



Cairo University - Faculty of Engineering
Computer Engineering Department



M-ARY AMPLITUDE SHIFT MODULATION

Subject: Digital Communication

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0.1 Part 1

Digital Communication

0.1.1 Problem 1

Figure 1 below showing the comparison between simulated BER and theoritical (analytical) BER VS the E_b/N_0 in db.

Please notice, you'll have to input the no. of bits you wish to be transmitted, and it has to be divisible by 3.

0.1.2 Problem 2

The constellation of the 8-ary with decision region pf each symbol.

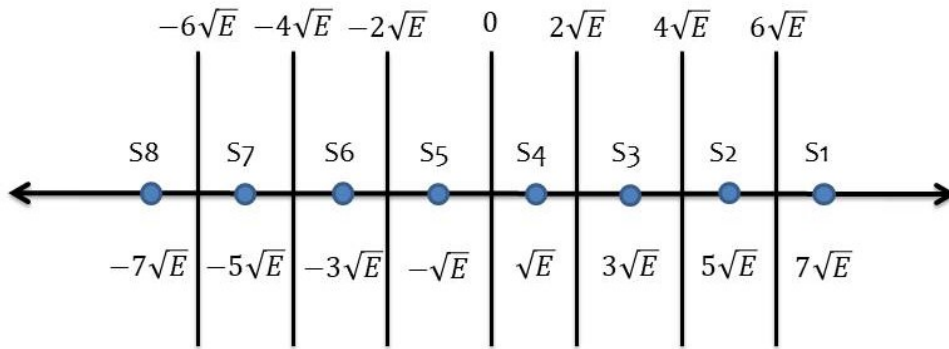


Figure 1: Symbols Boundary

0.1.3 Problem 3

The derivation of theoritical bit error rate.

$$Pe = \frac{1}{8} \sum_{i=0}^7 P(e|Si) \quad (1)$$

$$Pe(e|S0) = Pe(e|S7) \quad (2)$$

$$Pe(e|S1) = Pe(e|S2) = Pe(e|S3) = Pe(e|S4) = Pe(e|S5) = Pe(e|S6) \quad (3)$$

Using Union bound S0, S7 only one neighbour and S1, S2,...S6 has two neighbours.

$$Pe(e|S0) = \frac{1}{2} \text{erfc}\left(\frac{\sqrt{E}}{\sqrt{N}}\right) \quad (4)$$

$$Pe(e|S1) = \frac{1}{2}erfc(\frac{\sqrt{E}}{\sqrt{N}}) + \frac{1}{2}erfc(\frac{\sqrt{E}}{\sqrt{N}}) \quad (5)$$

$$Pe(e|S1) = erfc(\frac{\sqrt{E}}{\sqrt{N}}) \quad (6)$$

$$Pe = \frac{1}{8*3}(2*\frac{1}{2}erfc(\frac{\sqrt{E}}{\sqrt{N}}) + 6*erfc(\frac{\sqrt{E}}{\sqrt{N}})) \quad (7)$$

$$Pe = \frac{7}{24}(erfc(\frac{\sqrt{E}}{\sqrt{N}})) \quad (8)$$

0.1.4 Problem 4

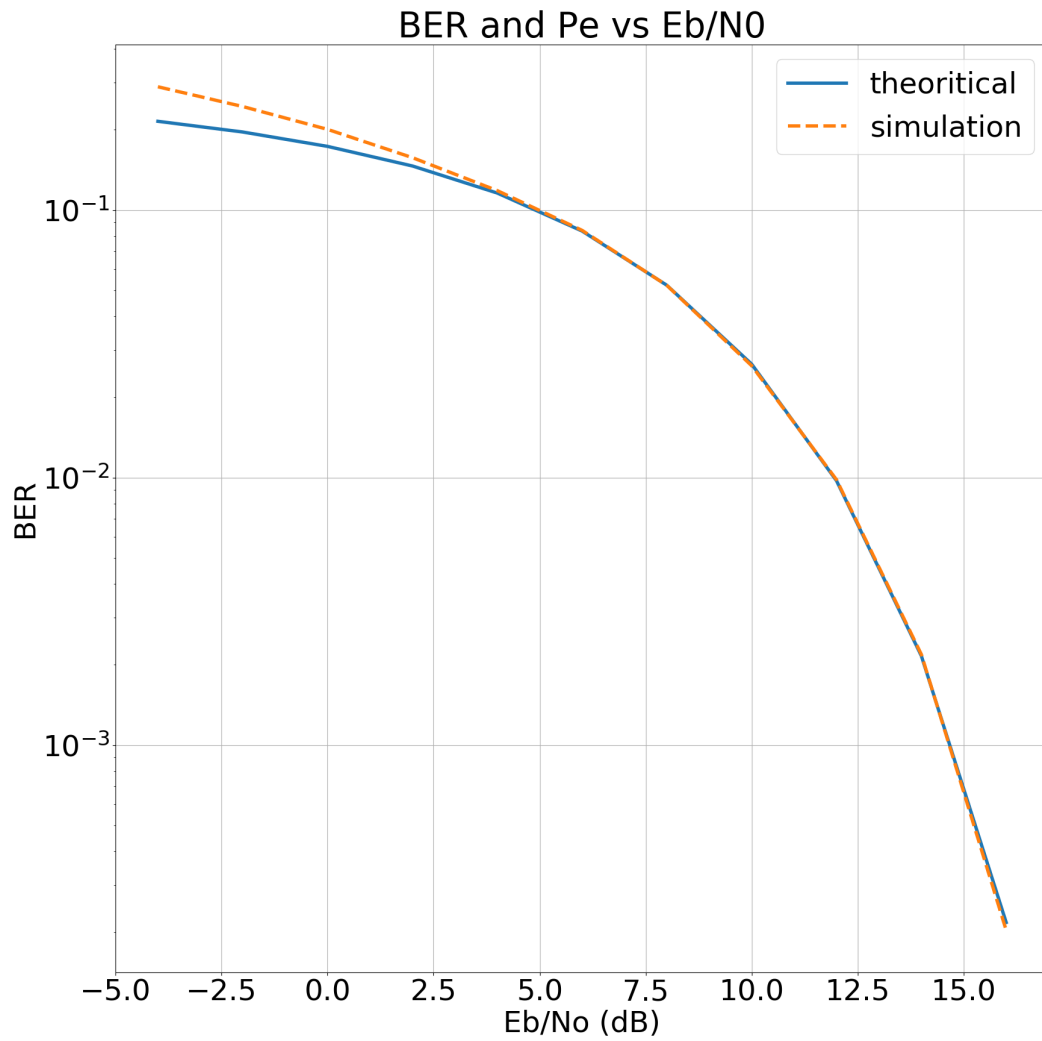


Figure 2: BER vs Eb/N0

0.2 Section 2

Hello World 2!

0.2.1 Subsection 2.1

Equations:

$$\frac{n!}{k!(n-k)!} = \binom{n}{k} \tag{9}$$

$$x^{\frac{1}{2}} \tag{10}$$

$$\frac{d}{dx}(kg(x)) \tag{11}$$

$$f(x) = x^2$$

0.3 Math

... This formula $f(x) = x^2$ is an example. ...

$$f(x) = x^2$$

$$g(x) = \frac{1}{x}$$

$$F(x) = \int_b^a \frac{1}{3}x^3$$

0.4 Figures



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(a) Meme.



(b) Same Meme.

Figure 3: The same meme, Two times.