CBCS SCHEME

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18EC53

Fifth Semester B.E. Degree Examination, June/July 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. Define amplitude modulation. Derive the expression of AM in both time domain and frequency domain representation with necessary waveforms. **(08 Marks)**

b. With a neat block diagram, explain demodulation of DSB-SC wave using costas receiver. **(06 Marks)**

c. With a neat block diagrams of a transmitter and receiver explain the operation of FDM system. **(06 Marks)**

OR

2 a. With a neat circuit diagram, waveforms and necessary equations, explain how the ring modulator can be used to generate DSB-SC wave. **(10 Marks)**

b. An audio frequency signal $m(t) = 5\sin [2\pi \times 500t]$ is used to amplitude modulate the carrier of signal $c(t) = 10 \sin [2\pi \times 10^6 t]$ find i) The modulation index μ ii) Side-band frequencies iii) Amplitude of each side band iv) Band width required v) Total power delivered to a load of 100Ω. **(05 Marks)**

c. With a neat block diagrams of transmitter and receiver explain quadrature carrier multiplexing system. **(05 Marks)**

Module-2

3 a. Define and describe the time domain representation of frequency modulation and phase modulation with waveforms. **(06 Marks)**

b. Explain the generation of narrow band FM with phasor diagram. **(06 Marks)**

c. With relevant block diagrams, explain FM stereo multiplexing and demultiplexing. **(08 Marks)**

OR

4 a. Derive an expression for single-tone sinusoidal FM wave. **(05 Marks)**

b. Explain with relevant block diagram, and mathematical expression, the demodulation of FM signal using non linear and linear model of the PLL. **(10 Marks)**

c. The equation for a FM wave is $s(t) = 10\sin [5.7 \times 10^8 t + 5 \sin 12 \times 10^3 t]$. Find:

i) Carrier frequency
ii) Modulating frequency
iii) Modulation index
iv) Frequency deviation
v) Power dissipated in 100Ω. **(05 Marks)**

Module-3

5 a. With a neat block diagram of receiver model show that the figure of merit of for DSB-SC system is unity. **(10 Marks)**

b. Discuss capture and threshold effect in FM receiving systems. **(05 Marks)**

c. Show that the figure of merit of noisy AM receiver for single tone modulation is $\frac{\mu^2}{1+\mu^2}$. **(05 Marks)**

OR

6 a. With a neat block diagram of receiver model using discriminator derive the expression for figure of merit of an FM receiver. **(10 Marks)**

b. Explain the working of pre-emphasis and de-emphasis in frequency modulation. **(06 Marks)**

c. Explain briefly the following: i) Shot noise ii) Thermal noise. **(04 Marks)**

Module-4

7 a. Mention the advantages of digital communication system. **(04 Marks)**

b. Show that the signal g(t) can be reconstructed using the interpolation formula shown below.

$$g(t) = \sum_{n=-\infty}^{\infty} g\left(\frac{n}{2w}\right) \text{Sinc}(2wt - n).$$ **(10 Marks)**

c. With a neat diagram, explain the concept of time division multiplexing. **(06 Marks)**

OR

8 a. Define the pulse amplitude modulation with relevant equations, waveforms, diagram, explain the generation and reconstruction of flat top sampling. **(10 Marks)**

b. With a neat block diagram and wave forms, explain the generation of pulse position modulation waves. **(10 Marks)**

Module-5

9 a. With a neat block diagram, explain the concept of the PCM. **(10 Marks)**

b. What is quantization process? Derive the expression for signal to quantization noise ratio for PCM signal where the input is sinusoidal signal. **(10 Marks)**

OR

10 a. With a neat encoder and decoder block diagram, necessary equations explain the delta modulation technique. **(08 Marks)**

b. Represent the binary data: 10011101
i) Polar NRZ ii) Bipolar RZ iii) Unipolar NRZ iv) Split phase formatting. **(04 Marks)**

c. Write a short note on:
i) Slope overload distortion
ii) Granular noise. **(08 Marks)**

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