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Question Paper Code : 71747

B.E/B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fifth/Eighth Semester

Electronics and Communication Engineering

EC 6801 — WIRELESS COMMUNICATION

(Common to Robotics and Automation Engineering, Information Technology)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the major advantage of wireless communication?

2. Define Coherence time. In what way does this parameter decide the behavior of wireless channel?

3. Why is cellular concept used for mobile telephony?

4. In a cellular network, among a handoff call and a new call, which one is given priority? Why?

5. What is the basic advantage of using Multicarrier schemes such as OFDM?

6. State any two advantages of MSK.

7. Why is an adaptive equalizer required?

8. What is diversity? Why is it employed?

9. What is spatial multiplexing?

10. What is Channel State Information? What is its benefit?

PART B — (5 × 16 = 80 marks)

11. (a) (i) If a transmitter produces 50W of power, which is applied to a unity gain antenna with a 900 MHz carrier frequency, find the received power in dBm at a free space distance of 100m from the antenna. What is received power at a distance of 10 km? Assume unity gain for the receiver antenna. (5)

(ii) Derive the path loss considering a Two-Ray Model for the propagation mechanism in a wireless channel. Is considering just two rays alone sufficient? Why? (11)

Or

(b) (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 10 m travel distance if f_c = 1900 MHz and v = 50m/s. How long would it take to make these measurements, assuming they could be made in real time from a moving vehicle? What is the Doppler spread B_D for the channel? (5)

(ii) Describe in detail, the parameters of mobile multipath channels with their significance. (6)

(iii) Compare and contrast fast fading and slow fading. "In practice fast fading only occurs for very low data rate (communications)". Why? (5)

12. (a) (i) Describe Channel assignment strategies and Hand–off strategies. (10)

(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) four–cell reuse (2)seven–cell reuse and (3)twelve-cell reuse. If 1 MHz of the allocated spectrums is dedicated to control channels, determine the equitable distribution of control channels and voice channels in each cell of each of the three systems. (6)

Or

(b) (i) Derive the expressions for Cellular CDMA schemes for both noise limited and interference limited scenarios. (10)

(ii) Consider Global System for Mobile, which is a TDMA/FDD system that uses 25 MHz for the forward link, which is broken into radio channels of 200 MHz. If 8 speech signals are supported on a single radio channel and if no guard band is assumed find the number of simultaneous users that can be accommodated in GSM. (2)

(iii) If GSM uses a frame structure where each frame consists of eight time slots, and each time slot contains 156.25 bits, and data is transmitted at 270.833 kbps in the channel, find (1) the time duration of a bit (2) the time duration of a slot (3) the time duration of a frame and (4) how long must a user occupying a single time slot wait between two successive transmissions? (4)

13. (a) (i) Why are constant envelope modulation schemes such as MSK and GMSK used in a wireless communication system? Compare and contrast these two modulation techniques. (8)

(ii) Describe OFDM scheme and state the reason behind using cyclic prefix in OFDM scheme. What is PAPR? Why is it normally larger in a OFDM technique? (8)

Or

(b) (i) Discuss the error performance of different modulation schemes in fading channels. (10)

(ii) What is Offset–QPSK? What is its advantage? Describe the Offset–QPSK scheme. (6)

14. (a) (i) Describe the role played by Equalisation and diversity as Multipath mitigation techniques. Compare and contrast these two techniques. (10)

(ii) Consider the design of the US Digital Cellular equalizer, where f = 900 MHz and the mobile velocity v = 80 km/hr, determine the maximum Doppler shift, the coherence time of the channel and the maximum number of symbols that could be transmitted without updating the equalizer assuming that the symbol rate is 24.3 k symbols/sec. (6)

Or

(b) (i) With a sketch, describe RAKE receiver. (6)

(ii) Assume four branch diversity is used, where each branch receives an independent Rayleigh fading signal. If the average SNR is 20 dB, determine the probability that the SNR will drop below 10 dB. Compare this with the case of a single receiver without diversity. (4)

(iii) Derive an expression for performance improvement due to Maximal Ratio combining. (6)

15. (a) Discuss in detail, the capacity in fading and non–fading channels. (16)

Or

(b) (i) Describe MIMO systems with emphasis on their requirement in a wireless communication environment. (8)

(ii) Describe the concepts of Pre–coding and Beam forming. (8)