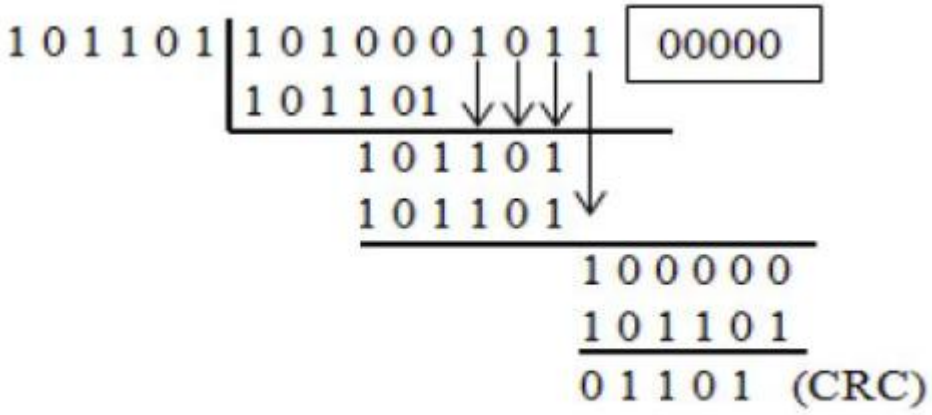
1. Consider the following message M=1010001011. The cyclic redundancy check(CRC) for this message using the divisor polynomial $x^5 + x^3 + x^2 + 1$ is:

(A) 01110 (B) 01011
(C) 10110 **(D) 01101**

Solution: Option (D)
Explanation:

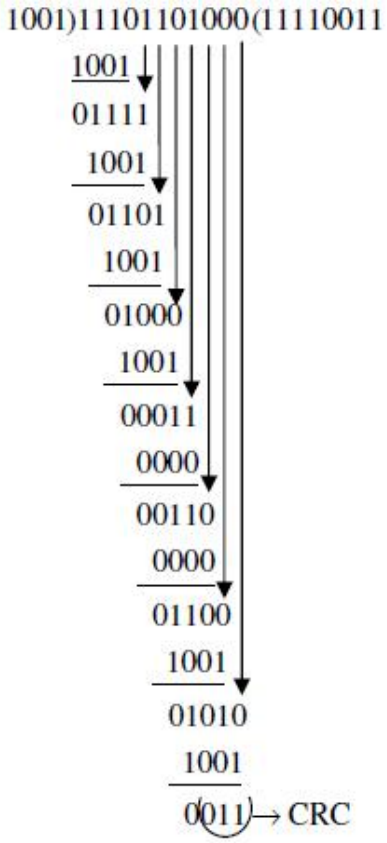
Given message M = 1010001011
Divisor $x^5 + x^3 + x^2 + 1$ = 101101
Perform exclusive OR or MOD 2 division
Diagram



2. Given a message "11101101" to be transmitted using CRC polynomial $x^3 + 1$. In order to protect it from errors, it will be transmitted as _____.

A. 11101101000 B. 11101110011
C. 11101101011 D. 11101101111

Answer: Option C
Explanation:



∴ The transmitted message is

Data + CRC

3. A sender uses Selective Repeat ARQ with a window size of 8 frames. Then the sequence number after sending 198 frames is

A. 0 **B. 6** C. 8 D. 15

Answer: Option B
Explanation:

Given window size is 8 frames.
Therefore, the number of bits used for the frame sequence is x = 4. Since 4 bits are used for frame sequencing, we can represent 0…15, i.e., [0, 1, 2,…, 15, 0, 1, 2,…, 15….].
After 192 frames, the sequence number is 0, so after 198, it will be 6.

4. Consider a 5 Kbps channel, which is error-free to send 5 Byte data frames in one direction, a short ACK coming back in the other direction, which is negligible, given propagation delay is 40 ms and throughput is 1 Kbps, the window size is

A. 2 B. 3 C. 4 D. 5

Answer: Option B
Explanation:

Bandwidth = 5Kbps and length of the frame is 5bytes.
Transmission delay = $5*8/(5*10^3) = 8ms$
Given propagation delay = 40ms
Throughput = 1Kbps

$$\text{Throughput} \leq \frac{\text{Window size}}{\text{Round trip time}}$$

$$1\text{Kbps} \leq \frac{\text{window size}}{8\text{ms} + 2 * 40\text{ms}}$$

$$\text{Window Size} \geq 88\text{bits} = 11\text{bytes}$$

Given that data, frames are of size 5bytes. So the window size is 3.

5. Consider a CSMA/CD network running at 1Gbps over 1Km without repeaters. Given signal speed is the minimum frame size is

A. 1000 bytes B. 1200 bytes **C. 1250 bytes** D. 1400 Bytes

Answer: Option C
Explanation:

Tt = 2*Tp

$$\frac{L}{B} = 2 \times \frac{d}{v}$$

Where L is the frame size, B is bandwidth, d is distance and v is speed

$$L = 2 \times \frac{d \times B}{v} = \frac{2 \times 10^3 \times 10^9}{2 \times 10^8} = 1000\text{bits} = 1250\text{ bytes}$$

6. Consider a network connecting two systems located 8000 kilometres apart. The bandwidth of the network is 500×10^8 bits per second. The propagation speed of the media is 4×10^6 meters per second. It is necessary to design a Go-Back-N sliding window protocol for this network. The average packet size is 10^7 bits. The network is to be used to its full capacity. Assume that processing delays at nodes are negligible. Then, the minimum size in bits of the sequence number field has to be _____.

A. 2 B. 4 **C. 8** D. 16

Solution: Option (c)
Explanation:

Given the distance between the two systems = 8000 km
Propagations speed of the network = 4×10^6 bits per second
Propagation delay Tp = D / V => $T=\frac{8000\times1000}{4\times10^6}=2$ seconds

Total round trip propagation time = 4 seconds

Transmission time for one packet Tt = (packet size)/(Bandwidth) = $\frac{10^7}{500\times10^6}=0.02$ seconds

Total number of packets that can be transferred before an acknowledgement comes back = $\frac{4}{0.02}=200$
The maximum possible window size is 200.
In the Go-back-n sliding window protocol, the maximum sequence number should be one more than the window size. So, a total of 201 sequence numbers are required, which can be represented by using 8 bits.

7. The minimum frame size required for a CSMA/CD base computer network running at 1Gbps on 200 m cable with a link speed of $2x10^8$ m/s is

(a) 125 bytes **(b) 250 bytes** (c) 500 bytes (d) none of these

Solution: Options (b)
Explanation:

Substitute the value Tt = 2Tp

8. A 3000 km long channel is used to transmit 64-byte frames using a protocol. If the propagation speed is 6 μsec/km and the bandwidth of the channel is 1.7Mbps, how many bits should the sequence numbers be to operate efficiently?

A. 5 B. 6 **C. 7** D. 8

Answer: Option C

Explanation:

To operate efficiently, the sequence space (actually, the send window size) must be large enough to allow the transmitter to keep transmitting until the first acknowledgement has been received.
Tp = 3000 km * 6 μsec/km =18 ms.
Tt = 0.3 msec
Therefore, the first frame fully arrives 18.3 msec after its transmission was started.
The acknowledgement takes another 18 msec to get back. (ignore transmission time for ack as it is not given)
Total time = 36.3 msec.
The transmitter must have enough window space to keep going for 36.3 msec. A frame takes 0.3 ms, so it takes 121 frames to fill the pipe. Seven-bit sequence numbers are needed.

9. Consider a machine M1 that wants to send a huge file to machine M2 over a TCP connection. Suppose the sequence number for a segment in this connection is S, then, the subsequent segment's sequence number will necessarily be S + 1.

A. False
B. Depends on implementation
C. True
D. None

Answer: A

Explanation:

If the sequence number of the segment is S and its size is Z, Then the next sequence number will be S+Z. So, the subsequent segments can be S+1 or more depending on the size of the segment we have sent.

10. Consider an ethernet of the distance between 2 peers is 500 meters. Is it possible to increase the length of this ethernet to multiple segments if a repeater is added at the end of each segment to connect to another segment?

A. Can't say
B. No
C. Yes, only if the repeater can have sufficient signal strength.
D. Yes

Answer: Option B
Explanation:

The answer is no. Although such an arrangement does guarantee sufficient signal strength, each repeater and segment along the path increases delay. The Ethernet CSMA/CD scheme is designed for low delay. If the delay becomes manageable, the scheme succeeds. In fact, repeaters are a part of the current Ethernet standard, which specifies that the network will not operate correctly if more than four repeaters separate any pair of stations.