(ii) Derive the average probability of bit error for BPSK under MRC with i.i.d. Rayleigh fading. (8)

Or

(b) (i) With the help of neat diagram, discuss the decision feedback equalization. (8)

(ii) Explain the LPC coding system and also derive the predictor coefficients of LPC vocoder. (8)

15. (a) (i) Implement a 4-stage feedback shift register based PN generator with feedback tap given by [4, 1]. The initial state of the register is assumed to be 1000. Find the output sequence of the shift register. Demonstrate the balance property, autocorrelation and the run property of the PN sequence obtained. (8)

(ii) Explain the working principles of frequency hopping spread spectrum and give its features. (8)

Or

(b) With neat block diagram, explain the OFDM transmitter and receiver. Also bring out its advantages and disadvantages. (16)

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B.E./B.TECH. DEGREE EXAMINATIONS, NOV/DEC–2011

REGULATIONS 2008

SEVENTH SEMESTER

EC 71 – WIRELESS COMMUNICATION

ELECTRONICS AND COMMUNICATION ENGINEERING

Time: Three Hours Maximum: 100 marks

ANSWER ALL QUESTIONS

PART–A (10×2=20 marks)

1. A cellular service provider decides to use a digital TDMA scheme which can tolerate a SIR of 15 dB in the worst case. Find the optimal value of N for 120^0 sectoring.
2. Distinguish between flat and frequency selective fading.
3. Define coherence bandwidth and coherence time.
4. Define outage probability and average error probability.
5. What is meant by spectral efficiency and power efficiency?
6. Draw the signal constellation of $\pi/4$-DQPSK signaling and show the possible transitions over adjacent symbol durations.
7. List out the significant factors which influence the choice of speech coders in mobile communication systems.
8. Find the outage probability of QPSK modulation at $P_s = 10^{-3}$ for a Rayleigh fading channel with Selection Combining diversity for M = 1 (no diversity), M = 2, and M = 3. Assume branch SNRs $\gamma_1 = 10$ dB, $\gamma_2 = 15$ dB, and $\gamma_3 = 20$ dB.

9. If the channel bandwidth used in a Direct Sequence Spread Spectrum System is 1.25 MHz and the processing gain is 30 dB, what is the maximum data rate that can be transmitted?

10. How are the chip rate, the hop rate and the symbol rate related to each other in the Fast and Slow Frequency hopping spread spectrum systems?

PART–B (5×16=80 marks)

11. (a) (i) Derive an expression for signal to interference ratio for hexagonal cellular architecture in terms of frequency reuse factor. Also calculate the value of reuse factor to achieve an SIR of 30 dB. (8)

(ii) Explain the following Architectural methods for capacity expansion: Cell splitting, Cell Sectoring and Lee's Micro cell method. (8)

Or

(b) Illustrate the concepts of TDMA/FDD, CDMA/FDD techniques. Compare the features of FDMA, TDMA and CDMA. (16)

12. (a) (i) Explain the difference between the three basic propagation mechanisms that give rise to signal attenuation in a wireless medium. (8)

(ii) Assume a receiver is located 10km from a 50W transmitter. If the carrier frequency is 1900MHz, G_t=1, G_r=2, find the power at the receiver assuming a free space propagation. Also determine the received power at the mobile using two ray ground reflection model considering the transmitter antenna height as 50m, receive antenna height as 1.5m above the ground and the ground reflection as -1. (8)

Or

(b) (i) Explain the Clarke's model for multipath flat fading channel. (8)

(ii) Consider a wideband channel with multipath intensity profile $A_c(\tau) = \begin{cases} e^{-\tau} & 0 \le \tau \le 20\mu\text{sec} \\ 0 & else \end{cases}$. Find the mean and rms delay spreads of the channel and find the maximum symbol period such that a linearly-modulated signal transmitted through this channel does not experience ISI. (8)

13. (a) With neat block diagram explain GMSK modulator and demodulator. Compare the features of GMSK and MSK. (16)

Or

(b) Explain with suitable block diagrams the modulator and demodulator for the QPSK modulation scheme. Highlight the differences between QPSK, Offset QPSK and π/4-QPSK modulation schemes. (16)

14. (a) (i) Explain the different diversity combining strategies and compare their performances in terms of the probability of signal outage due to fading. (8)