

Assignment 4 Solutions

1. The period of a ML PRBS is $2^k - 1$ bits where k is the number of bits in the linear-feedback shift register generator. At a data rate 1.544 Mb/s the bit period is $1/1.544 \times 10^6$. One day is $24 \times 60 \times 60$ seconds long. Thus for the period of the PRBS to be longer than one day:

$$\frac{2^k - 1}{1.544 \times 10^6} > 24 \times 60 \times 60$$

or

$$k > \log_2 (24 \times 60 \times 60 \times 1.544 \times 10^6 + 1) = 36.9$$

so $k = 37$.

2. Start and stop bits not required on a synchronous interface because the clock signal provides the timing information that allows the receiver to sample the data signal at the correct time.

A receiver using a synchronous interface could detect the start of each frame using a bit-oriented framing protocol such as HDLC that uses flag sequences to mark the start and end of frame.

The characters within the frame are transmitted one after the other so the receiver can separate them simply by counting bits.

3. The IEEE publishes the 802.3af specification. ITU-T publishes the V.21 modem specification.
4.
 - The 802.3 destination address is the first 6 bytes of the frame (00 1d 7e 2f b5 9b). The source address is the second 6 bytes of the frame (08 00 27 88 fd 91).
 - The OUIs are the first three bytes of each address (08 00 27 for the source and 00 1d 7e for the destination).
 - The value of the length/type field is the next two bytes, 0x0800 (2048).

- This field is a type value since it is larger than 1500 (for some standards, larger than 1536).
- The MSDU is the payload of the Ethernet frame and follows the type/length field. The first byte is 45.
- The CRC adds 4 bytes to the 75 bytes shown above for a total of 79 bytes. The length of the preamble depends on the specific PHY layer used (100BaseT, WiFi, etc) and is not included here.