

Unit 12 - Week 9 - Basics of Probability, Conditional Probability, Independent Events - Mary-PAM Example, Independent Events-Block Transmission, Independent Events-Multiantenna Fading

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

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

- Lec 53 - Basics - Sample Space and Events
- Lec 54 - Axioms of Probability
- Lec 55 - Conditional Probability - Mary-PAM Example
- Lec 56 - Independent Events - Mary-PAM Example
- Lec 57 - Independent Events-Block Transmission
- Lec 58 - Independent Events-Multiantenna Fading

Quiz : Assignment-9

- Feedback For Week 9
- Solution-9

Text Transcripts

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Week 10- Bayes Theorem, Maximum A posteriori 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-9

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

Due on 2020-04-01, 23:59 IST.

1) A television signal (video and audio) has a bandwidth of 8 MHz. This signal is sampled at 50% above the Nyquist rate, quantized and binary coded to obtain a PCM signal. If the samples are quantized into 512 levels, determine the bit-rate of the resulting signal. **1 point**

- 216 Mbps
- 72 Mbps
- 144 Mbps
- 288 Mbps

No, the answer is incorrect.
Score: 0

Accepted Answers:
216 Mbps

2) Consider a uniform quantizer with 64 quantization levels and maximum message amplitude 100. What is the quantization noise power? **1 point**

- 0.77 dB
- 3.55 dB
- 5.39 dB
- 2.57 dB

No, the answer is incorrect.
Score: 0

Accepted Answers:
-0.77 dB

3) Consider the probability density function of the message sample m given as $f_M(m) = 2(1 - m), 0 \leq m \leq 1$. What is the optimal quantization level corresponding to the interval [0, 1]? **1 point**

- 1/2
- 2/3
- 1/3
- 3/2

No, the answer is incorrect.
Score: 0

Accepted Answers:
1/3

4) In the delta modulation, the distortion that arises when the step size Δ is large in comparison to a signal that is relatively flat, is termed as **1 point**

- Small amplitude distortion
- Granular noise
- Slope overload distortion
- Additive White Gaussian Noise

No, the answer is incorrect.
Score: 0

Accepted Answers:
Granular noise

5) Consider a superhet receiver with broadcast frequency f_c and intermediate frequency f_{IF} . The corresponding local oscillator (LO) frequency that is larger than f_c is given as **1 point**

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

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $f_c + f_{IF}$

6) Consider the probability density function of the samples of a signal given as $f_M(m) = \sin(m), 0 \leq m \leq \pi/2$. What is the optimal quantization level corresponding to the interval [0, $\pi/2$]? **1 point**

- $\pi/4$
- 1/4
- 1/2
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
1

7) A television signal (video and audio) is sampled, quantized and binary coded to obtain a PCM signal. If the samples are quantized to 1024 levels, determine the number of binary pulses required to encode each sample **1 point**

- 9
- 10
- 1024
- 2

No, the answer is incorrect.
Score: 0

Accepted Answers:
10

8) Consider signals $m_i(t), 1 \leq i \leq 5$ band-limited to $2i$ kHz each, time division multiplexed after sampling respectively at the Nyquist rate for each signal. The samples are then quantized using a μ -law quantizer with $L = 512$ levels and binary coded using PCM. What is the bit rate of the resulting digital information signal? **1 point**

- 540 Kbps
- 120 Kbps
- 280 Kbps
- 660 Kbps

No, the answer is incorrect.
Score: 0

Accepted Answers:
540 Kbps

9) Which of the following quantizers is based on the principle of companding **1 point**

- Lloyd-max Quantizer
- Delta Modulation
- μ -Law Quantizer
- Differential Pulse Coded Modulation (DPCM)

No, the answer is incorrect.
Score: 0

Accepted Answers:
 μ -Law Quantizer

10) In a radio receiver for the AM system, the mixer translates the carrier frequency f_c to a fixed IF using the local oscillator (LO) frequency that is larger than the corresponding broadcast frequency. It is known that for the broadcast frequency of 950 kHz, the local oscillator frequency is 1.6 MHz. What is the local oscillator frequency corresponding to a broadcast frequency of 1.2 MHz? **1 point**

- 1.6 MHz
- 1.85 MHz
- 250 kHz
- 2.8 MHz

No, the answer is incorrect.
Score: 0

Accepted Answers:
1.85 MHz