Unit 14 - Week 12

Assignment 12

The due date for submitting this assignment has passed. **Due on 2020-04-22, 23:59 IST.**
As per our records you have not submitted this assignment.

1) The probability of symbol error (P_e using union bound estimate) for 64-ary orthogonal signaling scheme using non-coherent detection is *1 point*

- $P_e \leq 63 \exp\left(-\frac{6E_b}{N_0}\right)$
- $P_e \leq \frac{63}{4} \exp\left(-\frac{3E_b}{N_0}\right)$
- $P_e \leq 63 \exp\left(-\frac{3E_b}{N_0}\right)$
- $P_e \leq \frac{63}{2} \exp\left(-\frac{3E_b}{N_0}\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P_e \leq \frac{63}{2} \exp\left(-\frac{3E_b}{N_0}\right)$

2) The probability of bit error (P_b) using union bound estimate for 64-ary orthogonal signaling scheme using coherent detection is *1 point*

- $P_b \approx 32Q\left(\sqrt{\frac{6E_b}{N_0}}\right)$
- $P_b \approx \frac{63}{2}Q\left(\sqrt{\frac{6E_b}{N_0}}\right)$
- $P_b \approx 63Q\left(\sqrt{\frac{3E_b}{N_0}}\right)$
- $P_b \approx \frac{63}{2}Q\left(\sqrt{\frac{3E_b}{N_0}}\right)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$P_b \approx 32Q\left(\sqrt{\frac{6E_b}{N_0}}\right)$

3) The Rician pdf approximates to X pdf at small E_b/N_o and approximates to Y pdf at large E_b/N_o. X and Y are *1 point*

- Rayleigh and Gaussian respectively
- Gaussian and Rayleigh respectively
- Rayleigh and Rayleigh respectively
- Gaussian and Gaussian respectively

No, the answer is incorrect.
Score: 0

Accepted Answers:
Rayleigh and Gaussian respectively

4) Assuming coherent reception, the E_b/N_o required by 2-PPM and BPSK modulation schemes to achieve the probability of error of 10^{-8} in the presence of Rayleigh fading channel is *2 points*

- 74 dB and 74 dB respectively
- 77 dB and 77 dB respectively
- 77 dB and 74 dB respectively
- 74 dB and 77 dB respectively

No, the answer is incorrect.
Score: 0

Accepted Answers:
77 dB and 74 dB respectively

5) If $Z = \sqrt{X^2 + Y^2}$ where X and Y are Gaussian iid random variables, with a mean of 0 and 2 respectively and both with a variance of 1, then $f_Z(2)$ is *2 points*

- $0.0366 I_0(2)$
- $0.0366 I_0(4)$
- 0.0215
- 0.043

No, the answer is incorrect.
Score: 0

Accepted Answers:
$0.0366 I_0(4)$

6) Which of the following modulation schemes have been matched to the correct symbol error rate, given that they are using non-coherent receiver in an AWGN channel? *2 points*

- DPSK $\rightarrow \frac{1}{2}e^{\frac{-E_b}{2N_0}}$
- FSK $\rightarrow \frac{1}{2}e^{\frac{-E_b}{N_0}}$
- OOK $\rightarrow \frac{1}{2}e^{\frac{-E_b}{2N_0}}$
- Binary PPM $\rightarrow e^{\frac{-E_b}{N_0}}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
OOK $\rightarrow \frac{1}{2}e^{\frac{-E_b}{2N_0}}$

7) The probability of error for 16-ary orthogonal modulation scheme for $\frac{E_b}{N_o} = 10$ dB using exact method and union bound in a non-coherent system are *2 points*

- $1.54 \times 10^{-8}, 1.55 \times 10^{-8}$
- $1.54 \times 10^{-10}, 1.55 \times 10^{-10}$
- $1.54 \times 10^{-6}, 1.55 \times 10^{-6}$
- $1.54 \times 10^{-4}, 1.55 \times 10^{-4}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$1.54 \times 10^{-8}, 1.55 \times 10^{-8}$

8) The difference in E_b/N_o requirement to achieve the same probability of error for DQPSK and QPSK scheme is
(where P_e for DQPSK scheme is given by $\approx \exp\left(-\frac{E_b}{N_o}(2-\sqrt{2})\right)$ *2 points*

- −1.3 dB
- −2.3 dB
- −0.3 dB
- −3.3 dB

No, the answer is incorrect.
Score: 0

Accepted Answers:
−2.3 dB

9) For BPSK over an AWGN channel, the log-likelihood ratio is
(where log-likelihood ratio can be computed as $r = \ln\left(\frac{p(y/x=0)}{p(y/x=1)}\right)$ and $0 \rightarrow A, 1 \rightarrow -A$) *2 points*

- $\frac{2yA}{\sigma^2} + \frac{2}{\sigma^2}$
- $\frac{yA}{\sigma^2}$
- $\frac{4yA}{\sigma^2}$
- $\frac{2yA}{\sigma^2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\frac{2yA}{\sigma^2}$