# VALLIAMMAI ENGINEERING COLLEGE

**SRM Nagar, Kattankulathur**

## Department of Information Technology

**QUESTION BANK**

**Name of the Subject :** CS6304-Analog and Digital Communication **Semester/Class:** III /IT-1 &2
**Name of the Staffs :** Ms.A.R.Revathi & Mr.S.Narayanan **Academic Year:** 2014-15

## UNIT-I

### Part-A

1. What is demodulation and modulation
2. Draw the spectrum of FM signal
3. Define amplitude modulation and SNR.
4. Differentiate between narrow band and wide band FM signal
5. Define modulation index, bandwidth efficiency, Degree of Modulation.
6. What is the purpose of limiter in FM receiver
7. If a 10v carrier is amplitude modulated by two different frequencies with amplitudes 2V and 3V respectively. Find the modulation index. (or) Consider an AM signal $x(t)=2\cos(2\pi f_c t) +0.5\cos(2\pi f_c t).\cos(2\pi f_c t)$.Find the modulation index used to generate the signal.
8. What is meant by double conversion receiver?
9. Write down the mathematical expression for angle modulated wave
10. Differentiate between an analog signal and a digital signal.
11. Define modulation depth for a FM System and highlight its impact on the spectral occupation.
12. Define a continuous signal and Discrete signal
13. Define thermal noise, flicker noise, short noise.
14. Distinguish between FM and PM.
15. What is bandwidth need to transmit 4khz voice signal using AM
16. Write one advantage and one disadvantage of delta modulation
17. Distinguish between power efficiency and spectral efficiency
18. What is IST? What is the reason for it occurrence?
19. Find the capacity of a channel having 50 khz bandwidth and produces SNR of 1023 at the output.
20. Define internal noise and list all the internal noise.

## Part-B

1. Define FM and PM modulation and write their equations. Describe the generation of FM wave using Armstrong method.
2. An AM signal has the equation

   $v(t) = [15+4\sin(44x10^3t)] \sin (46.5x10^6t)V$

   1. Find the carrier frequency
   2. Find the frequency of the modulating signal.
   3. Find the value of m.
   4. Find the peak voltage of the unmodulated carrier.
   5. Sketch the signal in the time domain, showing voltage and time scales.
3. For a modulation coefficient m = 0.2 and carrier power Pc = 1000 W, determine the following.
   1. Total sideband power
   2. Upper and lower sideband power
   3. Modulated carrier power
   4. Total transmitted power.

4. a. Illustrate the relationship between frequency modulation and phase modulation with a block diagram.

   b. Describe the average power required for an angle modulated wave with mathematical expression.

5. a. With neat block diagram describe AM transmitter

   b. Derive for carrier power and transmitter power in AM in terms of modulation index.

6. a. Explain the function of every block of superhetrodyne FM receiver.

   b. Differentiate AM , FM & PM

7. a. Explain the Principles of amplitude modulation

   b. Write a note on frequency spectrum analysis of angle modulated waves. Explain the band width requirements of angle modulated waves

8. (i) A modulating signal of 2 cos5000*t* is amplitude modulated over a carrier signal of 5cos20000*t* . Derive expressions for the modulation index, LSB and VSB frequencies, Bandwidth and the ratio of Side Band Power in the Total Power of AM wave. (8)

   (ii) Explain the principle of Angle Modulation. Derive and explain phase deviation, Modulation index, frequency deviation and percent modulation. (8)

9. (i) An audio frequency signal 10 sin 2*3.14* 500*t* is used to amplitude modulate a carrier of 50 sin 5*3.14*10^5 t. Calculate

(1) Modulation index (6)

(2) Side band frequencies (5)

(3) BW required (5)

4) (i) Compare FM and AM. (12)

(ii) The phase deviation constant in a phase modulation system is K = 0.01 rad/v. Calculate the maximum phase deviation when a modulating signal of 10 V is applied?

10. (i) Distinguish between FM and PM by giving its mathematical analysis. (8)

(ii) Derive the relationship between the voltage amplitudes of the side band frequencies and the carrier and draw the frequency spectrum. (8)

11. In an AM modulator, 500 KHz carrier of amplitude 20 V is modulated by 10 KHz modulating signal which causes a change in the output wave of $\mp 7.5\ V$ . Determine:

(1) Upper and lower side band frequencies

(2) Modulation Index

(3) Peak amplitude of upper and lower side frequency

(4) Maximum and minimum amplitudes of envelope

12. Explain about different types of noises in communication systems.

## UNIT-II

## Part-A

1. Draw the constellation diagram of QPSK signal.
2. Find the minimum sampling frequency for a signal having frequency from 10mhz to 10.2 mhz in order to avoid aliasing
3. What do you meant by FSK
4. What is M--ary encoding
5. Draw 8-QAM phasor diagram
6. Determine the peak frequency deviation and minimum bandwidth for a binary FSK signal with a mark frequency of 49 khz, a space frequency of 51 khz
7. Define space division multiplexing
8. Draw the block diagram of BPSK Transmitter .

9. What is meant by fading
10. Define sampling theorem
11. Draw the null modem circuit.
12. What is binary phase shift keying?
13. Write down the expression for peak frequency deviation of FSK.
14. Define Nyquist sampling theorem.
15. Draw the block diagram of QPSK Transmitter.
16. Differentiate between PSK from DPSK.
17. What is the approximation bandwidth required to transmit a signal at 4khz using FM with frequency deviation of 75khz.

## PART-B

1. With a neat schematic diagram, explain the balanced ring modulator of BPSK.

2. a. Describe the two techniques of achieving carrier recovery circuit.

b. Explain the generation and detection of PSK system with the help of block diagrams.

3. a. For QPSK modulator with an input data rate equal to 12 Mbps and a carrier frequency of 100 MHz. determine the following.

i. Minimum double sided Nyquist bandwidth

ii. Baud Rate

iii. Sketch the output spectrum

b. Define QAM and explain the working of 8-QAM transmitter and receiver with a block diagram.

4. a. Compare the different digital modulation schemes in terms of bandwidth bit error rate and efficiency.

b. For the DPSK modulator , determine the output phase sequence for the following input bit sequence: 11001100101010. Assume that the reference bit = 1.

5. Explain BPSK transmitter and receiver with block diagram and derive an expression for its probability of error.

6. Describe the working of QPSK transmitter and receiver. Determine its bandwidth efficiency and compare it with other m-ary PSK schemes.

7. a. Draw the block diagram of QPSK modulator, demodulator and explain the principle of operation.

b. With neat constellation diagram, explain the operation of QAM transmitter. List out its merits over PSK.

8. a. Explain the operation of the binary FSK modulator and demodulator with its constellation diagram.

b. Write a note on QPSK.

c. Write a note on DPSK.

9. (i) Draw FSK Transmitter and explain. Describe its Bandwidth Considerations. (8)

(ii) For a BPSK modulator with a Carrier frequency of 70 MHz and an input bit rate of 10 Mbps, determine the maximum and minimum upper and lower side frequencies, draw the output spectrum, determine the minimum Nyquist bandwidth, and calculate the baud (Assume f= 5MHz)

10. (i) Draw and explain the operations of Non-coherent and coherent FSK modulators. (8)

(ii) Draw QPSK modulator and explain. Describe its Bandwidth considerations. (8)

11. (i) Explain the principle of FSK transmitter and receiver. (10)

(ii) Write short notes on the spectrum and bandwidth of FSK. (6)

12. Draw the block diagram of FSK receiver and explain the operation. Determine the :

(i) peak frequency deviation

(ii) minimum bandwidth

(iii) baud for FSK signal with a mark frequency of 49 kHz, space frequency of 51 kHz, and input bit rate of 2 kbps.

13. What is known as Binary phase shift keying? Discuss in detail the BPSK transmitter and Receiver and also obtain the minimum double sided Nyquist bandwidth.

## UNIT-III

## PART-A

1. What are the types of pulse modulation systems
2. What is pulse stuffing
3. What do you mean by non-linear encoding in PCM System
4. What is the advantage of differential PCM
5. Determine the nyquist rate for analog input frequency of a) 4khz b)10khz
6. Define companding
7. Find the minimum number of bits required in a PCM code for a dynamic range of 80 dB
8. Define the term : Synchronous transmission

9. Distinguish between half duplex and full duplex transmission.
10. Give at least four advantages of optical fiber over co-axial cable .
11. List the layer presented in ISO -OSI reference model
12. List any two data communication standard organisation
13. What is data modem
14. What are the types of data transmission?
15. What is the need for data modems
16. A Typical dial up telephone connection has a bandwidth of 3KU, and a signal to noise ratio of 30dB. calculate the shannon Limit.
17. What are advantages of QPSK?
18. What is half duplex and full duplex transmission?

## PART-B

1. a.Explain any two data communication codes presently codes used for character encoding.
   b. Give brief notes on eye pattern
2. With neat block diagram explain the data communication hardware.
3. a. Explain delta modulation with the help of transmitter and receiver diagrams.
   b. What is quantizing error? illustrate with an example.
4. Draw the block diagram and explain the principle of operation of a PCM system. A binary channel with bit rate = 36000 bits/sec is available for PCM voice transmission. Find number of bits per sample, number of quantization levels and sampling frequency assuming highest frequency component of voice signal is 3.2 KHz.
5. a. What is the need for data communication interfaces?
   b. Explain the electrical and functional specifications of the ISDN physical interface.
6. a. Draw the block diagram of a PCM system and explain function of each book.
   b. What is Delta Modulation ? Explain its difference and disadvantages compared to PCM.
7. Describe the PCM transmitter and receiver with block diagram.
8. a. Differentiate between synchronous and asynchronous modem used in data communication.
   b. Explain with block diagram how along signal is transmitted through digital transmission link using digital modulation technique.
9. a. Describe the basic principles of PCM system.

b. what is companding? Explain in Detail.

10. a. Write a note on data communication codes.

    b. Explain serial and parallel interfaces in detail.

## UNIT-IV

## PART-A

1. State shannon's channel capacity theorem.Give an example
2. List the methods for error correction
3. Differentiate between error detection and correction
4. Mention the difference between line coding and channel coding
5. List out the common features provided by the data communication modems
6. Define entropy
7. What is meant by block code?
8. How is parity check used for error detection
9. Mention any two error control codes
10. Mention the properties of PN sequence
11. What is Shannon limit for information Capacity
12. Which error detection technique is simple and which one is more reliable?
13. What is meant by ASCII code?
14. Define source coding theorem.
15. What is HDLC?
16. Define flow control.
17. What are error correcting codes?

## PART-B

1. a. What are parallel interfaces? Describe in detail about centronics parallel interfaces.

   b. Describe in detail about medium and high speed modems.

2. Explain source coding theorem. Consider five messages $S_0$, $S_1$, $S_2$, $S_3$, $S_4$ given by the probabilities 1/2, 1/4, 1/8, 1/16, 1/16. Use the Shanon -Fano algorithm to develop an efficient code.

3. Discuss asynchronous type modem requirements. Explain working principle of these modems. Explain error correction capability of block codes.
4. a. State and explain the Shanon's theorem for information capacity.

   b. For the messages M={m1,m2,m3,m4} with probabilities P(m)={1/2, 1/4, 1/8, 1/8}. Obtain the entropy of the source and efficiency of the system with and without coding.
5. a. Discuss the properties of cyclic codes.

   b. Construct a (6, 3) cyclic code whose generator polynomial is given as G(x) = 1 + x for the data 001.
6. a. What is the need for flow control?

   b. Explain the methods of flow control techniques?
7. a. Explain the Error detection and Correction methods used in Data Link control.

   b. Explain HDLC.
8. a. What is CRC? Draw the encoder of the same and explain its operation.

   b. Write short notes on forward error correction and backward error correction techniques.
9. Draw the block diagram of modem and explain the operation with the importance of each block in the diagram.
10. a. Explain in detail about error detection and correction.

    b. Write a note on medium and high speed modem.
11. State and explain the Huffman coding and Viterbi coding

## UNIT-V

## PART-A

1. What is Cellular Communication?
2. What is CDMA?
3. What is frequency reuse?
4. What is Cell?
5. What is Handoff?
6. Distinguish between CDMA and TDMA.
7. What is Uplink frequency?
8. What is Downlink frequency?
9. What is Channel assignment?

10. Write the types of Handoffs.
11. What is Cell cluster?
12. Write the Channel allocation techniques.
13. What is TDMA?
14. What is FDMA?
15. Write the frequency range of Bluetooth.
16. Write the formula for calculating Cell cluster.
17. Write a note on Base station.
18. Write about Mobile Switching Centre.
19. What are the Channels used in Cellular Systems?
20. What is Chip code in CDMA Systems.
21. Distinguish between FDMA and TDMA
22. Differentiate Multiplexing and Multiple access.

**PART-B**

1. Explain about advanced Mobile System
2. Explain the architecture of GSM.
3. Explain about CDMA.
4. Draw and explain about Cellular Systems
5. a. How the channels allocated to Cells in Cellular Systems.
   b. Explain about Handoff in Cellular Systems
6. Compare and explain about various multiple access schems.
7. Briefly explain about Satellite Communication.
8. Write a note on Bluetooth technologies.
9. Explain about FDMA.
10. Explain about TDMA.