

**BITS, PILANI – DUBAI
Academic City, Dubai**

**Semester I 2007 – 2008
IV Year (EEE)-Elective**

Test -1 (Closed Book)

Course No.: EA UC 452

Course Title: Mobile telecommunication Networks

Date: 04.11.2007

Time: 50Minutes

M.M. = 25 (25 %)

- Q1. Write the full form wrt Mobile Communications: [8]
- | | | | | | |
|--------|---------|---------|--------|----------|--------|
| 1. AAL | 2. ARQ | 3. BTS | 4. CSD | 5. DECT | 6. LAR |
| 7. JTC | 8. MAHO | 8. PABX | 9. GOS | 10. GPRS | |
- Q2. Write a short note on paging systems. Draw the rough sketch of a wide area paging systems. [4]
- Q3. A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive radio signals. The E field at 1 km from the transmitter is measured to be 0.001V/m. The carrier frequency used in this system is 900 MHz.
- Find the length and the effective aperture of the receiving antenna. [2]
 - Find the received power at the mobile using 2 ray ground model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above the ground. [4]
- Q4. What is Brewster Angle? Calculate the Brewster angle for a wave impinging on ground having a relative permittivity of 8. [4]
- Q5. Write a technical note on Bluetooth and PANs. [3]

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Semester I 2007 – 2008
IV Year (EEE/EIE)-Elective

Test -2 (Open Book)

Course No.: EA UC 452

Course Title: Mobile telecommunication Networks

Date: 13.12.2007

Time: 50Minutes

M.M. = 20 (20 %)

- **Attempt all questions.**
- **Assume suitable data, if missing any.**
- * *Mention the formula used clearly, before substituting values.*

Q1. Write a technical note on Doppler Spread and Coherence time. [2]

Q2. Compute the RMS delay spread for the following power delay profile in fig 1. If BPSK modulation is used, what is the maximum bit rate that can be sent through the channel without needing an equalizer? [1 + 2]

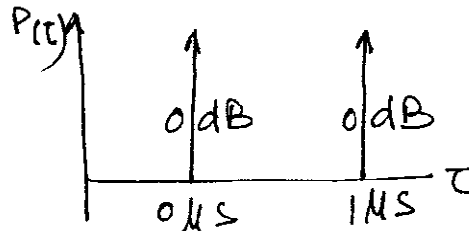


fig (4)

Q3. A class C plate modulated amplifier under 100% modulation with a sinusoidal signal requires a total plate input power of 1400Watts and its plate dissipation rises to 400Watts. Calculate:

- The carrier power output and plate dissipation when there is no modulation
- Modulator power output and plate dissipation at 100% modulation if the plate efficiency of the modulator is 0.6.

[3+3]

Q4. List the important features of TDMA and CDMA schemes. [2+2]

Q5. Draw the GSM system architecture. Draw a GSM frame structure if there are 8 time slots/frame and the frame period is 4.615 milli sec. Also calculate the bits in a frame and frame rate. [2+3]

BITS, PILANI – DUBAI
Academic City, Dubai

Semester I 2007 – 2008
IV Year (EEE/EIE)-Elective

Comprehensive Examination (Closed Book)

Course No.: EA UC452 **Course Title:** Mobile Telecommunication Networks

Date: 06.01.2008 **Time:** 03 Hours **M.M. = 40 (40 %)**

- **Attempt all question in serial order, marks will be deducted in case of violation.**
- **Assume suitable data/assumptions, if needed. Also write the formula used, if any.**

Q1. [a] Write a technical note on trends in Cellular radio and personal communications. [4]
[b] Write a brief note on Bluetooth and PAN, elaborating IEEE 802.11b channels for Bluetooth. [4]

Q2. What is the concept of frequency reuse? [2]

A hexagonal cell within a 4 cell system has a radius of 1.387km. A total of 60 channels are used within the entire system. If the load/user is 0.029 Erlangs and $\lambda = 1$ call/hr, compute for an Erlang C system that has 5% probability of a delayed call: (take for 5% probability of delay, $C=15$, Traffic intensity as 0.9 Erlang)

1. How many users per square km will this system support? [2]
2. What is the probability that a delayed call will have to wait for more than 10sec? [2]
3. What is the probability that a call will be delayed for more than 10sec? [2]

Q3. Discuss ground reflection (Two ray) model for reflection in mobile radio propagation. [4]

A mobile is located 5 km away from a base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive radio signals. The E field at 1 km from the transmitter is measured to be 0.001V/m. The carrier frequency used in this system is 900 MHz.

- a. Find the length and the effective aperture of the receiving antenna. [2]
- b. Find the received power at the mobile using 2 ray ground model assuming the height of the transmitting antenna is 50 m and the receiving antenna is 1.5 m above the ground. [2]

Q4. What do you mean by Small scale fading? Discuss various factors that influence small scale fading. [4]

For a Rayleigh fading signal, compute the positive going level crossing rate for $p=1$, when the maximum Doppler frequency is 20 Hz. What is the maximum velocity of the mobile for this Doppler frequency if the carrier frequency is 900 MHz? [4]

Q5. How much bandwidth is required for an analog frequency modulated signal that has an audio B/W of 5 kHz and a modulation index of 3? How much output SNR improvement would be obtained if the modulation index is increased to five?

What is the tradeoff for this improvement? [3]

Q6. Write the full form of WACS, and what was the name given to it later? [2]

If a normal GSM time slot consists of 6 trailing bits, 8.25 guard bits, 26 training bits and 2 traffic bursts of 58 bits of data, find the frame efficiency? [3]

MTN

19.09.07

Write the full forms the following abbreviations with reference to Mobile Communications:

1. ADSL 2. BSC 3. EDGE 4. IMT 2000 5. MTSO

ANS:

1. Asynchronous Digital Subscriber Line
2. Base Station Controller
3. Enhanced Data Rates for GSM Evolution
4. International Mobile Telecommunication 2000
5. Mobile Telephone Switching Office

NAME: _____

ID NO: _____

EA UC 452: MOBILE TELECOM NETWORKS

SURPRISE QUIZ NO 2

Dated: 23/10/2007

1. Bluetooth operates in the _____.
2. Bluetooth uses a _____ TDD scheme.
3. Each Bluetooth radio channel has _____ BW.
4. Each Bluetooth radio channel hops at a rate of app.
_____.
5. IEEE _____ is the standard for developing Bluetooth.

Answers:

1. 2.4 GHz ISM Band
2. frequency hopping
3. 1 MHz
4. 1600 hops/sec
5. IEEE 802.15

Name: _____

Id No.: _____

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EA UC 452: MOBILE TELECOM NETWORKS

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SURPRISE QUIZ -3

DATED: 21/11/2007

1. Name the four major factors in the radio propagation channel that influence small scale fading. [2]

2. A zero mean sinusoidal message is applied to a transmitter that radiates an AM signal with 10 kW power. Compute the carrier power if the modulation index is 0.6. [1]

3. With reference to Q2, what percentage of the total power is in the carrier? [1]

4. If SNR of a wireless communication link is 20 dB and the RF BW is 30 kW, calculate the maximum data rate that can be transmitted? [1]

Name: _____

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SURPRISE QUIZ -4

MM : 05

Complete the following tables.

Cellular System	Multiple Access Technique
AMPS	
GSM	
W-CDMA	
cdma2000	

[2]

TDMA Systems	GSM (Europa)	IS-54 (USA)	PDC (Japan)	DECT (European Cordless)
Bandwidth				
Duplexing				
Modulation				

[3]