# KINGS

COLLEGE OF ENGINEERING

## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

### QUESTION BANK

**SUB.NAME : COMMUNICATION THEORY** **SUB.CODE : EC2252**

**YEAR /SEM : II / IV**

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## UNIT I

### AMPLITUDE MODULATION SYSTEMS

**PART-A (2 Marks)**

1. Define Amplitude Modulation.
2. What is AM wave envelope?
3. Define modulation index for an AM wave.
4. List out the advantages of AM.
5. Define the transmission efficiency of AM signal
6. As related to AM, what is over modulation, under modulation and 100% modulation?
7. Define FDM .
8. Define SSB.
9. Mention the applications of SSB.
10. Mention the advantages of VSB.

**PART-B (16 Marks)**

1. (a).Explain the generation of AM signals using square law modulator. (8)
   (b).Explain the detection of AM signals using envelope detector. (8)
2. Explain Balanced modulator to generate DSB-SC signal. (16)
3. Explain coherent detector to detect SSB-SC signal. (16)
4. Explain the generation of SSB using balanced modulator. (16)
5. Draw the circuit diagram of Ring modulator and explain with its operation. (16)

6. Discuss the coherent detection of DSB-SC modulated wave with a block diagram of detector and Explain. (16)
7. Draw the block diagram for the generation and demodulation of a VSB signal and explain the principle of operation. (16)
8. Write short notes on frequency translation and FDM. (16)

## UNIT II

### ANGLE MODULATION SYSTEMS

**PART-A (2 Marks)**

1. Define PM.
2. Define FM.
3. Define Frequency deviation($\Delta f$)
4. Define Carson's rule.
5. Write the applications of FM
6. What do you mean by narrowband and wideband FM?
7. What is modulation index of PM?
8. Define Direct method and Indirect method FM.
9. Mention the advantages of FM.
10. What is the modulation index of FM?

**PART-B (16 Marks)**

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 reactance tube modulator and derive 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. Draw the frequency spectrum of FM and explain. Explain how Varactor diode can be used for frequency modulation. (16)
6. Discuss the indirect method of generating a wide-band FM signal. (16)

7. Draw the circuit diagram of Foster-Seelay discriminator and explain its working. (16)

## UNIT III

### NOISE THEORY

**PART-A (2 Marks)**

1. Define internal noise.
2. Define shot noise.
3. Define thermal noise.
4. Define narrow band noise.
5. Define noise figure.
6. Define noise equivalent bandwidth.
7. Define a random variable. Specify the sample space and the random variable for a coin tossing experiment.
8. What is white noise? Give its characteristics.
9. When is a random process called deterministic?
10. Define flicker noise.
11. State the reasons for higher noise in mixers.

**PART-B (16 Marks)**

1. Derive the effective noise temperature of a cascade amplifier and explain how various noises are generated in the method of representing them. (16)
2. Explain the following terms
   (i) Random variable
   (ii) Random process
   (iii)Gaussian process (16)
3. Explain how various noises are generated and the method of representing them. (16)
4. Write notes on noise temperature and noise figure. (16)
5. Derive the noise figure for cascade stages. (16)
6. What is narrowband noise? Discuss the properties of the quadrature components of a narrowband noise? (16)
7. Write short notes on thermal noise and short noise. (16)
8. Explain in detail about white and filtered noise. (16)

# UNIT IV

## PERFORMANCE OF CW MODULATION SYSTEMS

### PART-A (2 Marks)

1. What are the advantages of superheterodyne receiver?
2. Define image frequency.
3. Define Tracking
4. What is meant by FOM of a receiver?
5. What is threshold effect?
6. Draw the Phasor representation of FM noise.
7. Define pre-emphasis and de-emphasis.
8. Define SNR.
9. What is the SNR at the output of DSB system with coherent demodulation?
10. Define CSNR.
11. What is sensitivity and selectivity of receiver?

### PART-B (16 Marks)

1. Explain the working of Super heterodyne receiver with its parameters. (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. Calculate the noise power of a DSB-SC system using coherent detection. (16)
5. Discuss in detail the noise performance in SSB-SC receiver. (16)
6. Explain the significance of pre-emphasis and de-emphasis in FM system. (16)
7. Derive the noise power spectral density of the FM demodulation and explain its performance with diagram. (16)
8. a. Draw the block diagram of FM demodulator and explain the effect of noise in detail. (8)
   b. Explain the FM threshold effect and capture effect in FM. (8)

# UNIT V

## INFORMATION THEORY

### PART-A (2 Marks)

1. What is prefix code?
2. Define information rate.
3. What is channel capacity of binary synchronous channel with error probability of 0.2?

4. State channel coding theorem.
5. Define entropy for a discrete memory less source.
6. What is code redundancy?
7. Write down the formula for the mutual information.
8. Name the source coding techniques.
9. What is Data compaction?
10. Write the expression for code efficiency in terms of entropy.

**PART-B (16 Marks)**

1. Explain the significance of the entropy H(X/Y) of a communication system where X is the transmitter and Y is the receiver. (16)
2. An event has six possible outcomes with probabilities 1/2.1/4,1/8,1/16,1/32,1/32. Find the entropy of the system. (16)
3. Discuss Source coding theorem, give the advantage and disadvantage of channel coding in detail, and discuss the data compaction. (16)
4. Explain the properties of entropy and with suitable example, explain the entropy of binary memory less source. (16)
5. Five symbols of the alphabet of discrete memory less source and their probabilities are given below. S=[S0,S1,S2,S3]; P[S]=[.4,.2,.2,.1,.1].Encode the symbols using Huffman coding. (16)
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. (16)
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. State and prove continuous channel capacity theorem. (16)
10. Encode the following source using Shannon-Fano and Huffman coding procedures. Compare the results. (16)

| X | X1 | X2 | X3 | X4 | X5 |
|---|---|---|---|---|---|
| P(X) | 0.3 | 0.1 | 0.4 | 0.08 | 0.12 |

11.(a). Encode the following source using Shannon-Fano coding (8)

| X | X1 | X2 | X3 | X4 | X5 | X6 | X7 |
|---|---|---|---|---|---|---|---|
| P(X) | 0.4 | 0.2 | 0.12 | 0.08 | 0.08 | 0.08 | 0.04 |

(b). Explain in detail Huffman coding algorithm and compare this with other types of coding. (8)

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