R13

Code No: 115AK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, March - 2024

ANALOG COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a) Give the basic principle behind the coherent detection of DSB-SC modulated waves. [2]

b) Explain the concept of Double Sideband Suppressed Carrier (DSB-SC) modulation in time domain. [3]

c) What is SSB modulation, and how does it differ from conventional AM modulation? [2]

d) Explain the significance of bandwidth reduction in VSB modulation compared to traditional AM techniques. [3]

e) Define modulation index in FM. [2]

f) Compare Pre-emphasis and de-emphasis FM. [3]

g) What are arbitrary noise sources, and how do they differ from resistive noise sources? [2]

h) How do you calculate the average noise figure of cascaded networks? Explain briefly. [3]

i) What is Pulse Position Modulation (PPM), and how does it differ from PWM? [2]

j) Explain the concept of Time-Division Multiplexing (TDM) in pulse modulation systems. [3]

PART – B

(50 Marks)

2.a) Derive an expression for SSB-SC wave using the concept of pre-envelope.

b) The total power content of AM signal is 1kW. Determine the power being transmitted at the carrier frequency and each of the sidebands when the % modulation is 100. [6+4]

OR

3.a) Explain generation of DSB-SC signal with the help of balanced modulator using diodes.

b) A given AM broadcast station transmits a total power of 5kW when the carrier is modulated by sinusoidal signal with a modulation index of 0.7071. Determine Carrier power and Transmission Efficiency. [6+4]

4.a) Explain the concept of Hilbert Transform and its significance in SSB modulation.

b) Consider an AM signal with a carrier frequency of 1.2 MHz and a message signal bandwidth of 20 kHz. If the modulation depth is 0.6, calculate the bandwidth of the modulated signal and discuss the challenges associated with envelope detection in this scenario. [5+5]

OR

5.a) Explain the concept of frequency discrimination method for generating AM SSB modulated waves.

b) Consider a message signal with a frequency of 10 kHz. If the carrier frequency is 1 MHz, calculate the frequencies of the upper and lower sidebands for SSB modulation. Also, determine the bandwidth required for this modulation scheme. [5+5]

6.a) A carrier signal is frequency modulated by a sinusoidal signal of 5Vpp and 10 kHz. If the frequency deviation constant is 1 kHz/V, determine the maximum frequency deviation and state whether the scheme is narrow band FM or wide band FM.

b) Describe the fundamentals of Narrowband and wideband FM. [5+5]

OR

7.a) If the maximum phase deviation in a phase modulation system when a modulating signal of 10V is applied is 0.1radian, determine the value of phase deviation constant.

b) What are zero crossing detectors? Explain how it works and can be used as an FM Demodulator. [5+5]

8.a) Obtain the expression for output SNR of FM system.

b) Calculate thermal noise power available from any resistor at room temperature 290^0 K for a bandwidth of 2MHz and calculate noise voltage at 100Ω resistor. [6+4]

OR

9.a) Explain in detail the noise effect in PM and obtain expression for figure of merit.

b) The noise figure of a receiver is 20dB and it is fed by a low noise amplifier which has gain of 40dB and noise temperature of 80^0K. Calculate the overall noise temperature of the receiving system and the noise temperature of the receiver. [6+4]

10.a) Explain the concept of amplitude limiting in FM receivers and its importance in preventing distortion.

b) An FM receiver operating at a carrier frequency of 98 MHz with a maximum deviation of 25 kHz. If the input signal amplitude varies from 1 V to 5 V, calculate the output signal amplitude after limiting. [5+5]

OR

11.a) Explain the generation and demodulation of PWM signals.

b) Consider a PWM signal with a modulation frequency of 1 kHz and a duty cycle of 30%. If the carrier frequency is 10 kHz, calculate the bandwidth of the PWM signal and the peak-to-peak amplitude of the demodulated signal. [6+4]

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