Registration Number :

B.E. / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATION – APRIL / MAY 2012
ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH
SIXTH SEMESTER – (REGULATIONS R 2008)
EC9352 – WIRELESS COMMUNICATION

Duration : 3 Hours Max. Marks = 100

Answer **ALL** the questions.

PART- A (10 x 2 = 20 marks)

1. An electromagnetic wave at 1900 MHz strikes an plane surface. How is the dimension of the surface related to the wave for it to get (i) reflected and (ii) scattered.
2. Given the distance between the transmitter and the receiver as 10 km and transmission frequency as 900 MHz, determine the radius of the first Fresnel Zone at the mid-point.
3. What is the trade-off involved in the selection of hand-off margin in cellular systems.
4. Draw a suitable figure illustrating 3-cell reuse and 60° sectoring and show how Interference reduction is achieved.
5. Draw the signal constellations of QPSK and OQPSK schemes and show the possible transitions that can occur over adjacent symbol durations.
6. Justify the necessity to convert the modulation symbols from serial mode to parallel mode in OFDM systems.
7. Draw the block diagram of a 4-path Feedback/Switched Diversity combining technique.
8. Given a 4 x 2 MIMO system what is the order of improvement in BER and capacity that be realized compared to a SISO system.
9. Bring out the relationship between symbol rate, hop rate and chip rate in Fast Frequency Hopping Spread Spectrum systems.
10. How is the connectivity maintained between a Wi-Fi access point and a wireless node which is moving away from the access point.

PART – B (5 x 16 = 80 marks)

11. A city has an area of 1300 square miles and is covered by a cellular system using a seven-cell reuse pattern. Each cell has a radius of 4 miles and the city is allocated 40 MHz of spectrum with full duplex channel bandwidth of 60 KHz. Assume, a GOS of 2% for an Erlang B system is specified. On an average each user generates calls at the rate of 1 per hour with an average call holding time of 1.8 minutes. Compute (a) the number of cells in the service area, (b) the number of channels available per cell, (c) traffic intensity supported by each cell, (d) the maximum carried traffic, (e) the total number of users that can be served for 2% GOS, (f) the number of mobiles per unique channel and (g) the theoretical maximum number of users that could be served at one time by the system. Use the following Erlang B table.

No. of trunked channels	70	75	80	85	90	95	100
Traffic Intensity in Erlangs for 2 % blocking	60	67	70	76	80	84	90

12a. Distinguish between large scale fading and small scale fading. Explain with suitable diagrams and derivation the two - ray ground reflection model for path loss prediction and highlight it's advantages and disadvantages in the estimation of path loss.

(OR)

12b. (i) Explain the terms Coherence bandwidth, Coherence Time, RMS delay spread, Doppler spread, Level Crossing rate and Average Fade Duration for a mobile multipath channel. How does each of these parameters affect communication system design for wireless channels. (10)

(ii) If a baseband binary message with the bit rate 100 kbps is modulating an RF carrier using 4-QAM, (a) Find the range of values for the RMS delay spread of the channel for which the received signal is a flat faded signal and determine the coherence bandwidth, (b) If the carrier frequency is 5.8 GHz what is the coherence time of the channel assuming a vehicle speed of 30 km/hr, (c) Is the channel fast fading or slow fading, (d) How many bits are sent while the channel appears stationary. (6)

13a. Explain with suitable diagrams the different blocks present in an OFDM transceiver and explain the significance of each block. Show the impact of increasing the number of sub-carriers on the power spectral characteristics of the OFDM signal.

(OR)

13b. Explain with suitable diagrams the baseband transmitter and receiver for MSK modulation scheme. Compare QPSK and MSK signals based on their power spectral characteristics.

14a. With suitable block diagrams explain Selection Combining and Maximal Ratio Combining Techniques. Highlight their merits and demerits.

(OR)

14b. Illustrate a 4 x 4 Multiple Input Multiple Output (MIMO) channel and give the mathematical model for the same. Explain the similarity and difference between Spatial Diversity technique and Spatial Multiplexing technique applied over MIMO channels.

15a. (i) Classify the forward and reverse logical channels used in GSM. Also explain the signal exchange that takes place during call setup using these channels, between calling subscriber, BTS, BSC/MSC and called subscriber. (12)

(ii) 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. (4)

(OR)

15b. (i) Highlight the different factors that affect the capacities of FDMA, TDMA and CDMA techniques when applied in wireless systems. (8)

(ii) Explain the necessity for power control in CDMA systems. What are the different power control strategies adopted in the IS-95 CDMA Standard. (8)

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