Unit 10 - Week 9

Assignment 9

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

Due on 2018-10-03, 23:59 IST.

1) Consider the following set of quaternary signals defined in terms of orthogonal basis functions φ_1 and φ_2 : *1 point*

$s_1 = 0;\ s_2 = \sqrt{2}a\varphi_1 - \sqrt{2}a\varphi_2;\ s_3 = 2\sqrt{2}a\varphi_1;\ s_4 = \sqrt{2}a\varphi_1 + \sqrt{2}a\varphi_2$

Assuming that these signals are used for transmission of four equiprobable symbols over an AWGN channel with noise power spectral density $\frac{N}{2}$, the probability of symbol error is

$P_e = Q\left(\sqrt{\frac{a^2}{N}}\right) - Q^2\left(\sqrt{\frac{a^2}{N}}\right)$

$P_e = Q\left(\sqrt{\frac{2a^2}{N}}\right) - 2Q^2\left(\sqrt{\frac{2a^2}{N}}\right)$

$P_e = 2Q\left(\sqrt{\frac{2a^2}{N}}\right) - Q^2\left(\sqrt{\frac{2a^2}{N}}\right)$

$P_e = 2Q\left(\sqrt{\frac{a^2}{N}}\right) - Q^2\left(\sqrt{\frac{a^2}{N}}\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$P_e = 2Q\left(\sqrt{\frac{2a^2}{N}}\right) - Q^2\left(\sqrt{\frac{2a^2}{N}}\right)$

2) The signal component of a coherent PSK system is defined by $s(t) = A_c k \sin(2\pi f_c t) \pm A_c\sqrt{1-k^2}\cos(2\pi f_c t)$ where $0 \le t \le T_b$, and the plus sign corresponds to symbol 1 and the minus sign corresponds to symbol 0. The first term represents a carrier component included for the purpose of synchronizing the receiver to the transmitter. Then, in the presence of the additive white Gaussian noise of zero mean and power spectral density $\frac{N}{2}$ and transmission of equiprobable symbols, the average probability of bit error P_b is *1 point*

$P_b = \frac{1}{2}Q\left(\sqrt{\frac{2A_c^2T_b(1-k^2)}{N}}\right)$

$P_b = Q\left(\sqrt{\frac{A_c^2T_b(1-k^2)}{N}}\right)$

$P_b = \frac{1}{2}\, Q\left(\sqrt{\frac{A_c^2 T_b (1-k^2)}{N}}\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P_b = Q\left(\sqrt{\frac{A_c^2 T_b (1-k^2)}{N}}\right)$

3) In Question-2, if 10% of the transmitted signal power is allocated to the carrier component, then bit energy-to-noise power spectral density ratio, i.e., $\frac{E_b}{N}$ required to obtain $P_b = 10^{-4}$ is

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 7.50,7.90

1 point

4) Equiprobable binary data transmission over an AWGN channel with noise power spectral density $\frac{N}{2} = 10^{-12} W/Hz$ is achieved at a bit rate $R_b = 1Mbps$. If the average probability of bit error P_b is not to exceed 10^{-4} and there is a transmission loss of $40dB$, then the transmitted power in **watts** for coherent ASK is ....
Transmission loss is defined as:
$T_{loss}(in\ dB) = 10\log_{10}(Average\ Transmitted\ Power) - 10\log_{10}(Average\ Received\ P$

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.26,0.29

1 point

5) Equiprobable binary data is transmitted at the rate $R_b = 1Mbps$ over an AWGN channel with noise power spectral density $\frac{N}{2} = 10^{-10} W/Hz$. For the average probability of bit error P_b not to exceed 10^{-4} , the required average transmitted carrier power in **milliwatts** for a communication link that uses coherent BFSK is ...

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 2.60,2.90

1 point

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