CBCS SCHEME

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18EC53

Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Principles of Communication Systems

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat circuit diagram and waveforms explain the working of switching modulator used for generation of amplitude modulated waves. **(08 Marks)**

b. With a neat block diagram, explain the working of COSTAS receiver used for demodulation of DSB-SC signals. **(07 Marks)**

c. Explain the necessary block diagrams, quadrature carrier multiplexing and de-multiplexing system. **(05 Marks)**

OR

2 a. Explain the generation of DSB – SC signals using ring modulator. **(07 Marks)**

b. Explain the scheme of generation and demodulation of USB signals with relevant block diagrams and mathematical equations. **(08 Marks)**

c. Explain the concept of frequency division multiplexing with suitable block diagram. **(05 Marks)**

Module-2

3 a. Derive the equation of FM wave. Also mention the important properties of angle modulated waves. **(08 Marks)**

b. Obtain the time domain expression of NBFM plot its spectrum and compare with AM what is the inference? **(08 Marks)**

c. An angle modulated signal is give by $s(t) = 10\cos[2\pi \times 10^6 t + 0.2 \sin(2000\pi t)]$ volts determine :

i) Power in the modulated signal for a load of 100Ω
ii) Frequency deviation
iii) Phase deviation
iv) Approximate transmission BW. **(04 Marks)**

OR

4 a. With a neat diagram and relevant equations, explain the non linear model of PLL used for demodulation of FM systems. **(08 Marks)**

b. Discuss the non linear effects in FM systems. **(06 Marks)**

c. With relevant block diagrams, explain FM stereo multiplexing and de-multiplexing technique. **(06 Marks)**

Module-3

5 a. Define : i) Thermal noise ii) Shot noise iii) White noise. **(06 Marks)**

b. Define noise equivalent bandwidth and derive the expression for the same. **(06 Marks)**

c. Derive the expression for the figure of merit for a DSB – SC receiver using coherent detection. **(08 Marks)**

OR

6 a. Derive the expression for the figure of merit for a FM receiver under the influence of noise. **(10 Marks)**

b. Explain pre-emphasis and de-emphasis in FM system. **(05 Marks)**

c. An FM reciver operating with a sinusoidal wave and 80% modulation has an output SNR of 30dB. Calculate the corresponding carrier to noise ratio. **(05 Marks)**

Module-4

7 a. Mention the advantages of digitizing analog signals. **(05 Marks)**

b. State and explain sampling theorem for law-pass signals and derive the interpolation formula. **(10 Marks)**

c. With a neat block diagram, explain the operation of Time Division Multiplexing (TDM). **(05 Marks)**

OR

8 a. With a neat block diagram and waveforms explain the generation of PPM signal. Also mention the benefits of PPM. **(10 Marks)**

b. What is aperture effect in PAM systems? How it can be minimized. **(04 Marks)**

c. Determine the Nyquist rate and Nyquist interval for :

i) $x(t) = 3\cos(50\pi t) + 10\sin(300\pi t) + \cos(100\pi t)$

ii) $x(t) = \frac{1}{2\pi}[\cos(4000\pi t) \cdot \cos(1000\pi t)]$. **(06 Marks)**

Module-5

9 a. With proper block diagrams, explain the PCM system. **(08 Marks)**

b. A PCM system uses a uniform quantizer followed by a N bit encoder. Show that the rms signal to quantization noise is approximately given by (1.8 + 6N)dB. **(08 Marks)**

c. A PCM system uses a uniform quantizer and produces a binary output. The input signal amplitude varies between ± 4V and having average power of 40mW. Calculate the number of bits required for a SNR of 20dB. **(04 Marks)**

OR

10 a. Explain Delta modulation with relevant equations. **(05 Marks)**

b. Explain the channel vocoder with a neat block diagram [LP voice coder]. **(05 Marks)**

c. Represent the binary data 1 0 1 1 0 0 1 0 using :

i) Unipolar NRZ coding
ii) Polar NRZ coding
iii) Unipolar RZ coding
iv) Manchester coding
v) Bipolar RZ coding. **(10 Marks)**

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