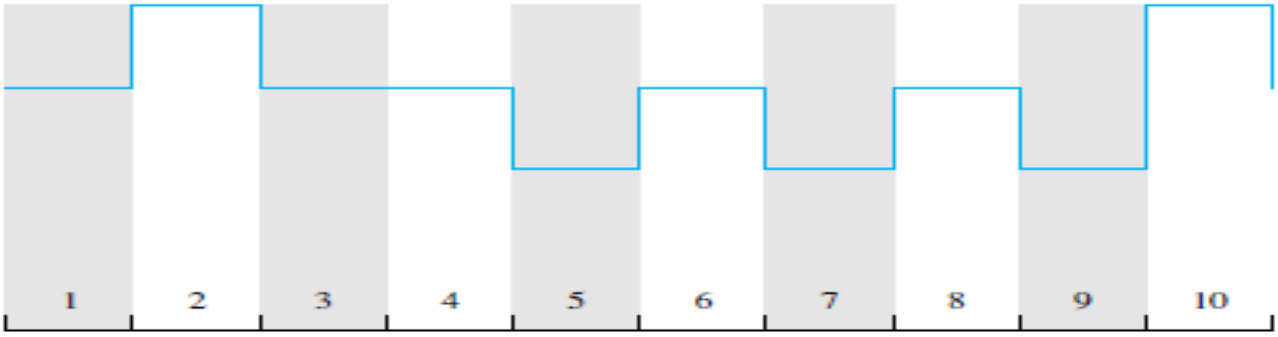
Department of ICT, MIT, Manipal
Principles of Data Communication [ICT 2156]
Tutorial 3

1. The waveform of Figure belongs to a Manchester encoded binary data stream. Determine the beginning and end of bit periods (i.e., extract clock information) and give the data sequence.

2. The bipolar-AMI waveform representing the binary sequence 0100101011 is transmitted over a noisy channel. The received waveform is shown in Figure 5.26; it contains a single error. Locate the position of this error and explain your answer.



3. One positive side effect of bipolar encoding is that a bipolar violation (two consecutive + pulses or two consecutive - pulses separated by any number of zeros) indicates to the receiver that an error has occurred in transmission. Unfortunately, upon the receipt of such a violation, the receiver does not know which bit is in error (only that an error has occurred). For the received bipolar sequence + - 0 + - 0 - + which has one bipolar violation, construct two scenarios (each of which involves a different transmitted bit stream with one transmitted bit being converted via an error) that will produce this same received bit pattern.

4. Assume that a telephone line channel is equalized to allow bandpass data transmission over a frequency range of 600 to 3000 Hz. The available bandwidth is 2400 Hz. For r=1, evaluate the required bandwidth for 2400 bps QPSK and 4800-bps, eight level multilevel signaling. Is the bandwidth adequate?

5. Find the baud rate and bandwidth for a signal transmitting at 12 Mbps, The value of r = 0. (for QPSK). Assume L = 2.

6. What is the bandwidth efficiency for FSK, ASK, PSK, and QPSK for a bit error rate of 10^{-7} on a channel with an SNR of 12 dB? Assume $(E_b/ N_0)_{db}$ =14.2dB for FSK and ASK and $(E_b/ N_0)_{db}$ =11.2dB for PSK.