125/12
150

Sr. No: 015303

December 2023

B.Tech.(ENC) III SEMESTER

Subject Name: Analog Communication (ECP-304)

Time: 3 Hours

Max. Marks:75

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Differentiate between low level and high level amplitude modulation. (1.5)

(b) Find the inverse fourier transform of the signal : $X(\omega) = 2[\delta(\omega-1) - \delta(\omega+1)]$ (1.5)

(c) A bandwidth of 20MHZ is to be considered for the transmission of AM signals. If the highest audio frequency used to modulate the carrier are not to exceed 2KHz. How many stations could broadcast with in this band simultaneously without interfering with one another? (1.5)

(d) A signal is band limited to 4.2 MHz is transmitted using PCM. The number of quantization levels is 512. Calculate bit rate and signal to quantization noise ratio. (1.5)

(e) Determine the nyquist rate and nyquist interval for the signal: $x(t) = \sin^2 c(100\pi t)$ (1.5)

(f) Differentiate between ideal and practical sampling techniques. (1.5)

(g) Define internal noise. How can you classify internal noise? (1.5)

(h) Determine the power content of each of sidebands and the carrier of an AM signal that has percent modulation of 85% and contains 1200W of total power. (1.5)

(i) Find the overall noise figure of three stage cascaded amplifier, each stage having a power gain of 10dB and noise figure of 6dB. (1.5)

(j) A 100MHz carrier is frequency modulated by 5 KHz wave. For a frequency deviation of 100 KHz, calculate the carrier swing of the FM signal. (1.5)

PART -B

Q2 (a) Differentiate between the following: (4)
(i) Continuous time signal and discrete time signal
(ii) Piecewise defined and simply defined signal

(b) Prove the following properties of the fourier transform (6)
(i) Frequency shifting property
(ii) Differentiation in frequency domain

© Consider the signal: $x(t) = \sin(\omega_0 t)$, whose fundamental frequency is ω_0. Find the complex exponential fourier series of x(t) and plot its frequency spectrum. (5)

Q3 (a) Explain the operation of square law modulator which generates AM waves. (7)

015303/150/111/626

015303

Prove that with the help of deviation that it generates the AM at its output.

(b) Discuss about the synchronous detection approach for DSB-SC signal detection. Why is this technique known as "synchronous detection"? Also discuss about how phase and frequency errors affect synchronous detection. (8)

Q4 (a) Explain the difference between narrowband FM and wideband FM. Derive an expression for narrowband FM. Also give statement of carson's rule. (6)

(b) Explain varactor diode method for generation of FM signal. (4)

© A frequency modulated signal describe by the equation (5)
$S(t) = 10 \cos[2\pi \times 10^6 t + 0.1 \sin(2000\pi t)]$
Find (i) Carrier frequency
(ii) Modulating frequency
(iii) Modulation index
(iv) Maximum frequency deviation
(v) What power will this FM wave dissipate in 10Ω resistor?

Q5 (a) State and prove sampling theorem. (5)

(b) Derived an expression for signal to quantization noise ratio for PCM uses uniform quantization techniques. (4)

© What do you mean by pulse time modulation? Explain their types with waveforms. Also explain one method of generation of PWM and PPM. (6)

Q6 (a) What do you mean by delta modulation? Discuss the advantages and disadvantages of delta modulation. (5)

(b) Explain noise figure. Derive an expression for calculation of noise figure. (5)

© Draw the compressor and expander characteristics and also discuss A law and μ law of companding. (5)

Q7 Write short notes on the following: (5x3)
(i) Balanced modulator
(ii) Demodulation of FM signal
(iii)TDM and FDM

****