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EC8652 WIRELESS COMMUNICATION

IMPORTANT QUESTIONS AND QUESTION BANK

UNIT – I WIRELESS CHANNELS

2-Marks

1. List the Propagation mechanisms in mobile radio?
2. Define Large scale propagation model?
3. Solve the Brewster Angle, θB for a wave impinging on poor ground having a permittivity of =4 at the frequency of 100 MHz. Also calculate the same for typical ground with permittivity of =15?
4. Write Friis free space equation?
5. What is the importance of EIRP?
6. Analyse the types of propagation model?
7. Find the difference between coherence time and coherence bandwidth?
8. Assess the effects of Doppler Shift?
9. Examine the need of Link Budget calculation?
10. How is Fraunhofer distance measured?

Part-B
1. How to relate the signal propagation against free space attenuation and reflection and describe in detail about two ray propagation mechanisms?
2. Explain in brief about the three propagation mechanisms? Write the impact on propagation in a mobile environment?
3. Identify the advantages and disadvantages of the two-ray ground reflection model in the analysis of path loss?
4. Explain in detail about the parameters in mobile multipath channels?
5. Analyze the process to achieve a balanced link budget within a given cell size and Enumerate the characteristics of coherence bandwidth and compare with signal bandwidth in wireless channel?
6. Classify the small scale fading in wireless channel based on multipath time delay spread and explain its features?
7. Illustrate the types of fading experienced by the signal as a function of symbol period (Ts) and baseband signal bandwidth (Bs)?
8. Explain the distribution that describes the statistical time varying behavior of the received signal in mobile radio channel?
9. Discuss in detail about fast fading and slow fading in wireless channel?
10. Evaluate the method to assess why large-scale and small-scale fading occur in wireless systems. Justify the statement "In practice fast fading only occurs for very low data rate communication?

11. Formulate the parameters of mobile multipath channels with their significance?

12. Consider two different wireless systems a and b. For a, the signal bandwidth of the system is much smaller than the coherence bandwidth of the channel. Conversely, b employs a signal bandwidth that is much larger than the coherence bandwidth of the channel. Which system (a or b) is best suited for employing frequency diversity techniques?

13. 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?

14. Estimate the length and effective aperture of the effective the receiving antenna for a mobile is located at 5Kms away from base station and uses a vertical $\lambda/4$ monopole antenna with a gain of 2.55 dB to receive cellular radio signals. The E-field at 1Km from transmitter is measured to 10^{-3}V/m the carrier frequency is 900 MHz. Also find the received power at the mobile using the two-ray ground reflection model assuming the height of the transmitting antenna is 50m and the receiving antenna is 1.5 m above the ground?

15. Classify the various parameters involved in mobile multipath channel?

UNIT – II CELLULAR ARCHITECTURE

2-Marks

1. Write the advantages of CDMA?
2. List out the effects of multipath propagation on CDMA?
3. Define Multiple Access technique?
4. Identify the need for calculating capacity in cellular systems?
5. Compare Narrow band Wide bans systems?
6. Analyse the difference between FDMA, CDMA and TDMA?
7. Illustrate frequency reuse technique?
8. Write the features of forward and reverse channel?
9. What is the difference between Soft and hard handoff?
10. Examine the effects of blocked call delay systems?

Part-B

1. Define multiple access techniques and Compare various multiple access techniques with each other?
2. Explain the channel capacity of TDMA in cell system in detail?
3. How would you explain the importance of capacity calculation in cellular system and narrate the methods to achieve it?

4. Summarize the features of various multiple access technique used in wireless mobile communication and also state the advantages and disadvantages of multiple access techniques?

5. List out the techniques to improve coverage and channel capacity in cellular system?

6. What would result if handoff strategies involved in cellular systems Explain in detail?

7. Elaborate spread spectrum multiple access techniques. (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?

8. Compare co-channel interference with adjacent channel interference?

9. Describe the techniques to avoid interference?

10. Explain the interference concepts with suitable diagrams?

11. Explain the capacity improvement techniques in detail?

12. If signal-to-interference ratio of 15dB is required for satisfactory forward channel performance of a cellular system, what is the frequency reuse factor and cluster size that should be used for maximum capacity if the path loss exponent is (1) n=4 (2) n=3?

13. How frequency is efficiently allocated in a cellular radio system?

14. Analyse a spectrum of 30 MHz is allocated to a wireless FDD cellular system which uses two 25 KHz simplex channels to provide full duplex voice and control channels, compute the number of channels available per cell. Compute the number of channels available per cell if it uses 4 cell reuse?

UNIT – III DIGITAL SIGNALING FOR FADING CHANNELS

2-Marks

1. Illustrate the structure of wireless communication link?

2. Give the function of Gaussian filter in GMSK?

3. List the advantages of OQPSK?

4. What is meant by non-coherent detection?

5. Discuss about the features of QPSK?

6. Develop the constellation diagram of offset QPSK?

7. Differentiate between MSK and GMSK?

8. Why is MSK referred to as fast FSK?

9. Examine the term Bandwidth efficiency?

10. Analyse the importance of constellation diagram. What do you infer from it?

Part-B

1. Explain about the modulation technique of QPSK with neat diagram and also list the advantages and disadvantages QPSK?
2. Describe the modulation and demodulation of π/4 QPSK and its advantages with neat block diagram?
3. What is MSK? Explain its power spectral density?
4. How would you describe the generation and demodulation of Minimum Shift Keying signals? Explain in detail?
5. What is flat fading channels? Derive the expression for probability of error in flat fading channels?
6. Explain in detail about Gaussian Minimum Shift Keying transmission and reception with necessary block diagram?
7. Illustrate the expression for the bit error rate for binary phase shift keying modulation for frequency flat fading channels?
8. Draw the structure of a wireless communication link and summarize the functions of components in detail?
9. A zero mean sinusoidal message is applied to a transmitter that radiates an AM signal with 10KW power. Compute the carrier power if the modulation index is 0.6. What percentage of the total power is in the carrier? Calculate the power in each sideband?
10. Derive the expression for bandwidth and power spectral density of digital signals?
11. Analyze the performance of digital modulation in slow flat fading channels?
12. Assess the principle of OFDM systems and explain its operation with neat block diagram?
13. Evaluate the expression for probability of error in frequency dispersive fading channels?
14. Design a delay dispersive and frequency dispersive fading Assess why constant envelope modulation schemes such as MSK and GMSK are used in a wireless communication system? Compare and contrast these two modulation techniques channels and formulate an expression for the error probability?
15. Develop the fading channel models and its performance in wireless communication?

UNIT – IV MULTIPATH MITIGATION TECHNIQUES

2-Marks

1. What is the need of equalization?
2. Define zero forcing equalizer?
3. Write the merits of space diversity schemes?
4. List the factors used in the selection of adaptive equalizers?
5. Why is an adaptive algorithm required?
6. Outline the advantages of LMS algorithm?
7. Express the prediction error measured in linear equalizer during training process?
8. How least mean square algorithm is used in equalization techniques?
9. Classify the diversity and its combining techniques?
10. Develop the transfer function of linear predictive coder?

Part-B

1. Summarize about the working principle of linear and non-linear equalizers with neat diagram?
2. List and explain the various factors that affect the performance of adaptive equalization? Write the different types of adaptive equalization methods?
3. Sketch the decision feedback equalizer block diagram and explain its working principle and derive an expression for its minimum mean square error?
4. Describe the two modes of operating methods in adaptive equalizer and compare the performance of various algorithms for adaptive equalization?
5. Discuss the principle of diversity and various diversity schemes with their advantages and disadvantages?
6. Examine the different types of diversity techniques and explain Time, Frequency and Angular diversity techniques?
7. Assess the different types of diversity techniques used in wireless communication with necessary analytical models?
8. Explain macro diversity. Obtain the RSSI and BER in selection diversity?
9. Describe the error performance in fading channel and obtain the canonical receiver structure?
10. Demonstrate on the different types of diversity combining methods used in multipath propagation model?
11. Elaborate Rake receiver with relevant diagrams. Also discuss how time diversity is achieved in a CDMA technique using Rake receiver?

12. Evaluate the performance of adaptive equalizers with necessary equations and also prove that it exhibits superior performance over the conventional equalizers?

13. Describe about the importance of equalization and diversity methods used for the mitigation of interference in multipath propagation model. Compare and contrast these two techniques?

14. Derive an expression for error probability in flat-fading channel?

15. Describe the error performance in fading channel and obtain the canonical receiver structure?

UNIT-V MULTIPLE AENTENNA TECHNIQUES

2-Marks

1. Define MIMO Systems?
2. What is spatial diversity?
3. Identify the requirements of beam forming?
4. Outline the working of spatial multiplexing?
5. Summarize about the requirement for precoding?
6. Interpret the capacity of fading channel with noisy information?
7. Extend the features of orthogonal space time block codes?
8. Choose the parameters for a multipath channel (No line of sight)?
9. Illustrate the channel state information. What is the benefit of it?
10. Specify about the characteristics of SDMA system?

Part-B

1. What is meant by MIMO systems? Describe the MIMO system model with necessary diagrams in detail?
2. Define precoding and explain the operation of transmit precoding?
3. Describe about Multiple antenna techniques?
4. Quote on diversity and explain STC and bandwidth efficiency?
5. Discuss on Channel State Information at transmitter and receiver?
6. Describe the capacity of a fading and non-fading channel for information transmitted from a wireless system?
7. Why beamforming is important for wireless systems? Write short notes on transmit diversity?
8. Illustrate on selection diversity and equal ratio combining?
9. Demonstrate the coding and decoding schemes in channels and plot the average SNR Vs C/B?
10. Compare the capacity of fading and non-fading channel for information transmitted from wireless system?
11. Analyze on the receiver diversity and combination of signals?

12. Explain in detail maximal ratio combiner technique and its advantages?
13. Evaluate the system model and precoding for multi-user MIMO systems?
14. Formulate the expression for performance improvement due to maximal ratio combining?
15. Determine the capacity of slow fading channel and obtain the outage probability for receive diversity system with L receive antenna?
16. Elaborate the different types of diversity technique. Explain each in detail?

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