



AKSHEYAA COLLEGE OF ENGINEERING

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(An ISO 9001:2008 Certified Institution)



EC6801/WIRELESS COMMUNICATION (Regulation-2013)

IV Year/VIII Semester

UNIT-WISE EXPECTED QUESTIONS FOR UNIVERSITY EXAMINATION

UNIT-1 Services and Technical Challenges

PART-A

1. Differentiate cellular telephony and cordless telephony (NOV-11)
2. When does a WLAN become a Personal Area Network (PAN)? (NOV-11)
3. What are the different types of multiple access schemes? (MAY-12)
4. Mention the significance of frequency reuse in cellular networks? (MAY-12)
5. What is flat fading? (NOV-12)
6. Define signal to self-interference ratio. (NOV-12)
7. Define frequency reuse. (MAY-13)
8. State the operating principle of adhoc networks. (MAY-13)
9. What are the most important effects of small scale multipath propagation? (NOV-13)
10. What is a multiple access technique? (NOV-13)
11. What are the basic requirements for wireless services? (MAY-14)
12. What is frequency hopped multiple access? (MAY-14)
13. What are the different modules of a basic cellular system? (NOV-14)
14. State advantages of ADMA over FDMA? (NOV-14)
15. Mention a few techniques used to expand the capacity of a cellular system. (MAY-15)

PART-B

1. Compare and contrast wired and wireless communication. (8) (Nov-11)
2. Describe briefly about the requirements of service for a wireless system. (8) (Nov-11)
3. Discuss in detail the constructive and destructive interference. (8) (Nov-11) (MAY-15)
4. Explain how Inter Symbol Interference is caused and how it is eliminated. (8) (Nov-11) (MAY-15)
5. Explain in detail Wide Area Data Services and Broadband Wireless Access services offered to wireless networks. (10) (MAY-12)
6. What are paging systems? Explain. (6)(MAY-12)
7. With a neat block diagram, explain the cellular network architecture. (10) (MAY-12)
8. Explain any one type of multiple access schemes. (6) (MAY-12)
9. Explain about the factors that influence small-scale fading. (10) (NOV-12) (MAY-15)
10. Find the average fade duration for threshold levels $p=0.01$, $p=0.1$ and $p=1$, when the Doppler frequency is 200Hz. (6) (NOV-12)
11. Write a note on noise and interference limited systems. (8) (NOV-12)
12. Discuss the principle of cellular networks. (8) (NOV-12)
13. Explain the methods for increasing the capacity of wireless cellular networks. (10) (MAY-13)

14. Brief about the principle of time division multiple access. (6) (MAY-13)
15. Describe in detail about the effects of multipath propagation in wireless environment. (10) (MAY-13)
16. A communication system has the following parameters: $P_t=5W$, $G_t=13dB$, $d=80Km$, $f=3GHz$. Determine the value of a received power. (6) (MAY-13)
17. Discuss the types of services, requirements, spectrum limitations and noise considerations of wireless communications. (16) (NOV-13) (MAY-15)
18. Explain the principle of cellular networks and various types of handoff techniques. (16) (NOV-13)
19. Discuss about the technical challenges faced by the wireless communication. (10) (MAY-14)
20. What are the features of interference limited systems. (6) (MAY-14)
21. What are the major differences between TDMA, FDMA and CDMA? Explain in detail about each multiple access. (16) (MAY-14)
22. With a block diagram of a basic cellular system, explain its various functional modules and the method by which a call is routed. (10) (NOV-14)
23. Explain in detail a handoff scenario at cell boundary. (6) (NOV-14)
24. Explain the different types of multipath propagation in wireless communication. (10) (NOV-14)
25. With neat illustration, explain CDMA. (6) (NOV-14)

UNIT-2 Wireless Propagation Channels

PART-A

1. Compute the Rayleigh distance of a square antenna with 20db gain. (Nov-11)
2. List any two properties of wideband channel. (Nov-11) (MAY-15)
3. List the different types of wireless channels. (MAY-12)
4. What is frequency selective fading? How to avoid fading problem? (MAY-12)
5. Distinguish between narrowband and wideband systems. (NOV-12) (NOV-13)
6. What is link budget calculation? (NOV-12)
7. State the differences between small-scale and large-scale fading. (MAY-13) (MAY-15)
8. Define Snell's law. (MAY-13) (MAY-15)
9. Find the far-field distance for an antenna with maximum dimension of 1m and operating frequency of 900MHz. (NOV-13)
10. State the propagation effects in mobile radio. (MAY-14)
11. Interpret link budget equation. (MAY-14)
12. List the different types of propagation mechanisms. (NOV-14)
13. What are the different fading effects due to Doppler spread? (NOV-14)

PART-B

1. Describe any two methods of diffraction by multiple access. (8)(Nov-11)
2. Discuss about ultra wide band channel. (8) (Nov-11)
3. Compare coherence bandwidth and coherence time. (8) (Nov-11)
4. Discuss the mathematical formulation for narrowband and wideband system, with relevant figures. (8) (Nov-11)
5. Explain the free space path loss and derive the gain expression. (8) (MAY-12)
6. Describe in detail Two Ray Model propagation mechanism. (8) (MAY-12) (NOV-14)
7. Define the following Auto-correlation, cross correlation and power spectral density for narrow and fading model. (8) (MAY-12)
8. What is the need for link calculation? Explain with suitable example. (8) (MAY-12)
9. How the received signal strength is predicted using the free space propagation model? Explain. (10) (NOV-12)
10. Find the far-field distance for an antenna with maximum dimension of 1m and operating frequency of 900 MHz. (6) (NOV-12)

11. With system theoretic description explain the characteristics of time- dispersive channels. (8) (NOV-12)
12. Explain the three basic propagation mechanisms in a mobile communication system. (8) (NOV-12) (MAY-15)
13. Explain the time variant two path model of a wireless propagation channel. (8) (MAY-13)
14. Brief about the properties of Rayleigh distribution. (8) (MAY-13)
15. Explain the narrow band modeling methods for short scale fading and long scale fading. (10) (MAY-13)
16. Brief about the properties of Nakagami distribution. (6) (MAY-13)
17. Briefly explain the factors that influence small scale fading. (8) (NOV-13)
18. If a transmitter produces 50W of power, express the transmit power in units of dBm And dBW. If 50W is applied to a unity gain antenna with a 900MHz carrier frequency, find the received power in dBm at a free space distance of 100m from the antenna. What is Pr (10Km)? Assume unity gain for the receiver antenna. (8) (NOV-13)
19. Briefly explain the three basic propagation mechanisms which impact propagation in a mobile communication system. (8) (NOV-13)
20. What is Brewster angle? Calculate the Brewster angle for a wave impinging on ground having a permittivity of $\epsilon_r=4$. (8) (NOV-13) (MAY-15)
21. Explain how signal propagates against free space attenuation and reflection. (8) (MAY-14)
22. Discuss about the temporal channel variations in fixed wireless systems. (8) (MAY-14)
23. Explain in detail two path model propagation mechanism. (8) (MAY-14)
24. Explain different models for characterizing wideband channels. (8) (MAY-14)
25. Explain briefly on outdoor propagation models. (8) (NOV-14)
26. Explain on path loss estimation techniques using path loss models. (8) (NOV-14)
27. Describe on Rician distribution. (8) (NOV-14)
28. In detail explain about channel classification.(16) (MAY-15)

UNIT-3 – Wireless Transceivers

PART-A

1. Draw the mathematical link model for analysis of modulation schemes. (Nov-11)
2. What is OQPSK? (Nov-11)
3. List the advantages of QPSK. (MAY-12)
4. Differentiate between MSK and GMSK. (MAY-12)
5. Find the 3db bandwidth for a Gaussian low pass filter used to produce 0.25 GMSK with a channel data rate of $R_b=270\text{kbps}$. What is the 90% power bandwidth in the RF channel? (NOV-12)
6. What is slotted frequency hopping? (NOV-12)
7. Mention any two criteria for choosing a modulation technique for a specific wireless application. (MAY-13)
8. Draw the structure of generic optimum receiver. (MAY-13)
9. Give the expression for bit error probability of Gaussian Minimum shift keying modulation. (NOV-13)
10. What is fading and Doppler spread? (NOV-13)
11. What are the main features of QPSK? (MAY-14)
12. What are Rayleigh and Rician fading? (MAY-14)
13. State the advantages of Offset-QPSK. (NOV-14)
14. List the advantages of GMSK. (NOV-14)
15. Comment on the necessity of a Gaussian filter in GMSK. (MAY-15)
16. List the advantages of digital modulation schemes. (MAY-15)

PART-B

1. Compute the ratio of signal power to adjacent channel interference when using (i) raised cosine pulses, (ii) root raised cosine pulses with $\alpha=0.5$, when two considered signals have center frequencies 0 and $1.25/T$. **(16) (Nov-11)**
2. Discuss in detail any two demodulation techniques of minimum shift keying method. **(8) (Nov-11)**
3. Explain in detail about optimum receiver structure for non-coherent detection. **(8) (Nov-11)**
4. Explain with neat diagrams the modulation and demodulation technique of QPSK. **(16) (MAY-12) (MAY-15)**
5. Describe with a block diagram Offset-Quadrature Phase Shift Keying and its advantages. **(8) (MAY-12)**
6. Explain the concept of GMSK and mention its advantages. **(8) (MAY-12)**
7. Briefly explain the structure of a wireless communication link. **(6) (NOV-12) (MAY-15)**
8. With block diagram, explain the MSK transmitter and receiver. Derive an expression for MSK and its power spectrum. **(10) (NOV-12) (NOV-14)**
9. Derive an expression for: (i) M-ary phase shift keying (8)
(ii) M-ary quadrature amplitude modulation. Also derive an expression for their bit error probability. **(8) (NOV-12)**
10. Explain the principle of $\pi/4$ Differential Quadrature Phase Shift Keying from a signal space diagram. **(8) (MAY-13) (NOV-14)**
11. Derive the expression for probability of error in flat fading channels. **(8) (MAY-13)**
12. Explain the principle of Minimum Shift keying (MSK) modulation and derive the expression for power spectral density. **(8) (MAY-13) (MAY-15)**
13. Derive the expression for probability of error in frequency dispersive fading channel. **(8) (MAY-13)**
14. Explain the Nyquist criterion for ISI cancellation. **(8) (NOV-13)**
15. With transfer function, explain the raised cosine roll off filter. **(8) (NOV-13)**
16. Explain the QPSK transmission and detection techniques. **(8) (NOV-13)**
17. Explain the performance of digital communication in slow flat fading channels. **(8) (NOV-13)**
18. Explain with neat diagram the QPSK based transmission and reception technique and their significance in the wireless system. **(16) (MAY-14)**
19. Explain with neat diagram, the principle of Gaussian Minimum shift Keying receiver and mention how this is different from MSK. **(16) (MAY-14)**
20. Explain with neat constellation diagram the modulation techniques of QPSK. **(8) (NOV-14)**
21. List the advantages and application of BFSK. **(8) (NOV-14)**

UNIT-4 – Signal processing in Wireless Systems

PART-A

1. Mention four common methods of macro diversity. **(Nov-11)**
2. Define hamming distance and Euclidean distance between two codes. **(Nov-11)**
3. List the different types of speech coding techniques. **(MAY-12)**
4. State the significance of linear and decision feedback equalizer. **(MAY-12)**
5. Assume four branch diversity is used, where each branch receives an independent Rayleigh fading signal. If the average SNR is 20db, determine the probability that the SNR will drop below 10db. Compare this with the case of a single receiver without diversity. **(NOV-12)**
6. Define coding gain. **(NOV-12)**
7. Define Hamming distance. **(MAY-13)**
8. State the principle of diversity. **(MAY-13)**
9. What is diversity? **(NOV-13)**
10. What is equalization? **(NOV-13)**
11. Compare macro and micro diversity. **(MAY-14) (NOV-14)**
12. What are the application of non-linear equalizers? **(MAY-14)**

13. List the different types of channel coding techniques. (NOV-14)
14. What do you mean by transmit diversity? (MAY-15)
15. Write about MMSE decision feedback equalizer. (MAY-15)

PART-B

1. Explain the Viterbi decoding scheme if the decoder input sequence is 010 000 100 001 011 110 001. (16) (Nov-11)
2. With a neat block diagram discuss the structure of a decision feedback equalizer. (8) (Nov-11) (MAY-12)
3. Discuss the linear predictive vocoder with block diagram. (8) (Nov-11) (MAY-13)
4. With a neat block diagram, explain the principle of diversity. (8) (MAY-12)
5. Explain any one method of channel coding. (8) (MAY-12) (MAY-15)
6. What are the advantages of speech coding? Explain any one technique of speech coding. (8) (MAY-12) (MAY-15)
7. Explain in detail about: (i) Polarization diversity (6) (ii) Time diversity (5) (iii) Frequency diversity (5) (NOV-12) (MAY-15)
8. Explain the basic idea about linear and decision feedback equalizer and derive an expression for its minimum mean square error. (8) (NOV-12)
9. With a suitable diagram, explain the channel coding and speech coding techniques. (8) (NOV-12)
10. Explain any two diversity techniques to combat small-scale fading. (8) (MAY-13)
11. Describe any two adaptation algorithm for mean square error equalizers. (8) (MAY-13)
12. The generator matrix for a linear binary code is $G = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$ (i) Express G in systematic form. (ii) determine the parity check matrix H for the code. (iii) Construct the table of syndrome for the code. (iv) Determine the minimum distance of the code. (8) (MAY-13)
13. Explain in detail about: (i) Linear Equalizers. (8) (ii) Non linear Equalizers. (8) (NOV-13) (MAY-15)
14. With block diagram, explain the operation of a RAKE receiver. (8) (NOV-13)
15. Briefly explain the frequency domain coding of speech signals. (8) (NOV-13)
16. What is the need for diversity? List different types of diversity. (6) (MAY-14)
17. Explain with diagram, the different techniques available for signal combining. (10) (MAY-14)
18. With neat block diagram explain how RAKE receiver provides diversity to improve the performance of CDMA receiver. (16) (MAY-14)
19. With a neat block diagram, explain the principle of macro diversity. (8) (NOV-14) (MAY-15)
20. Explain the operation on adaptive equalizer at the receiver side. (8) (NOV-14)
21. Explain with a block diagram Maximal ratio combiner. (8) (NOV-14)
22. Describe on polarization and space diversity. (8) (NOV-14)

UNIT-5 – Advanced Transceiver Schemes

PART-A

1. Discuss the principle of OFDM modulation scheme. (Nov-11)
2. Give three important functional blocks of GSM system. (Nov-11)
3. State effects of multipath propagation on CDMA. (MAY-12) (NOV-14) (MAY-15)
4. List a few wireless network standards. (MAY-12)
5. What is duplexing? (NOV-12)
6. What is the speech codes used in IS-95 system? Why? (NOV-12)
7. Define direct sequence spread spectrum. (MAY-13)
8. State the goals of a standard IMT-2000. (MAY-13)

9. What is an PN sequence? Give its significance I spread spectrum modulation technique. **(NOV-13)**
10. What is DECT? **(NOV-13)**
11. Why QPSK is preferred for wireless communication? **(MAY-14)**
12. List the advantages of third generation (3G) networks. **(MAY-14)**
13. List some features of 3G networks. **(NOV-14)**
14. What are the basic channels available in GSM? **(MAY-15)**

PART-B

1. Explain the principle of direct sequence spread spectrum technique. **(8) (Nov-11)**
2. Discuss some methods to increase the capacity of wireless communication system. **(8) (Nov-11)**
3. Explain in detail about the GSM logical channels. **(8) (Nov-11)**
4. Explain the block diagram of IS-95 transmitter. **(8) (Nov-11) (MAY-15)**
5. Explain: (a) Code Division Multiple Access (CDMA) and compare its performance with TDMA. **(16) (MAY-12)**
6. What is orthogonal frequency division multiplexing? Explain OFDM technique and mention its merits, demerits and application. **(16) (MAY-12)**
7. Discuss in detail about cellular code division multiple access systems with neat diagrams. **(8) (NOV-12)**
8. Write a short note on transceiver implementation. **(8) (NOV-12)**
9. Explain with neat diagram of orthogonal frequency division multiplexing. **(8) (NOV-12)**
10. Write a note on second generation and third generation wireless networks and standards. **(8) (NOV-12)**
11. Explain the principle of cellular CDMA systems. **(8) (MAY-13)**
12. Brief about the properties of spreading codes used in CDMA systems. **(8) (MAY-13)**
13. Describe in detail about the operation of OFDM transceivers structures. **(8) (MAY-13) (MAY-15)**
14. Explain the physical layer features of WCDMA systems. **(8) (MAY-13)**
15. Explain in detail about: (i) Direct sequence spread spectrum technique. **(8)** (ii) Frequency hopped spread spectrum technique. **(8) (NOV-13)**
16. Discuss in detail about the second generation (2G) and third generation (3G) wireless networks and standards. **(16) (NOV-13)**
17. Describe the principle involved in cellular code division multiple access systems. **(16) (MAY-14)**
18. Explain with necessary diagram, the operation of orthogonal frequency division multiplexing transceiver. **(16) (MAY-14)**
19. Write short notes on the following: (i) Frequency Hopping and its advantages. **(8)** (ii) OFDM **(8) (NOV-14)**
20. Discuss in detail the 2G and 3G wireless network standards. Compare the relative merits and demerits of both the standards. **(16) (NOV-14)**
21. Examine about the effects of multipath propagation on CDMA. **(16) (MAY-15)**