CBCS SCHEME

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18EC53

Fifth Semester B.E. Degree Examination, Feb./Mar. 2022
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. Write an AM wave expression in time domain and in frequency domain. Draw AM waveform. **(07 Marks)**

b. With neat diagram, explain the demodulation of AM wave using envelope detector. **(08 Marks)**

c. An audio frequency signal $M(t) = 5 \sin 2\pi (10^3)t$ is used to amplitude modulate a carrier of $C(t) = 100 \sin 2\pi (10^6)t$. Assume modulation index $\mu = 0.4$. Find: i) Sideband frequencies ii) Amplitude of each sideband iii) Bandwidth iv) Total power delivered to a load of 100μ v) Find efficiency of AM wave, assume $R = 1\Omega$. **(05 Marks)**

OR

2 a. Explain the generation of DSBSC wave using a Ring modulator. **(10 Marks)**

b. Explain with a neat diagram, the working of Quadrature Carrier Multiplexing (QAM). **(08 Marks)**

c. An AM signal with a carrier of 1kW has 200W in each sideband. What is the percentage of modulation? **(02 Marks)**

Module-2

3 a. Define angle modulation. Derive the FM wave expression in time domain. **(08 Marks)**

b. Define the following terms:
   i) Modulation index
   ii) Frequency deviation
   iii) Bandwidth **(07 Marks)**

c. A FM wave is represented by the equation $V = 10 \sin [5 \times 10^8 t + 4 \sin 1250t]$. Find: i) Carrier frequency and modulating frequency ii) Modulation index and frequency deviation iii) Bandwidth using Carson's rule. **(05 Marks)**

OR

4 a. Write the basic block diagram of PLL. Derive the expression for non-linear model of PLL. **(10 Marks)**

b. Explain the direct method of generating FM wave using Hartley oscillator with relevant equations and diagram. **(06 Marks)**

c. Write the Narrowband FM and wideband FM expression. **(04 Marks)**

Module-3

5 a. Derive the expression for figure of merit of an AM receivers using envelope detection. **(10 Marks)**

b. Explain the noisy receiver model with neat diagram. Explain briefly the figure of merit. **(06 Marks)**

c. Explain the noise equivalent bandwidth with relevant equation. **(04 Marks)**

OR

6 a. Derive the expression for Figure Of Merit (FOM) for DSBSC receiver. **(10 Marks)**
b. Explain the use of pre-emphasis and de-emphasis circuit in an FM system. **(06 Marks)**
c. Define the white noise. Briefly explain the power spectral density and autocorrelation function of white noise. **(04 Marks)**

Module-4

7 a. State sampling theorem. Write the mathematical form of sampled signal and explain the steps to reconstruct the signal g(t) from the sequence of sample value. **(10 Marks)**
b. Explain the concept of TDM with a neat block diagram. **(06 Marks)**
c. What is aperture effect? Briefly explain how to overcome this effect. **(04 Marks)**

OR

8 a. Briefly explain the following pulse modulation with waveform:
i) PAM ii) PWM iii) PPM. **(09 Marks)**
b. With neat block diagram, explain the generation of PPM wave. **(05 Marks)**
c. Explain the following terms:
i) Under sampling
ii) Over sampling
iii) Nyquist rate. **(06 Marks)**

Module-5

9 a. Derive the expression of output signal to noise ratio of a uniform quantizer. **(08 Marks)**
b. With neat block diagram, explain the transmitter, transmission path and receiver of a PCM system. **(08 Marks)**
c. An audio signal digitalized using PCM. Assume the audio signal bandwidth to be 20kHz.
i) What is the Nyquist rate and Nyquist period of the audio signal?
ii) If the samples are quantized to L = 4096 levels and then binary coded, determine the number of bits required to encode a sample. **(04 Marks)**

OR

10 a. Draw the line codes for given binary representation 01101001
i) Unipolar NRZ signaling
ii) Polar NRZ signaling
iii) Unipolar RZ signaling
iv) Bipolar RZ signaling
v) Manchester code. **(10 Marks)**
b. Explain granular noise and slope overload distortion in delta modulation. **(04 Marks)**
c. With neat diagram explain delta modulation system. **(06 Marks)**

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