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NPTEL

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Courses » Principles of Digital Communications

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Unit 5 - Week 4

Course outline

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Week 2

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Week 4

- Lecture 18 : Vector Representation of a Random Process
- Lecture 19 : AWGN Vector Channel
- Lecture 20 : Basics of Signal Detection: ML,MAP Detectors
- Lecture 21 : ML,MAP Detectors for AWGN Channel
- Lecture 22 : Optimal Receiver : Matched Filter
- Lecture 23 : Probability of error for Optimal Receiver
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Assignment 4

The due date for submitting this assignment has passed. **Due on 2018-09-05, 23:59 IST.**
As per our records you have not submitted this assignment.

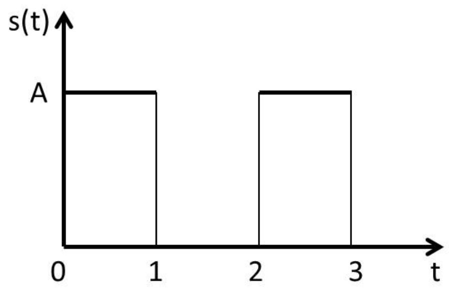
1) The signal $s(t)$ is input to a matched filter with impulse response $h(t) = s(T-t)$, where $s(t) = A/2, t \in [0, T/2]$, $s(t) = -A/2, t \in (T/2, T]$ and 0 other The peak value of the output is ***1 point***

- $A^2T/4$
- $A^2T/3$
- A^2T
- $A^2T/2$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$A^2T/4$

2) A communication system uses antipodal signals $s(t)$ and $-s(t)$ for respective transmission of equiprobable binary symbols. The received signal is $r(t) = \pm s(t) + n(t)$, where $s(t)$ is the signal shown below and $n(t)$ is additive zero-mean white Gaussian noise with power spectral density $N_o/2$ watts/hertz. What is the variance of the noise at the output of the matched filter with impulse response $h(t) = s(3-t)$, at $t = 3$? ***1 point***



Week 6
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Week 12

$2A^2N_o$

$4A^2N_o$

No, the answer is incorrect.
Score: 0

Accepted Answers:
A^2N_o

3) For the optimum receiver, the probability of symbol error for the communication system in question 2, as a function of A and N_o is *1 point*

$Q(\sqrt{A^2/N_o})$

$Q(\sqrt{2A^2/N_o})$

$Q(\sqrt{4A^2/N_o})$

$Q(\sqrt{A^2/2N_o})$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Q(\sqrt{4A^2/N_o})$

4) Two equiprobable symbols are transmitted using signals $s_1(t)$ and $s_2(t)$ given below, over a zero-mean AWGN channel with noise power spectral density $N_o/2$. The signal $s_1(t) = At/T, t \in [0, T]$ and 0 otherwise. $s_2(t) = A\left(1 - \frac{t}{T}\right), t \in [0, T],$ and 0 otherwise. The probability of symbol error for the optimum receiver in terms of A, T and N_o is *1 point*

$Q(\sqrt{A^2T/6N_o})$

$Q(\sqrt{A^2T/3N_o})$

$Q(\sqrt{A^2T/2N_o})$

$Q(\sqrt{A^2T/4N_o})$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$Q(\sqrt{A^2T/6N_o})$

5) The input to a signal detector is of the form $r = \pm A + n$. The amplitudes $+A$ and $-A$ are equiprobable. The noise variable n is distributed according to Laplacian pdf, $f(n) = \frac{\lambda}{2}\, e^{-\lambda|n|}$. The expression for signal to noise ratio (SNR) in this case is $A^2\lambda^2/2$. The required SNR to achieve an error probability of 10^{-5} for the optimum receiver, approximately (in dB) is *1 point*

9.6

11.6

- 17.6
- 13.6

No, the answer is incorrect.
Score: 0

Accepted Answers:
17.6

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