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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 $s(t) = 10\cos[2\pi \times 10^6t + 0.2 \sin (2000\pi t)]$ 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 receiver 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 low-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 ± 4 V 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)
