

Indian Institute of Technology Bombay  
Department of Electrical Engineering

**Handout 9**  
Solutions to Quiz 3

EE 706 Communication Networks  
February 9, 2010

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1. Name any four issues which are handled at the physical layer. [2 points]

**Ans.**

- (a) Modulation
- (b) Demodulation
- (c) Timing Recovery
- (d) Carrier frequency synchronization
- (e) Carrier phase synchronization
- (f) Intersymbol interference

2. Match the issues on the left to the layers on the right. For example, write I1-L1 to connect first issue in the left list with first layer in the right list. [3 points]

**Issues**

- 1. Routing
- 2. Error-free communication between adjacent nodes
- 3. Demultiplexing of packets at receiver
- 4. Medium Access Control on Multiple Access Channels
- 5. Internetworking
- 6. Modulation and Demodulation

**Layers**

- 1. Transport Layer
- 2. Network Layer
- 3. Data Link Layer
- 4. Physical Layer

**Ans.**

**Issues**

- 1. Routing
- 2. Error-free communication between adjacent nodes
- 3. Demultiplexing of packets at receiver
- 4. Medium Access Control on Multiple Access Channels
- 5. Internetworking
- 6. Modulation and Demodulation

**Layers**

- Layer 2
- Layer 3
- Layer 1
- Layer 3
- Layer 2
- Layer 4

3. Draw the unipolar NRZ, polar NRZ and NRZI waveforms corresponding to the bit string 1001101. State any assumptions you made. [5 points]

**Ans.**

The key assumption is in the NRZI scheme where we have to assume the polarity of the signal before the first 1 in 1001101. In the figure, we have shown the case where the signal level is low before the first 1.

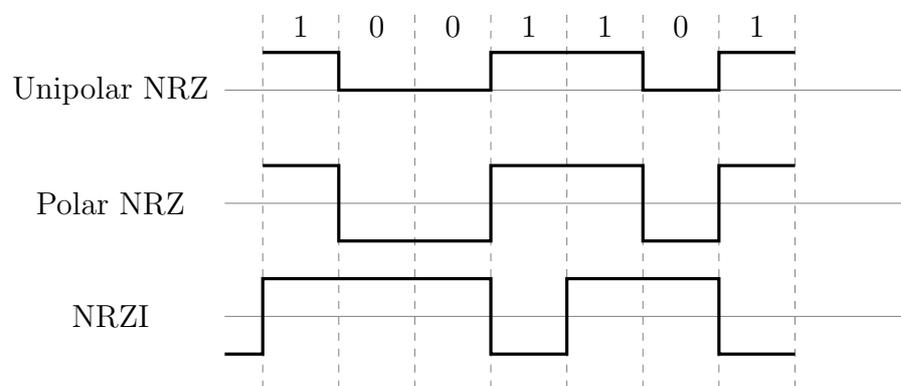


Figure 1