Department of Electronics and Communication Engineering

EC 2311 - COMMUNICATION ENGINEERING

QUESTION BANK

UNIT I

ANALOG COMMUNICATION

PART – A

1. Differentiate between AM and FM.
2. The carrier amplitude after amplitude modulation varies between 4V and 1V. Calculate depth of modulation.
3. What do you meant by AGC?
4. Define modulation index of AM and FM.
5. How PDM/PM signal is generated?
6. Define amplitude Modulation
7. Define Modulation index and percent modulation for an AM wave.
8. Define Low level Modulation.
9. Define High level Modulation.
10. Define image frequency
11. Define Single sideband suppressed carrier AM.
12. Define AM Vestigial sideband.
13. What are the advantages of single sideband transmission?
14. Define frequency deviation.
15. State Carson rule.
16. Define Deviation ratio.
17. What are the disadvantages of conventional (or) double side band full carrier system?
18. Define image frequency rejection ratio.
19. Define Heterodyning.
20. Distinguish between low level and high level modulation

PART B

1. Write the methods to generate AM waves.
2. What is the advantage of using high frequency carrier for transmission.
3. Describe an expression to show that for every modulating frequency component,the amplitude modulated wave contains,2 sideband frequencies in addition to the carrier and also that the amplitude of sideband components is equal to mVc/2 where m and Vc are modulation Index and amplitude of unmodulated carrier. Draw the spectrum of AM single for a signal frequency component.

(AU-Apr/May 2006)

4. What are the advantages of producing FM from PM over direct FM.   (AU-Apr/May 2006)
5. Derive an expression to illustrate that when a modulating signal with only one frequency component to frequency modulates a carrier.Also show the resulting FM signal has got infinite sideband frequencies.

(AU-Apr/May 2006)

6. Draw the block diagram of single sideband AM transmitter and explain function of each block.

(AU-Apr/May 2007)

7. Draw and explain the generation of DSB-SC-AM.
8. Explain the power calculations of DSB-SC and its frequency spectrum.
9. Explain the working of FM stereo transmitter with necessary circuit diagram.
10. With the help of neat diagram explain FM receiver.   (AU-Nov/Dec 2007)
11. Explain the narrow band and wideband FM.   (AU-May/June 2008)
12. Explain two methods of FM generation.   (AU-May/June 2008)
13. With the help of neat block diagram explain functioning of heterodyne radio receiver.list out the significance of it over TRF receivers.   (AU-Nov/Dec 2008)
14. Deduce an analytical expression for the FM wave.   (AU-Nov/Dec 2008)
15. Discuss any one method of generating FM wave with neat diagram.
16. Derive the expression of AM wave and its power relations.   (AU-May/June 2011)
17. With neat block diagram explain Tuned Radio Frequency receivers.
18. Explain in detail about the generation of FM using Armstrong method.

(AU-May/June 2009)

19. What are the benefits of FM   (AU-Nov/Dec 2009)
20. Compare AM with FM with respect to spectrum ,power requirements ,sideband and bandwidths required.

(AU-May/June 2010)

21. Explain the methods of generating SSB-SC.   (AU-May/June 2010)
22. Explain demodulation of AM using envelope.   (AU-Nov/Dec 2010)
23. Derive an expression of AM wave and its power relations.   (AU-Nov/Dec 2010)
24. Explain modulation and demodulation of AM wave.   (AU-May/June 2011)
25. Explain the indirect method of FM generation.   (AU-May/June 2011)
26. Draw the block diagram for generation and demodulation of a VSB signal and explain the principle of operation.   (AU-Nov/Dec 2011)
27. With suitable sketch discuss about square law detector.   (AU-Nov/Dec 2011)

PROBLEMS

1. A carrier wave of 10 MHz is amplitude modulated to 50%   level with a tone of 5000Hz.Sketch the waveform and amplitude distribution in time and frequency domain. Assume amplitude as 10V.

(AU-Nov/Dec 2010)

2. A transmitter using AM has unmodulated carrier output power of 5kW.The modulation index is 0.707 for message signal.Find the transmission power,efficiency and average power of the signal.

(AU-Nov/Dec 2008)

3. In a broadcast superheterodyne receiver having an RF amplifier loaded to an antenna coupling circuit is 100.If the intermediate frequency is 455kHz.Find the image frequency and rejection ratio at 1000 kHz.

4. The carrier frequency of a broadcast signal is 50MHz.The maximum frequency deviation is 60kHz.If the higher audio frequency modulating the carrier is limited to 15kHz.What is the bandwidth.

(AU-Nov/Dec 2009)

5. A commercial AM station is broadcasting with an average transmitted power of 10kW.The modulation Index is set at 0.707 for message signal .Find the transmission power, efficiency and average power in carrier component of transmitted signal.

(AU-May/June 2011)

6. A telephone transmitter using AM has unmodulated carrier output power of 20 kW and can be modulated to a maximum depth of 80% by a sinusoidal modulating voltage without causing overloading.Find the value to which unmodulated carrier power may be increased without resulting in overloading if the maximum permitted modulation index is restricted to 60%.

(AU-Apr/May 2009)

7. Determine carrier swing ,maximum and minimum frequencies attained and the modulation index of FM signal generated by FM at 101.6MHz carrier with a 8kHz sine wave causing a frequency deviation of 40kHz.

8. In a FM system the frequency deviation is a 1kHz/V.A sinusoidal modulating voltage of amplitude 15V and frequency 3kHz is applied. Find maximum frequency deviation and modulation index.

(AU-Nov/Dec 2010)

UNIT II

DIGITAL COMMUNICATION

PART –A

1. What are the merits and demerits of axial cable?
2. State sampling theorem.
3. What is Channel capacity?
4. Define PAM.

5. Define PWM.
6. Define PPM.
7. Define PTM.
8. Define DCM.
9. Define DM.
10. Define ADM.
11. What is Quantization?
12. What is sampling?
13. What is slope over load error?
14. What is granular noise?
15. What is ASK, FSK, PSK?
16. What is BSK, QPSK?
17. Define QAM.
18. What is OOK?
19. Define MSK, GMSK?
20. What are the applications of data communications?

PART B

1. Explain about flat top sampling.   (AU-May/June 2008)
2. Explain the principle of PAM with neat block diagram.   (AU-May/June 2008)
3. Explain quantization. How quantization noise is related with channel bandwidth?
4. Explain PCM. Mention its advantages and disadvantages.   (AU-May/June 2009)
5. Explain PCM with neat block diagram.   (AU- Nov/Dec 2008)
6. Explain how PCM is influenced by noise sources.   (AU- Nov/Dec 2009)
7. Derive the output signal to noise ratio in PCM.   (AU-May/June 2009)
8. What is companding? Explain how companding improves the SNR of the system.
9. Write short notes on DM and ADM.   (AU-May/June 2009)
10. Compare the principles of delta and adaptive delta modulation.   (AU- Nov/Dec 2008)
11. Explain Slope overload distortion in DM. Explain the condition to be satisfied to avoid the distortion.
                                                             (AU- Nov/Dec 2007)
12. Derive an expression for average output noise power in delta modulation.
13. Explain DPCM with neat block diagram.   (AU-May/June 2010)
14. Explain DPCM. How DPCM is better than PCM.   (AU- Nov/Dec 2010)
15. Briefly explain the different step size control in ADM.
16. Compare the performance of DM, ADM, DPCM, PCM.
17. Discuss the generation and detection of QPSK with block diagram.   (AU- Nov/Dec 2010)
18. Compare QPSK and BPSK.   (AU-May/June 2011)
19. Draw the block diagram of QPSK transmitter and coherent receiver and explain their operation, signal

    space diagram ,and power spectra of QPSK. (AU-May/June 2011)

20. Explain how QPSK signal can be generated and recovered. (AU- Nov/Dec 2011)
21. Describe the methods to generate and receive FSK signal. (AU- Nov/Dec 2011)
22. Compare the performance of PSK and FSK.   (AU-May/June 2008)
23. Give the generation and detection of FSK.   (AU- Nov/Dec 2011)
24. Explain PSK.

25. Sketch the waveforms of inphase and quardrature components of MSK signal for the sequence 1100100010.   (AU- Nov/Dec 2010)
26. Draw the block diagram of MSK and explain the operation.   (AU-May/June 2009)
27. Write the special properties of MSK.   (AU-May/June 2007)
28. Explain Minimum Shift Keying   (AU-Nov/Dec 2008)

PROBLEMS

29. The signal g(t)=10cos(20πt)cos((200πt) is sampled at a rate of 250 samples/second. Determine the spectrum of the resulting sampled signal. What is the nyquist rate.
30. Determine the minimum sampling rate necessary to sample and reconstruct the signal x(t)=sin (6280t)/(6280t).
31. Determine the nyquist rate and nyquist sampling interval for the signal s(t)=sinc(100πt).
32. Calculate the minimum required bandwidth for a non coherently detected orthogonal binary FSK system. The higher frequency signlling rate is 1 Mhz/sec and the symbol duration is 1 ms.
33. Sketch the clock, even clock, odd clock for a QPSK system given b(t) as 100100111.
34. The bit stream 10101011110101010001111 is to be transmitted using QPSK system. Show four differently encoded sequences that can represent the data sequence.
35. Sketch the waveform for a binary sequence 101100 modulated under QPSK.

UNIT III

SOURCE CODES,LINE CODES & ERROR CONTROL

PART A

1. What is entrophy?
2. What is bit error rate?
3. What are error correction codes?
4. What is source coding?
5. What is channel coding?
6. What is Huffman coding?
7. What is SNR?
8. Draw the wave forms of NZ and NRZ.

9. What are AMI and HDBP codes?
10. What are ABQ and HDBP codes?
11. What are error control codes?
12. What are convolution codes?
13. Write the format of block codes?
14. What are the advantages of block codes?
15. What is sequential decoding?
16. What is Trellis coding?
17. Why VITERBI algorithm is preferred in convolution codes?
18. What is Shannon Fanom coding?
19. List the properties of BSC channel.
20. What is Channel capacity?

PART B

1. Explain about discrete memoryless channels.
2. Explain about the error detection capabilities of linear block codes.
3. Explain about coding and decoding of linear block codes.   (AU-May/June 2009)
4. Describe the decoding procedure for linear block codes.   (AU- Nov/Dec 2011)
5. Explain about hamming codes.   (AU- May/June 2008)
6. Write the generator matrix of (7,4) hamming code.
7. What are cyclic codes. Explain the merits and demerits.   (AU- Nov/Dec 2010)
8. Give the properties of cyclic codes.   (AU- May/June 2010)
9. Explain about syndrome coding.   (AU- Nov/Dec 2008)
10. Explain bit error rate.
11. Explain convolution coding with the block diagrams.   (AU- May/June 2007)
12. Explain the concept of Viterbi algorithm.   (AU- Nov/Dec 2011)
13. Explain the concept and design procedure of Viterbi decoding algorithm for a block code.
14. Explain Huffman coding with an example.   (AU- May/June 2012)
15. Explain the procedure of Shannon source coding theorem.   (AU- May/June 2011)
16. Explain line coding techniques with the power spectra.
17. Explain the trade off between bandwith and Signal to noise ratio.   (AU- Nov/Dec 2011)
18. Explain about BSC, BEC and BCC.   (AU- Nov/Dec 2010)
19. Write the procedure for Huffman coding and its entropy.
20. Give the transition matrix and channel diagram for BSC and BEC.   (AU- Nov/Dec 2009)

PROBLEMS

21. Consider the linear block code with the code word defined

$U1=m1+m2+m4+m5$
$U2=m1+m3+m4+m5$
$U3=m1+m2+m3+m5$
$U4=m1+m2+m3+m4$

Where m1, m2, m3, m4 are message bits. Show generator matrix, Parity matrix and find n,k.

22. The (7,3) block code is constructed using parity equations (m1+m2+m3), (m1+m2), (m2+m3). Write all the code words.

23. A (15,5) cyclic code has a generator polynomial as $g(x)=1+x+x^2+ x^5+ x^8+ x^{10}$
    Draw the diagram of the encoder for this code.

24. Find all the cyclic codes (7,3) for the generator polynomial $g(x)=1+x+x^4$.

25. A discrete memory less source has five symbols m0, m1, m2, m3, m4 with probability 0.4, 0.2, 0.2, 0.1, 0.1 respectively. Obtain the code word and entropy using Huffman coding.

26. Explain the procedure of shannon fano algorithm and calculate the entropy for the following probabilities using the algorithm.

m1	m2	m3	m4	m5	m6	m7	m8
16/32	4/32	4/32	2/32	2/32	2/32	1/32	1/32

27. A discrete memoryless channel has five symbols x1, x2, x3, x4, x5 with the probabilities 0.4, 0.19, 0.16, 0.15, 0.15 respectively.

    (i) Construct Shannon fano code for the source and calculate the code efficiency.

    (ii) Repeat (i) for the Huffman code and compare the two techniques.

UNIT IV

MULTIPLE ACCESS TECHNIQUES

PART-A

1. What is FDMA?
2. What is TDMA?
3. Write the expansion of SSMA technique?
4. What is CDMA?
5. What is SDMA?
6. Mention any two application of FDMA?
7. Mention any two application of CDMA?
8. Mention any two applications for SDMA?
9. Mention any two applications for TDMA?
10. What are the merits and demerits of wireless communication?

PART B
1. Discuss in detail about Time Division Multiple Access system   (AU-Apr/May 2008)
2. Discuss the various Multiple Access techniques used in wireless communication with merits and demerits.
                                                                         (AU-Nov/Dec 2010)
3. With a neat block diagram explain the operation of a typical TDMA and compare it with FDMA.
                                                                         (AU-Nov/Dec 2011)
4. Explain the concept of CDMA techniques and mention its merits and demerits.
5. Discuss in detail about TDMA and FDMA techniques.   (AU-Nov/Dec 2011)

6. Discuss in detail about CDMA techniques and compare the performance with FDMA and TDMA.

(AU-May/June 2011)

7. With a neat block diagram explain FDMA.Discuss the application in communication.

(AU-May/June 2011)

8. Explain the application of CDMA in wireless communication .   (AU-Apr/May 2010)

9. Compare the performance of CDMA with FDMA and TDMA.   (AU-Nov/Dec 2011)

10. Discuss about SDMA technique and its applications in wired and wireless communication.

11. Explain the model of spread spectrum and its applications.

UNIT V

SATELLITE AND OPTICAL FIBER – POWERLINE,SCADA

PART-A

1. What is satellite?
2. What are the types of satellites used in orbits?
3. What is the frequency used in establish the link?
4. What is MA technique?
5. Mention the different layers in atmosphere?
6. What is the function done in earth station?
7. How are actuators used in satellite?
8. What is Intelsat and INSAT?
9. What type of sources and detectors are used in satellite?
10. What is optical link?
11. What is power line communication?
12. Mention the application of SCADA?

PART B

1. What is geosynchronous satellite? Explain the advantages and limitations of geosynchronous satellite.

(AU-May/June 2008)

2. Explain the characteristics of different types of optical fiber.   (AU-May/June 2008)

3. Explain the construction of an optical fiber link   (AU-Nov/Dec 2007)

4. Give the significance of numerical aperture of optical fiber.   (AU-Nov/Dec 2007)

5. With the block diagram explain the operation of fiber optic communication.

6. Compare single and multimode fibers.   (AU-May/June 2009)

7. Explain how light beam propagates through fiber. What are the different types of losses and its effects

(AU-Nov/Dec 2008)

8. Explain the charecteristics of an uplink,a transpoder and a downlink model for a satellite system.

(AU-Nov/Dec 2008)

9. With neat sketch for the ray propagation into and down an optical fiber cable, derive an expression for acceptance angle. (AU-Nov/Dec 2009)

10. What are the benefits of satellite communication systems? How the position / location of satellite tracked from the earth station? Derive the satellite link equations and and component on it.

(AU-May/June 2010)

11. List the merits and demerits of optical communication systems. What are the components and losses?

(AU-May/June 2010)

12. Describe the fundamental charecteristics of uplink,transpoder and downlink model of satellite system.

(AU-Apr/May 2011)

13. Derive the expression foe numerical aperture. (AU-May/June 2011)

14. Explain the principle operation of Avalanche photo diode. (AU-May/June 2009)

15. List the advantages and disadvantages of geosynchronous orbits. (AU-May/June 2008)

16. Describe the losses with fiber cables. (AU-Nov/Dec 2008)

17. Explain satellite system link models. (AU-Nov/Dec 2008)

18. Explain the losses associated with fiber cables. (AU-May/June 2011)

19. Describe the primary charecteristics of light detectors. (AU-May/June 2011)

20. Derive the satellite system link equation. (AU-Nov/Dec 2009)

21. Briefly describe the losses associated with fiber optical communication systems.

22. List the advantages of using optical fiber as a medium of communication in telephone network.

(AU-Nov/Dec 2009)

23. Draw the block diagram of fiber optical communication link.Explain the principle of operation of light sources detectors. (AU-Nov/Dec 2009)

24. Explain the operation of PIN diode and APD. (AU-Apr/May 2010)

25. Compare optical fiber cable with RF cable. (AU-Nov/Dec 2010)

26. Distinguish among single-mode step index,multimode step index and multimode graded index optical fibers. (AU-Nov/Dec 2010)

27. Give notes on satellite subsysytems and powerline carrier system. (AU-Nov/Dec 2011)