CENG 3331 Intro to Telecommunication and networks- Homework 2

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Problem 1: $C = 2B\log_2(M)$

A. $C = 2B\log_2(M) \rightarrow \log_2(M) = 4 \rightarrow 9600 = 2(B)(4) \rightarrow B = 1200$ Hz

B. $C = 2B\log_2(M) \rightarrow \log_2(M) = 8 \rightarrow 9600 = 2(B)(8) \rightarrow B = 600$ Hz

Problem 2: $N_0 = kTB$ $\quad$ $SNR = 10\log_{10}(\frac{Power\ in\ W}{Noise\ in\ W})$ $\quad$ $C = B\log_2(1 + SNR)$

$K = 50^{o}C + 273 = 323$ kelvin

$N_0 = kTB = 1.38e\text{-}23 * 323 * 10000 = 4.4574e\text{-}17$ W

$SNR = 10\log_{10}(\frac{Power\ in\ W}{Noise\ in\ W}) = 10\log_{10}(\frac{1000}{4.4574e-17}) = 193.5092$ dBW

$C = B\log_2(1 + SNR) = 10000 * \log_2(1 + 193.5092) = 76036.9458$ bps

Problem 3:

Nyquist’s work on channel capacity placed an upper limit on the bit rate of a channel with bandwidth, assuming the channel is noise free. The result of this was: if you double the bandwidth then you double the data rate.

Shannon’s work on channel capacity placed an upper limit on the bit rate of a channel with bandwidth and the signal-to-noise ratio, which focused on the theoretical maximum channel capacity by assuming white noise and not accounting for impulse noise, attenuation distortion, or delay distortion. The result was the error-free capacity.

Problem 4: $C = B\log_2(1 + SNR)$ $\quad$ $C = 2B\log_2(M)$

A. $C = B\log_2(1 + SNR) = 1000000 * \log_2(1 + 63) = 1000000 * 6 = 6000000$ bps

B. $6000000 * \frac{2}{3} = 4000000$

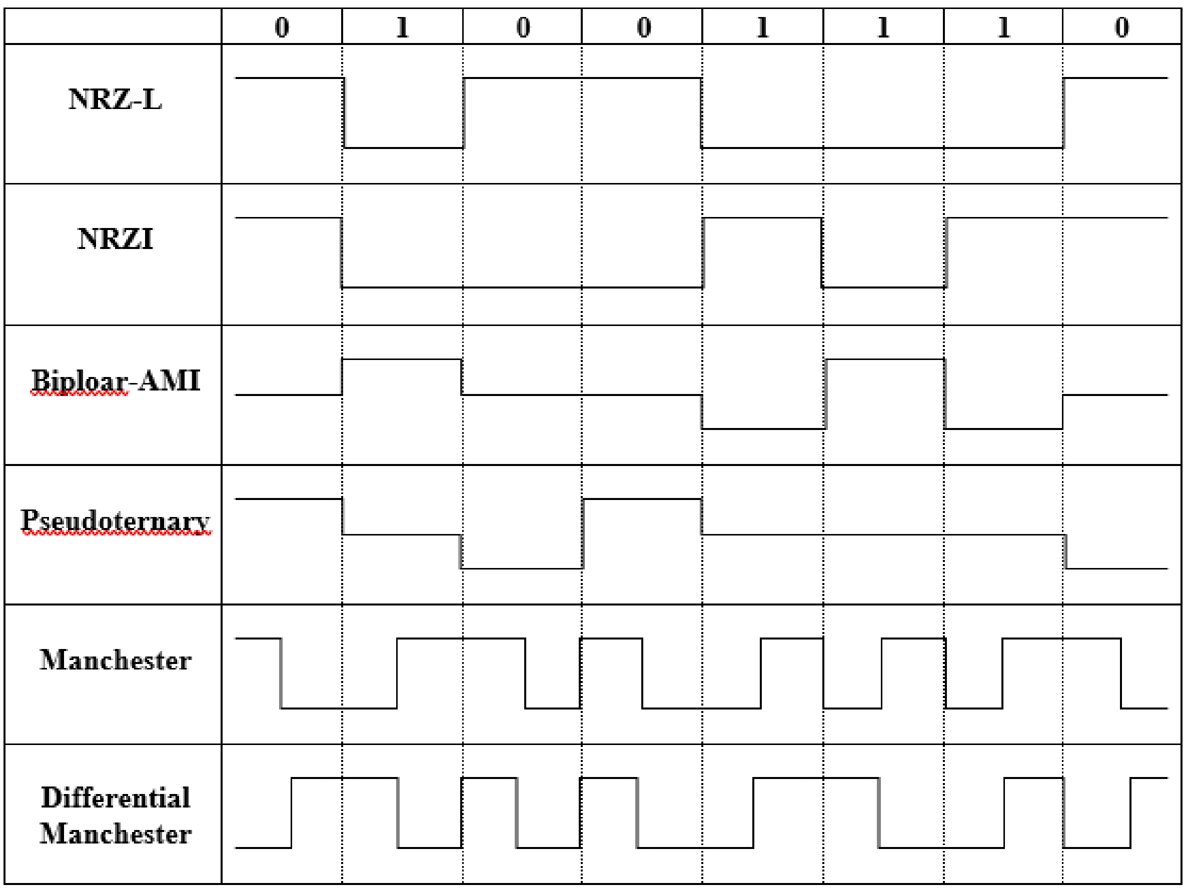
$C = 2B\log_2(M) \rightarrow 4000000 = 2 * 1000000 * \log_2(M) \rightarrow 2 = \log_2(M) \rightarrow M = 4$

Problem 5: $(\frac{Eb}{No})_{db}$ = S – 10log(R) + 228.6 – 10log(T)

$(\frac{Eb}{No})_{db}$ = -151 – 10log(2400) + 228.6 – 10log(1500) =

-151-151 – 33.802 + 228.6 – 31.761 = 12.037 bps/Hz

Problem 6:



Problem 7:

The data sequence is 0101011101001011001101.

Problem 8:

The position of the error is at 7 where the wave should be at the positive pulse, but it is at the negative pulse.

Problem 9:

Michael Lankford Just now

RE: Quantum communication COLLAPSE

1. What is quantum communication?

Quantum communication uses quantum bits and the laws of quantum physics to transmit information without the risk of the information being hacked and released.

2. How does quantum communication work?

Quantum communication uses quantum bits, which represent multiple combinations of 1 and 0 simultaneously, to securly transmit information. The multiple combinations of 1 and 0 make it impossible for a hacker to look at information and discern what it contains because quibits will "collapse" and show signs of the hackers activity.

3. Why quantum communication?

Quantum communication is the most secure way to protect data. Modern encryption standards are getting better, though still fall flat compared to quantum communication.

4. What are the applications in the future?

The biggest application for the future would be to have quantum communication over the entire internet and have all information and data to be ultra secure.

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