CBCS SCHEME

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18EC53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
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 proper necessary equations, explain the time domain and frequency domain expressions for an AM wave. Outline the waveforms and spectrum. **(08 Marks)**

b. Explain the generation of AM wave using switching modulator with neat block diagram and relevant equations. **(08 Marks)**

c. An audio frequency signal $10\sin 2\pi(500t)$ is used to amplitude modulate a carrier signal of $50\sin 2\pi(10^5 t)$. Assume modulation index as 0.2. Determine

(i) Side band frequencies.
(ii) Amplitude of each sideband.
(iii) Band width required. **(04 Marks)**

OR

2 a. What is a coherent detector used for DSB.SC? Why it is so named? Explain its working with a neat block diagram. What can be the problems in a coherent detector? **(08 Marks)**

b. Compare and contrast standard AM, DSB-SC, SSB-SC and VSB-SC (at least 5 points in each) **(05 Marks)**

c. When the modulation percentage is 75 an AM transmitter produces 10 kW. How much of this is carrier power? Determine the percentage of power saving if the carrier and one of the sidebands were suppressed before transmission took place. **(07 Marks)**

Module-2

3 a. From the fundamentals deduct an expression of WBFM and plot its frequency spectrum. **(10 Marks)**

b. What is frequency modulation? Deduct the expression for a narrow band FM signal. Represent a narrow band FM signal with neat phasor diagram. **(08 Marks)**

c. A FM signal has sinusoidal modulation with $W = 15$ kHz and modulation index $\beta = 2$. Using Carson's rule determine the transmission bandwidth and deviation ratio. Assume $\Delta f = 75$ kHz. **(02 Marks)**

OR

4 a. With relevant mathematical analysis and block diagrams show the reconstruction of message signal from FM wave using PLL. **(10 Marks)**

b. Explain the generation of FM wave using a neat block diagram and necessary equations. **(06 Marks)**

c. A Carrier is frequency modulated by a sinusoidal modulating signal of frequency 3 kHz resulting in a frequency deviation of 10 kHz.

(i) What is the bandwidth occupied by the modulated waveform?
(ii) If the amplitude of the modulating signal is increased by a factor of 2 and its frequency is lowered to 1 kHz. Determine the new bandwidth. **(04 Marks)**

Module-3

5 a. What is thermal Noise? List out different characteristics of thermal Noise. **(06 Marks)**

b. What is white noise? Deduct the power spectral density and auto-correlation function for a RC-Low pass filtered white Noise. Also find the Noise equivalent bandwidth for the same and show its relationship with normal bandwidth. **(08 Marks)**

c. Explain the applicability of pre-emphasis and de-emphasis with respect to FM system. **(06 Marks)**

OR

6 a. Determine the FOM for a DSB-SC receiver. **(08 Marks)**

b. Determine the FOM for a standard AM receiver. **(08 Marks)**

c. Explain capture effect and threshold effect with respect to FM receiver. **(04 Marks)**

Module-4

7 a. What are the advantages of digital modulation techniques over analog? **(04 Marks)**

b. What is sampling theorem? Explain sampling with neat sketches and equations. What are the challenges faced with Nyquist criteria of sampling? **(08 Marks)**

c. What is Flat top sampling writ PAM. Explain the same with neat waveforms and derive the equation for flat-top sampled PAM. **(08 Marks)**

OR

8 a. What is multiplexing and why it is required in communication? Explain the working of TDM with neat block diagram. **(08 Marks)**

b. What is pulse position modulation? Explain the generation of a PPM wave with neat block diagram and necessary waveforms. **(08 Marks)**

c. What is aperture error in PAM? How to minimize it? **(04 Marks)**

Module-5

9 a. What is Quantization? Why it is required in digital communication? Explain symmetric quantizer of midtread and midrise type. **(08 Marks)**

b. With neat block diagram, explain the working of PCM system. **(08 Marks)**

c. What is companding? Explain different laws of companding. **(04 Marks)**

OR

10 a. What is Quantization noise? Derive the expression for O/P signal to Noise Ratio of a Quantizer. Consider a sinusoidal modulating signal of amplitude AM which uses all representation levels provided. Calculate the $(SNR)_O$ for the O/P of quantizer of the above signal. **(08 Marks)**

b. What is Delta modulation? Explain the same with block diagrams. **(06 Marks)**

c. Write a note on Vocadens. **(06 Marks)**

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