

Unit 11 - Week 8- Delta Modulation, Differential Pulse Code Modulation, Frequency Mixing and Translation in Communication Systems, Heterodyne and Super Heterodyne Receivers, Frequency Division Multiplexing, Time Division Multiplexing, T1 TDM System: Case Study

Course outline

How does an NPTEL online course work?

Week-0

Week 1-Basic tools for communication, Fourier Series/Transform, Properties, Parsevals Relation, Properties of Fourier Transform, LTI Systems

Week 2- Cross- and Auto-correlation, (ESD), Introduction to Amplitude Modulation (AM), Spectrum of AM, Envelope Detection, Power Efficiency, (DSB-SC) Modulation and Demodulation

Week-3- Power Efficiency, (DSB-SC) Modulation and Demodulation, Carrier Phase Offset Example for (DSB-SC), Costas Receiver

Week-4 Quadrature Carrier Multiplexing (QCM) and Demodulation of QCM signals, Single Sideband Modulation (SSB), Hilbert Transform

Week-5 Generation of SSB , Complex pre-envelope of QCM, VSB , Introduction to AM

Week-6 Narrowband FM Generation, Spectrum of FM Signals, Carson's Rule for FM Bandwidth, Narrowband FM Generation, FM Demodulation, Introduction to Sampling, Spectrum of Sampled Signal, Aliasing, Nyquist Criterion

Week 7- Signal Reconstruction from Sampled Signal ,Introduction to Pulse Amplitude Modulation, Spectrum of PAM Signal and Reconstruction, Quantization, Uniform Quantizers – Midrise and Midtread, Quantization noise, Lloyd Max Quantization Algorithm, Non-uniform Quantizers

Week 8- Delta Modulation, Differential Pulse Code Modulation, Frequency Mixing and Translation in Communication Systems, Heterodyne and Super Heterodyne Receivers, Frequency Division Multiplexing, Time Division Multiplexing, T1 TDM System: Case Study

Lec 45- Delta Modulation and One-bit Quantizer

Lec 46- Signal reconstruction in delta modulation

Lec 47- Introduction to Differential Pulse Coded Modulation(DPCM)

Lec 48- Heterodyne and Super Heterodyne receivers

Lec 49- Principles of frequency translation

Lec 50-Frequency Division Multiplexing (FDM)

Lec 51- TDM, Sample Spacing in TDM

Lec 52-Bandwidth Requirements of TDM

Quiz : Assignment-8

Feedback For Week 8

Solution-8

Week 9 - Basics of Probability, Conditional Probability, Independent Events - Mary-PAM Example, Independent Events-Block Transmission, Independent Events-Multiantenna Fading

Text Transcripts

DOWNLOAD VIDEOS

Week 10- Bayes Theorem, Maximum Aposteriori Probability (MAP) Receiver, Random Variables and PDF, Power of Fading Wireless Channel, Mean & Variance of Random Variables and Application:Average & RMS Delay Spread

Week 11 - Transformation of Random Variables, Gaussian Random Variable ,Special Case: IID Gaussian Random Variables, Application: Uniform Linear Arrays, Random Processes and (WSS) and WSS Exampe

Week 12- Power Spectral Density(PSD) for WSS Random Process, PSD Application in Wireless, WSS Random Process Through LTI System, Special Random Processes and Gaussian Process Through LTI System

Assignment-8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-25, 23:59 IST.

1) What is the minimum sampling rate required to avoid aliasing for the signal $m(t) = \text{sinc}^2(t)$? Note $\text{sinc}(x) = \frac{\sin(\pi x)}{\pi x}$. 1 point

- π Hz
 1 Hz
 2 Hz
 0.5 Hz

No, the answer is incorrect.
Score: 0

Accepted Answers:
2 Hz

2) In the delta modulation, the distortion that arises when the signal rises or falls rapidly in comparison to the staircase approximation is termed as 1 point

- Peak amplitude distortion
 Granular noise
 Slope overload distortion
 Additive White Guassian Noise

No, the answer is incorrect.
Score: 0

Accepted Answers:
Slope overload distortion

3) Bit rate of T1 system is approximately 1 point

- 1 Kbps
 16 Kbps
 1.354 Gbps
 1.544 Mbps

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.544 Mbps

4) Twenty-four voice signals are sampled uniformly and then time-division multiplexed. The sampling operation uses flat-top samples with $1\mu s$ duration. The multiplexing operation included provision for synchronization by adding an extra pulse of sufficient amplitude and also $1\mu s$ duration. The highest frequency component of each voice signal is 3.4 kHz. Assuming a sampling at the Nyquist rate, calculate the approximate silence time between successive pulses of the multiplexed signal. 1 point

- $0.68\mu s$
 $4.88\mu s$
 $2.38\mu s$
 $8.48\mu s$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $4.88\mu s$

5) In a radio receiver for the AM system, the mixer translates the carrier frequency f_c to a fixed IF of 500 kHz using the local oscillator frequency f_{LO} . For the broadcast frequency 800 kHz, what is the value of f_{LO} when using a superhet receiver 1 point

- 300 kHz
 800 kHz
 500 kHz
 1300 kHz

No, the answer is incorrect.
Score: 0

Accepted Answers:
1300 kHz

6) Uniform quantizers with an even number of quantization levels is known as 1 point

- Mid-rise quantizer
 Mid-tread quantizer
 Delta quantizer
 DPCM quantizer

No, the answer is incorrect.
Score: 0

Accepted Answers:
Mid-rise quantizer

7) Consider quantization step size of Δ and uniformly distributed quantization error. The power of the resulting quantization noise is 1 point

- Δ^2
 $\frac{\Delta^2}{4}$
 $\frac{\Delta^2}{3}$
 $\frac{\Delta^2}{12}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{\Delta^2}{12}$

8) Quantization is used to map 1 point

- A continuous time signal to a discrete time signal
 A continuous time aperiodic signal to a power signal.
 A random continuous time signal to a deterministic discrete time signal.
 Samples of a continuous time signal to a discrete set of values.

No, the answer is incorrect.
Score: 0

Accepted Answers:
Samples of a continuous time signal to a discrete set of values.

9) Consider a sinusoidal modulating signal $m(t) = A_m \cos(50t)$ that is quantized using delta modulation. The maximum value of amplitude A_m for no slope overload distortion corresponding to a sampling frequency $f_s = 200\text{Hz}$ and step size $\Delta = 1$ is 1 point

- 25
 4
 50
 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
4

10) Consider a superhet receiver with broadcast frequency f_c and intermediate frequency f_{IF} . The corresponding image frequency is given as 1 point

- $f_c + f_{IF}$
 $f_c + 2f_{IF}$
 $2f_c + f_{IF}$
 $f_c - f_{IF}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $f_c + 2f_{IF}$