Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 52929

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fifth/Eighth Semester

Electronics and Communication Engineering

EC 6801 – WIRELESS COMMUNICATION

(Common to: Robotics and Automation Engineering/Information Technology)

(Regulation 2013)

Also common to: PTEC 6801 – Wireless communication for B.E. (Part-Time)- Sixth Semester- Electronics and communication Engineering (Regulation – 2014)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate small from large scale fading.
2. What are the two factors that contribute to the rapid fluctuations of the signal amplitude?
3. How FDMA handles near-far problem?
4. What do you mean by mobile-assisted handoff?
5. List the features of offset QPSK.
6. What are the differences between zero-forcing and mean squared error equalizer?
7. What do you mean by macro diversity?
8. Name the three techniques used to improve the received signal quality.
9. Differentiate transmit diversity from random beamforming.
10. Define precoding.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Describe the free space propagation model and derive the loss in the signal strength. (7)

(ii) If the transmit power is 1W and carrier frequency is 2.4GHz and the receiver is at a distance of 1 mile from the transmitter. Assume that the transmitter and receiver antenna gains are 1.6. (6)

(1) What is the received power in dBm in the free space of a signal?

(2) What is the path loss in dB?

(3) What is the transmission delay in ns?

Or

(b) (i) Discuss the flat fading channel characteristics with relevant diagrams. (8)

(ii) Describe the classification of small scale fading with respect to Doppler spread. (5)

12. (a) (i) Describe the principle of CDMA. (5)

(ii) Write a brief note on

(1) Trunking and

(2) Cell splitting. (8)

Or

(b) (i) Illustrate the handoff scenario at cell boundary. (7)

(ii) 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 channels available per cell if a system uses

(1) 4-cell reuse,

(2) 7-cell reuse. (6)

13. (a) State the principle and describe the working of $\pi/4$ QPSK transmitter with a neat diagram.

Or

(b) (i) Explain the principle of OFDM by comparing it with FDMA with a sketch. (8)

(ii) Discuss any four reasons for the physical cause of error floors in delay and frequency dispersive fading channels. (5)

14. (a) Draw and explain a simplified communication system using an adaptive equalizer at the receiver.

Or

(b) (i) Explain with a sketch, the working of RAKE receiver. (7)

(ii) Write a brief note on categories of space diversity reception methods. (6)

15. (a) Explain clearly how spatial multiplexing works with a neat diagram and write down the expression for the channel matrix and received signal vector.

Or

(b) Explain the concept of diversity with CSI at the transmitter and Derive the expression for the capacity.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Determine the proper spatial sampling interval required to make small scale propagation measurements which assume that consecutive samples are highly correlated in time. How many samples will be required over 10m travel distance if f_c=1900 MHz and v = 50 m/s. How long would it take to make these measurements, assuming they could be made in real time for a moving vehicle? What is the Doppler spread for the channel? (7)

(ii) Draw the chart showing the classification of equalizers. (8)

Or

(b) (i) In a cellular MIMO system: let the BS have 8 antenna elements, and each MS have 2 antenna elements. The system has 5MHz bandwidth centered at 2GHz carrier frequency, and operates in a channel with 250 kHz coherence bandwidth. The coherence time is 5 ms, corresponding to typical vehicular speeds. With 30 users in the cell, what is the total overhead data rate for the feedback? (4)

(Assume that real and imaginary parts are quantized with 6 bits each, and a rate 2/3 code is used to protect the feedback information.) Justify with the answer why the feedback reduction techniques are important? (6)

(ii) Compare and contrast wired and wireless communication. (5)
