King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE418: Satellite Communications (121)
Quiz 5: Modulation
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Serial # 0

- 1 points for not writing your serial number

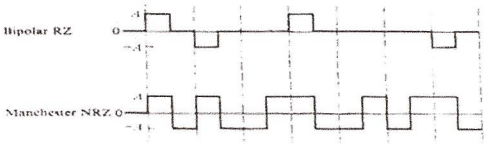
Name: KEY

1/1

1. Which one of the following is **not** a feature of digital communications?
   a. Robust ness
   b. Bandwidth efficiency
   c. Adaptiveness
   d. Compatibility
   e. Security

2/1

2. Compare the following line codes (Bipolar RZ with Manchester) from all different aspects.



① Bipolar has error detection capability.
Manchester = no = = = .

② Manchester is better in synchronization in case of long sequence of zeros.

Not easy to see: • Bandwidth difference } advantage for Manchester ?!
• power efficiency.

1/1

3. What does ISI stands for? And what causes ISI?

ISI: Intersymbol Interference. Bandwidth limitation causes ISI.

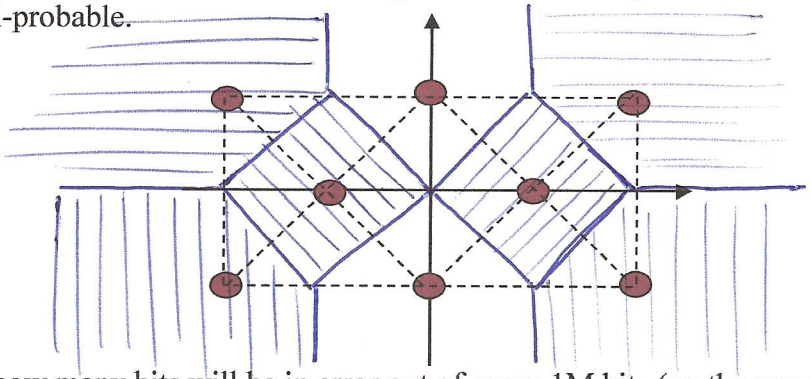
2/1

4. A satellite has a bit rate of 256 kbit/s and QPSK modulation with roll-off factor 0.2. Find the occupied bandwidth. $R_s = 128$ K symbol/sec.

$$B = R_s(1+\alpha) = 128K\,(1.2) = 153.6\ KHz$$

2/1

5. Sketch the decision boundaries for the following constellation diagram. Assume that all symbols are equi-probable.



2/1

6. Approximately, how many bits will be in error out of every 1M bits (on the average) if BPSK is used with $\frac{E_b}{N_0} = 10dB$. $= 10^{\frac{10}{10}} = 10$

$$BER \approx \frac{0.2821}{\sqrt{10}} e^{-10} = (0.0892)(e^{-10}) = 4.0497 \times 10^{-6}$$

$$\Rightarrow BER \cdot BitRate \approx \boxed{4.0497} \quad 4\ bits$$

$$BER = \frac{1}{2}\operatorname{erfc}\left(\sqrt{\frac{E_b}{N_o}}\right)$$

$$BER \approx \frac{0.2821}{\sqrt{\frac{E_b}{N_o}}} e^{-\frac{E_b}{N_o}}$$

Good Luck, **Dr. Ali Muqaibel**