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Question Paper Code : 71217

M.E. DEGREE EXAMINATION, JUNE/JULY 2013.

Second Semester

Communication Systems

CU 9221/CP 951 – WIRELESS MOBILE COMMUNICATION

(Common to M.E. Computer and Communication, M.E. Digital Electronics and Communication Engineering and M.E. Communication and Networking)

(Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. When are two multipath components said to be nonresolvable?

2. Define channel coherence time.

3. Compare the effect of AWGN and fading on probability of symbol error.

4. Define outage probability.

5. Distinguish microdiversity and macrodiversity.

6. Differentiate time and frequency diversity schemes.

7. Consider a multicarrier system with a total passband bandwidth of 1 MHz. If the channel delay spread is 20 μs. How many subchannels (nonoverlapping) are needed to obtain approximately flat fading in subchannel?

8. What are the advantages of multicarrier modulation over equalizers?

9. What are the properties of maximal length PN sequence?

10. Distinguish acquisition and tracking with respect to spread spectrum systems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive expressions for the capacity of flat fading channels when CSI is known at the receiver and CSI is known to the receiver and transmitter. (10)

(ii) Consider a flat fading channel with i.i.d. channel gain $\sqrt{g[i]}$ which can take on three values : $\sqrt{g\,1} = 0.05$ with probability $P_1 = 0.1$, $\sqrt{g\,2} = 0.5$ with $P_2 = 0.5$ and $\sqrt{g\,3} = 1$ with probability $P_3 = 0.4$. The transmit power is 15 mW, the noise power spectral density $N_0/2$ has $N_0 = 10^{-9}$ W/Hz and the channel bandwidth is 25 KHz. Assume that the receiver has knowledge of the instantaneous value of g[i] but the transmitter does not. Find the Shannon capacity of this channel and compare this with the capacity of an AWGN channel with the same average SNR. (6)

Or

(b) (i) Derive expressions for the capacity of time varying and time invariant channels suffering from frequency selective fading. (10)

(ii) Distinguish narrowband and wideband fading with suitable expressions. (6)

12. (a) (i) Define average probability of error and explain the average probability of error for BPSK, FSK, QAM and DPSK systems under Rayleigh fading with necessary equations and diagrams. (10)

(ii) Define Doppler spread and discuss the effect of Doppler spread on the performance of modulation techniques using differential detection. (6)

Or

(b) (i) Describe the performance of digital modulation techniques in frequency selective fading channels. (8)

(ii) Compare the performance of PSK, FSK and QAM systems under AWGN and flat fading conditions with suitable expressions and diagrams. (8)

13. (a) (i) Draw and explain the system model of receiver diversity and explain selection and threshold combining methods. (12)

(ii) Compare maximal ratio and equal gain combining techniques. (4)

Or

(b) (i) Describe the technique of transmitter diversity in detail. (12)

(ii) In a four branch selection diversity scheme, each branch receives an independent Rayleigh fading channel. If the average SNR is 20 dB, determine the probability that the SNR will drop below 10 dB. (4)

14. (a) (i) Explain multicarrier modulation with overlapping subchannels with suitable diagrams and expressions. (10)

(ii) Describe the methods of mitigating subcarrier fading. (6)

Or

(b) (i) Discuss orthogonal frequency division multiplexing with neat block diagrams. (12)

(ii) Write a brief note on IEEE 802.11 a. (4)

15. (a) (i) Describe direct sequence spread spectrum systems with neat block diagrams. (8)

(ii) Explain the principle and operation of RAKE receivers. (8)

Or

(b) (i) Discuss the principle and operation of frequency hopping spread spectrum systems with neat diagrams. (10)

(ii) Write a brief note on multiuser DSSS systems. (6)
