KINGS

COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

SUBJECT CODE : EC1301 **SEM / YEAR** : V / III

SUBJECT NAME : COMMUNICATION THEORY

UNIT I – AMPLITUDE MODULATIONS

PART A

All questions – Two Marks:

1. As related to AM, what is over modulation, under modulation and 100% modulation?
2. Draw the frequency spectrum of VSB, where it is used
3. Define modulation index of an AM signal
4. Draw the circuit diagram of an envelop detector
5. What is the mid frequency of IF section of AM receivers and its bandwidth.
6. A transmitter radiates 9 kW without modulation and 10.125 kW after modulation. Determine depth of modulation.
7. Draw the spectrum of DSB.
8. Define the transmission efficiency of AM signal.
9. Draw the phasor diagram of AM signal.
10. Advantages of SSB.
11. Disadvantages of DSB-FC.
12. What are the advantages of superhetrodyne receiver?
13. Advantages of VSB.
14. Distinguish between low level and high level modulator.
15. Define FDM & frequency translation.
16. Give the parameters of receiver.

17. Define sensitivity and selectivity.
18. Define fidelity.
19. What is meant by image frequency?
20. Define multitone modulation.
21. Need for modulation.
22. Application of AM.
23. What is meant by diagonal clipping and negative peak clipping?
24. Define envelope.
25. Distinguish between linear and non linear modulator.
26. What are the limitations of AM.
27. Draw the envelope of AM.
28. Differentiate phase modulation and frequency modulation.
29. Suggest one application for AM, SSB, DSB and VSB modulation techniques and justify your answer.
30. When a signal m(t) = 3 cos (2p x 103t) modulates a carrier c(t) = 5 cos (p x 106t), find the modulation index and transmission bandwidth if the modulation is AM.

PART B

1. Explain the generation of AM signals using square law modulator. **(16)**
2. Explain the detection of AM signals using envelope detector. **(16)**
3. Explain about Balanced modulator to generate DSB-SC signal. ` **(16)**
4. Explain about coherent detector to detect SSB-SC signal. **(16)**
5. Explain the generation of SSB using balanced modulator. **(16)**
6. Draw the circuit diagram of Ring modulator and explain with its operation? **(16)**
7. Discus the coherent detection of DSB-SC modulated wave with a block diagram of detector and Explain. **(16)**
8. Explain the working of Superheterodyne receiver with its parameters. **(16)**
9. Draw the block diagram for the generation and demodulation of a VSB signal and explain the principle of operation. **(16)**
10. Write short notes on frequency translation and FDM? **(16)**
11. Explain about AM transmitters. **(16)**

UNIT II – ANGLE MODULATION

PART A

All questions – Two Marks:

1. What do you mean by narrowband and wideband FM?
2. Give the frequency spectrum of narrowband FM?
3. Why Armstrong method is superior to reactance modulator.
4. Define frequency deviation in FM?
5. State Carson's rule of FM bandwidth?
6. Differentiate between narrow band and wideband FM.?
7. What are the advantages of FM.?
8. Define PM.
9. What is meant by indirect FM generation?
10. Draw the phasor diagram of narrow band FM.
11. Write the expression for the spectrum of a single tone FM signal.
12. What are the applications of phase locked loop?
13. Define modulation index of FM and PM.
14. Differentiate between phase and frequency modulation.
15. A carrier of frequency 100 MHz is frequency modulated by a signal x(t)=20sin (200¶x10^3 t). What is the bandwidth of the FM signal if the frequency sensitivity of the modulator is 25 KHz per volt?
16. What is the bandwidth required for an FM wave in which the modulating frequency signal is 2 KHz and the maximum frequency deviation is 12 KHz?
17. Determine and draw the instantaneous frequency of a wave having a total phase angle given by ø(t)= 2000t +sin10t.
18. Draw the block diagram of PLL.

PART B

1. Explain the indirect method of generation of FM wave and any one method of demodulating an FM wave**.** **(16)**
2. Derive the expression for the frequency modulated signal. Explain what is meant by narrowband FM and wideband FM using the expression**.** **(16)**

3. Explain any two techniques of demodulation of FM. **. (16)**
4. Explain the working of the reactance tube modulator and drive an expression to show how the variation of the amplitude of the input signal changes the frequency of the output signal of the modulator**. (16)**
5. Discuss the effects of nonlinearities in FM. **. (8)**
6. Discuss in detail FM stereo multiplexing. **. (8)**
7. Draw the frequency spectrum of FM and explain. Explain how Varactor diode can be used for frequency modulation. **. (16)**
8. Discuss the indirect method of generating a wide-band FM signal**. (8)**
9. Draw the circuit diagram of Foster-Seelay discriminator and explain its working**. (16)**
10. Explain the principle of indirect method of generating a wide-band FM signal with a neat block diagram**. (8)**

UNIT III – NOISE PERFORMANCE OF DSB, SSB RECEIVERS

PART A

All questions – Two Marks:

1. Define noise figure.
2. What is white noise
3. What is thermal noise? Give the expression for the thermal noise voltage across a resistor
4. What is shot noise
5. Define noise temperature.
6. Find the thermal noise voltage developed across a resistor of 700ohm. The bandwidth of the measuring instrument is 7MHz and the ambient temperature is 27'C.

PART B

1. Derive the effective noise temperature of a cascade amplifier. Explain how the various noise are generated in the method of representing them. **. (16)**
2. Explain how the various noises are generated and the method of representing them. **.(16)**

3. Write notes on noise temperature and noise figure**.** **(8)**
4. Derive the noise figure for cascade stages**.** **(8)**
5. What is narrowband noise discuss the properties of the quadrature components of a narrowband noise. **(8)**
6. What is meant by noise equivalent bandwidth? Illustrate it with a diagram(8)
7. Derive the expression for output signal to noise for a DSB-SC receiver using coherent detection. **.** **(16)**
8. Write short notes on noise in SSB. **(16)**
9. Discuss the following: **.** **(16)**
   - i) noise equivalent bandwidth **(4)**
   - ii) narrow band noise **(4)**
   - iii) noise temperature **(4)**
   - iv) noise spectral density **(4)**
12. How sine wave plus noise is represented? Obtain the joint PDF of such noise component. **(16)**

UNIT IV – NOISE PERFORMANCE OF AM & FM RECEIVERS

PART A

All questions – Two Marks:

1. How to achieve threshold reduction in FM receiver?
2. What is meant by FOM of a receiver?
3. What is extended threshold demodulator?
4. Draw the Phasor representation of FM noise.
5. Define pre-emphasis and de-emphasis.
6. What is capture effect in FM?
7. What is the SNR for AM with small noise case?
8. What is threshold effect with respect to noise?
9. Define SNR.
10. Define CSNR.
11. Discuss the factors that influence the choice of intermediate frequency in a radio receiver.

PART B

1. Define Hilbert Transform with a suitable example. Give the method of generation and detection of SSB waver. . **(16)**
2. Discuss the noise performance of AM system using envelope detection. **(16)**
3. Compare the noise performance of AM and FM systems. **(16)**
4. Explain the significance of pre-emphasis and de-emphasis in FM system? **(8)**
5. Derive the noise power spectral density of the FM demodulation and explain its performance with diagram**.** **(16)**
6. Draw the block diagram of FM demodulator and explain the effect of noise in detail. Explain the FM threshold effect and capture effect in FM? **(16)**
7. Explain the FM receiver with block diagram**.** **(8)**

UNIT V – INFORMATION THEORY

PART A

All questions – Two Marks:

1. What is entropy?
2. What is prefix code?
3. Define information rate.
4. What is channel capacity of binary synchronous channel with error probability of 0.2?
5. State channel coding theorem.
6. Define entropy for a discrete memory less source.
7. What is channel redundancy
8. Write down the formula for the mutual information.
9. When is the average information delivered by a source of alphabet size 2, maximum?
10. Name the source coding techniques.
11. Write down the formula for mutual information.
12. Write the expression for code efficiency in terms of entropy.
13. Is the information of a continuous system non negative? If so, why?

14. Explain the significance of the entropy H(X/Y) of a communication system where X is the transmitter and Y is the receiver.
15. An event has six possible outcomes with probabilities ½.1/4,1/8,1/16,1/32,1/32. Find the entropy of the system.

PART B

1. Discuss Source coding theorem, give the advantage and disadvantage of channel coding in detail, and discuss the data compaction**.** **(16)**
2. Explain in detail Huffman coding algorithm and compare this with the other types of coding**.** **(8)**
3. Explain the properties of entropy and with suitable example, explain the entropy of binary memory less source**.** **(8)**
4. What is entropy? Explain the important properties of entropy. **(8)**
5. Five symbols of the alphabet of discrete memory less source and their probabilities are given below. **(8)**

   S=[S0,S1,S2,S3,S4]

   P[S]=[.4,.2,.2,.1,.1]

   Code the symbols using Huffman coding.
6. Write short notes on Differential entropy, derive the channel capacity theorem and discuss the implications of the information capacity theorem. **.** **(16)**
7. What do you mean by binary symmetric channel? Derive channel capacity formula for symmetric channel**.** **(8)**
8. Construct binary optical code for the following probability symbols using Huffman procedure and calculate entropy of the source, average code Length, efficiency, redundancy and variance? 0.2, 0.18, 0.12, 0.1, 0.1, 0.08, 0.06, 0.06, 0.06, 0.04 **(16)**
9. Define mutual information. Find the relation between the mutual information and the joint entropy of the channel input and channel output. Explain the important properties of mutual information. **.** **(16)**
10. Derive the expression for channel capacity of a continuous channel. Find also the expression for channel capacity of continuous channel of a infinite bandwidth. Comment on the results. **(16)**