

# CBCS SCHEME

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21EC44

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024

## Communication Theory

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Explain in detail, the working of switching modulator with suitable block diagram and necessary derivation. (08 Marks)
- b. Explain the concept of VSB transmission for analog and digital transmission. (06 Marks)
- c. Explain with block diagram of FDM system. (06 Marks)

OR

- 2 a. Explain the generation of DSBSC wave using a ring modulator. (07 Marks)
- b. Explain the scheme of generation and demodulation of VSB modulated wave with relevant spectrum of signals and mathematical expression. (08 Marks)
- c. An audio frequency signal  $m(t) = 5 \sin 2\pi \times 10^3 t$  is used to amplitude modulate a carrier of  $c(t) = 100 \sin 2\pi 10^6 t$ . Assume modulation index of 0.4. Find:
  - i) Side band frequencies
  - ii) Amplitude of each side band
  - iii) Band width
  - iv) Total power delivered to a load of  $100\Omega$
  - v) Find the efficiency of AM wave assume  $R = 1\Omega$ . (05 Marks)

### Module-2

- 3 a. Explain the narrowband FM with relevant expressions and phasor diagram. (10 Marks)
- b. Discuss the non-linear effects in FM system. (06 Marks)
- c. When a 50MHz carrier is frequency modulated by a sinusoidal AF modulating signal. The highest frequency reached is 50.405MHz. Calculate :
  - i) Frequency deviation produced
  - ii) Carrier swing of the wave
  - iii) Lowest frequency reached. (04 Marks)

OR

- 4 a. Derive the expression for linear model of PLL. (08 Marks)
- b. Explain FM stereo multiplexing. (06 Marks)
- c. With a neat diagram, explain the superheterodyne receiver. (06 Marks)

### Module-3

- 5 a. Derive the expression of Figure of Merit (FOM) of an AM receivers using envelop detection. (06 Marks)
- b. Explain shot noise and thermal noise with relevant diagrams and expressions. (08 Marks)
- c. Discuss the FM threshold effect and its reduction method. (06 Marks)

OR

- 6 a. Derive the expression of figure of merit for a DSB-SC receiver. (10 Marks)  
 b. Explain the use of pre emphasis and de-emphasis circuit in an FM system. (06 Marks)  
 c. An AM receiver operating with a sinusoidal modulating signal has a following specification  $m = 0.8$  and  $(SNR)_0 = 30\text{dB}$ . What is the carrier to noise ratio. (04 Marks)

Module-4

- 7 a. State sampling theorem and explain the sampling theorem with relevant equation. (10 Marks)  
 b. With neat block diagram, explain TDM. (06 Marks)  
 c. What are the advantages of digital modulation techniques over analog? (04 Marks)

OR

- 8 a. With a neat diagram, explain the generation and detection of PPM. (08 Marks)  
 b. With a neat diagram, explain the generation of PAM waves. (08 Marks)  
 c. A Compact Disc (CD) Audio signals digitally using PCM. Assume the audio signal B.W to be 20kHz.  
 i) What is the Nyquist rate?  
 ii) If the Nyquist samples are quantized to  $L = 65.536$  levels and then binary coded. Determine the number of bits required to encoded a sample.  
 iii) Determine the number of binary digits / sec required to encode the audio S/R. (04 Marks)

Module-5

- 9 a. With a neat diagram, explain the basic elements of a PCM. (08 Marks)  
 b. Discuss the concept and operation of delta modulation. (08 Marks)  
 c. A TV signal with a Bandwidth of 4.2MHz is transmitted using binary PCM. The number of representation level is 512. Calculate:  
 i) Codeword length  
 ii) Final bit rate  
 iii) Transmission Bandwidth. (04 Marks)

OR

- 10 a. What is quantization? Why it is required in digital communication? Explain symmetric quantizer of mid tread and mid rice type. (10 Marks)  
 b. Draw the line codes for the given binary sequence 01101010  
 i) Unipolar NRZ  
 ii) Polar NRZ  
 iii) Unipolar RZ  
 iv) Manchester  
 v) Bipolar RZ signaling. (10 Marks)

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