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Courses » Principles of Digital Communications

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Unit 11 - Week 10

Assignment 10

The due date for submitting this assignment has passed. Due on 2018-10-10, 23:59 IST.
As per our records you have not submitted this assignment.

1) A QPSK signal over AWGN channel uses one of the four equiprobable signals *1 point*
$s_i(t) = A\cos\left(2\pi f_c t + i\,\frac{\pi}{2}\right)$, where $i = 0, 1, 2, 3$ and f_c is the carrier frequency, and the duration of each signal is T. Assume input to the QPSK system is a random binary sequence in which symbols/bits 1 and 0 are equally likely, and the symbols/bits in different time slots are statistically independent and identically distributed. Assume channel noise with power spectral density $\frac{N_0}{2}$. With Gray encoding of the signals, the probability of bit error P_b is

- $P_b = Q\left(\sqrt{\frac{2A^2T}{N_0}}\right)$
- $P_b = Q\left(\sqrt{\frac{A^2T}{2N_0}}\right)$
- $P_b = 2Q\left(\sqrt{\frac{A^2T}{N_0}}\right)$
- $P_b = 2Q\left(\sqrt{\frac{A^2T}{2N_0}}\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P_b = Q\left(\sqrt{\frac{A^2T}{2N_0}}\right)$

2) If in Question 1, instead of QPSK, binary coherent FSK signals are used with *1 point*

Videos

Weekly Feedback

Quiz : Assignment 10

Assignment 10 - Solution

Week 11

Week 12

$T_1 = 2T$ and $B = \frac{A}{\sqrt{2}}$

$T_1 = \frac{T}{2}$ and $B = \frac{A}{\sqrt{2}}$

$T_1 = 2T$ and $B = \sqrt{2}A$

$T_1 = \frac{T}{2}$ and $B = \sqrt{2}A$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$T_1 = \frac{T}{2}$ and $B = \sqrt{2}A$

3) A QPSK signal over an AWGN channel uses one of the four equiprobable signals $s_i(t) = \begin{cases} \sqrt{\frac{2E}{T}} \cos\left[2\pi f_c t + (2i-1)\frac{\pi}{4}\right], & 0 \le t \le T \\ 0, & elsewhere \end{cases}$ where $i = 1,2,3,4$ ' power spectral density $S_i(f)$ of an offset QPSK signal produced by a random binary sequence in which symbols/bits 1 and 0 are equally likely, and the symbols/bits in different time slots are statistically independent and identically distributed, in terms of the bit energy E_b and bit duration T_b, is *1 point*

$S_i(f) = E_b\left[\mathrm{sinc}^2 2T_b(f-f_c) + \mathrm{sinc}^2 2T_b(f+f_c)\right]$

$S_i(f) = 4E_b\left[\mathrm{sinc}^2 2T_b(f-f_c) + \mathrm{sinc}^2 2T_b(f+f_c)\right]$

$S_i(f) = 2E_b\left[\mathrm{sinc}^2 2T_b(f-f_c) + \mathrm{sinc}^2 2T_b(f+f_c)\right]$

$S_i(f) = \frac{E_b}{2}\left[\mathrm{sinc}^2 2T_b(f-f_c) + \mathrm{sinc}^2 2T_b(f+f_c)\right]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$S_i(f) = E_b\left[\mathrm{sinc}^2 2T_b(f-f_c) + \mathrm{sinc}^2 2T_b(f+f_c)\right]$

4) A continuous-phase FSK signal is represented by $s(t) = \pm\sqrt{\frac{2E_b}{T_b}}\cos\left(\frac{\pi t}{2T_b}\right)\cos(2\pi f_c t) \pm \sqrt{\frac{2E_b}{T_b}}\sin\left(\frac{\pi t}{2T_b}\right)\sin(2\pi f_c t), 0 \le t \le 2T_b$. Envelop of the signal is given by *0.5 points*

$\sqrt{\frac{2E_b}{T_b}}\sin\left(\frac{\pi t}{2T_b}\right)$

$\sqrt{\frac{2E_b}{T_b}}\cos\left(\frac{\pi t}{2T_b}\right)$

$\sqrt{\frac{2E_b}{T_b}}$

$\frac{2E_b}{T_b}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\sqrt{\frac{2E_b}{T_b}}$

5) Assuming that both coherent BFSK and MSK have identical performance in terms of bit error probability, the additional amount of bit energy in dB needed for coherent BFSK compared to MSK is ___

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 3

0.5 points

6) A speech signal is sampled at a rate of 8 kHz, logarithmically compressed and encoded into a PCM format using 8 bits/sample. The PCM data is transmitted through an AWGN bandpass channel using M-level ASK (assume double sideband transmission) signaling scheme. The channel bandwidth in kHz required for transmission when M=16 is ____

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 16

1 point

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