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 100Ω
v) Find the efficiency of AM wave assume R = 1Ω. **(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 50MHzs carrier is frequency modulated by a sinusoidal AF modulating signal. The highest frequency reached is 50.405MHzs. 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 $(SNR)_0$ = 30dB. 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 20kHzs.

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 4.2MHzs 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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