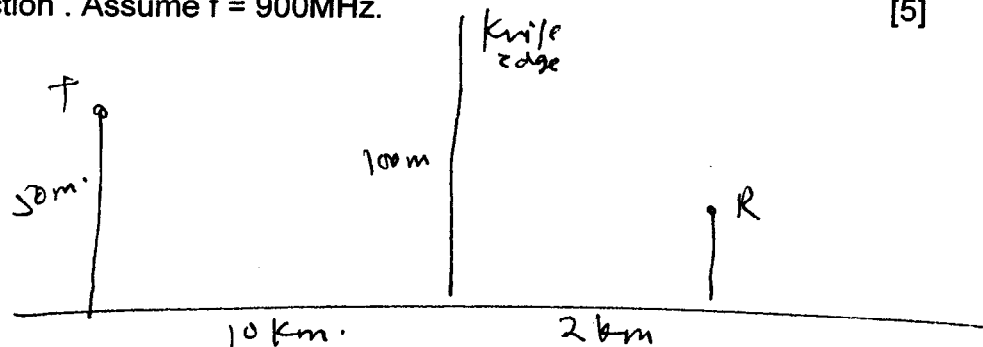
Attempt all questions:

Q.1. Write down the type, year of introduction and frequency band of the following mobile standards: [7.5]

A. AMPS B. GSM C. is-95 D. NAMPS E. DCS-1800

Q.2. Discuss various channel assignment strategies. [4]

Q.3. Given the following geometry, determine the loss due to knife edge diffraction. Assume $f = 900\text{MHz}$. [5]



Q.4. Write a technical note on scattering specifying mathematical formulae for critical height and scattering loss factor for any given angle of incidence.

[3.5]

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Semester I 2006 – 2007
IV Year (EEE/EIE)-Elective

Comprehensive Examination (Closed Book)

Course No.: EA UC452

Course Title: Mobile Telecommunication Systems N/W.

Date: 25.12.2006

Time: 03 Hours

M.M. = 40 (40 %)

- *Attempt all question in serial order.*
- *Assume suitable data/assumptions, if needed.*

1. Define the following with reference to Wireless Communication systems:
- Base Station
 - Control Channel
 - Forward Channel
 - Full Duplex Systems
 - Half Duplex Systems
 - Reverse channel
 - Handoff
 - Mobile Station
 - Subscriber
 - transceiver

[5]

2. [A] What do you understand by Bluetooth and PAN? Discuss technically.

[3]

- [B] Discuss frequency reuse with respect to cellular systems. If a total of 33 MHz of bandwidth is allocated to a particular FDD cellular telephone systems which uses two 25 kHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per call if a system uses 4 cell reuse and 7 cell reuse. If 1 MHz of the allocated spectrum is dedicated to control channels, determine an equitable distribution of control channels and voice channels in each cell for each of the systems.

[4]

3. [A] Discuss Channel planning for wireless systems.

[3]

- [B] 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 maximum capacity if the path loss exponent is 4, assume there are 6 channel cells in first tier and all of them are at the same distance from the mobile.

[4]

4. [A] Write a technical Note on Radar Cross section Model for Scattering in Mobile Systems.

[3]

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- [B] If a transmitter produces 50W of power, express the transmit power in units of dBm and dBW. If 50W is applied to a unity gain antenna with a 900 MHz carrier frequency, find the receive power in dBm at a free space distance of 1 Km from the antenna. Assume suitable assumption, if needed. [4]
- 5.
- [A] Discuss fading effects due to Multipath Time delay spread experienced by a signal propagating through a mobile radio channel. [3]
- [B] What do you understand by the terms Equalization, Diversity and Channel Coding? [3]
- [C] If US AMPS cellular operator is allocated 25 MHz for each simplex band, and if total spectrum allocation is 25 MHz, guard band is 20 kHz and channel bandwidth is 30 kHz, find the number of channels available in FDMA System. [2]
- 6.
- [A] Discuss frame structure of GSM. [3]
- [B] Define the following:
TDMA, FDMA & CDMA [3]

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Quiz (Closed Book)

Course No.: EA UC452

Course Title: Mobile Telecommunication Networks

Date: 16.11.2006

Time: 30Minutes

M.M. = 20 (10 %)

1. Each Bluetooth radio channel has a _____ MHz bandwidth and hops at a rate of app. _____ hops/sec.
2. _____ Standards committee has been formed to provide an international forum for developing Bluetooth.
3. Each cellular base station is allocated a group of radio channels to be used within a small geographical area called a _____.
4. When mobile moves into a different cell while a conversation is in progress, the MSC automatically transfers the call to a new channel belonging to a new base station. This operation is known as _____.
5. ETACS is the example of _____ generation network.
6. The uplink frequency for GSM in Europe is _____.
7. The downlink frequency for GSM in Europe is _____.
8. With reference to cellular radio systems, to accommodate a large number of users in a limited radio spectrum is known as _____.
9. The _____ is a measure of the ability of user to access a trunked system during the busiest hour.
10. Cell splitting increases the capacity of a cellular system since it _____.

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Quiz (Closed Book)

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Date: 16.11.2006

Time: 30Minutes

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11. For a cluster size of 7, the co channel reuse ration is _____.
12. The average received power (P_r) at a distance d from the transmitting antenna is approximated by formula :
13. The S/I ratio for a mobile can be approximated as :
14. _____ is the process of subdividing a congested cell into smaller cells, each with its own base station.
15. Due to sectoring , SIR _____.
16. Write the Friis free space equation.
17. The gain of an antenna is related to its effective aperture by equation _____.
18. Okumura model is one of the most widely used models for signal penetration for Urban / Rural areas.
19. List various physical factors in radio propagation channel that influence small scale fading.
20. In Flat fading, the BW of signal is Less / More than BW of channel.

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Semester I 2006 – 2007

IV Year (EEE/EIE)-Elective

Test 2 (Closed Book)

Course No.: EA UC452

Course Title: Mobile Telecommunication Systems

Date: 04.12.2006

Time: 50Minutes

M.M. = 20 (20 %)

Q1.

[A] Define the following:

TDMA, FDMA & CDMA

[3]

[B] Name the various multiple access techniques used in the following wireless communication systems:

AMPS, GSM, DECT, W-CDMA, CDMA2000

[3]

Q2. If US AMPS cellular operator is allocated 25 MHz for each simplex band, and if total spectrum allocation is 25 MHz, guard band is 20 kHz and channel bandwidth is 30 kHz, find the number of channels available in FDMA System. [3]

Q3. If the SNR of a wireless communication link is 20 dB and the RF bandwidth is 30 kHz, determine the maximum theoretical data rate that can be transmitted. [2]

Q4. A Zero mean sinusoidal message is applied to a transmitter that radiates an AM signal with 25 kW power. Compute the carrier power if the modulation index is 0.6. What percentage of the total power is in the carrier? [3]

Q5. Consider a transmitter which radiates a sinusoidal carrier frequency of 1850MHz. For a vehicle moving 60 mph, compute the received carrier frequency if the mobile is moving directly towards transmitter, directly away from the transmitter and in a direction which is perpendicular to the direction of arrival of the transmitted signal. [3]

Q6. Write a technical note on Okumura Model. [3]

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Test 1 (Closed Book)

Course No.: EA UC452

Course Title: Mobile Telecommunication Systems

Date: 15.10.2006

Time: 50Minutes

M.M. = 20 (20 %)

Attempt all questions.

Q.1. Write the full form of the following:

[5]

- | | | |
|----------|-----------|-------------|
| A. CCITT | B. CPFSK | C. EDGE |
| D. FDMA | E. ITU | F. MSC |
| G. UMTS | H. W-CDMA | I. TD-SCDMA |
| J. BSC | | |

Q.2. How the absolute decibel level of power in dBW and dBm are defined mathematically? If 0 dBm is equal to 1 mW over some load, express 10 W in units of dBm.

[4]

Q.3. How interference affects the performance of cellular radio systems? 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 maximum capacity if the path loss exponent is 4, assume there are 6 channel cells in first tier and all of them are at the same distance from the mobile.

[4]

Q.4. A mobile is located 5000 m away from a base station and uses a vertical 8.33 cm antenna (monopole) with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1 km from the transmitter is measured to be 0.001 V/m. the carrier frequency used for this system is 0.9GHz. Find the effective aperture of the receiving antenna and also find the received power at the mobile using two ray ground reflection model assuming the height of the transmitting antenna is 0.05 km and receiving antenna is 1.5 m above ground.

[5]

Q.5. Write a technical note on Bluetooth and PANs.

[2]