# COMPUTER NETWORK

# SOLUTIONS

**1.** At which layer, the trailer usually contains bits used for error detection?

(a) Network
(b) Session
(c) Transport
(d) Data Link

**Solution:** Option (d)

**2.** How many IP addresses does the network 192.68.72.0/20 contain?

(a) $2^{20}$
(b) $2^{20}$-2
(c) $2^{12}$
(d) $2^{12}$-2

**Solution:** Option (c)

**Explanation:**

Number of IP addresses in the network is $2^{32-n}$

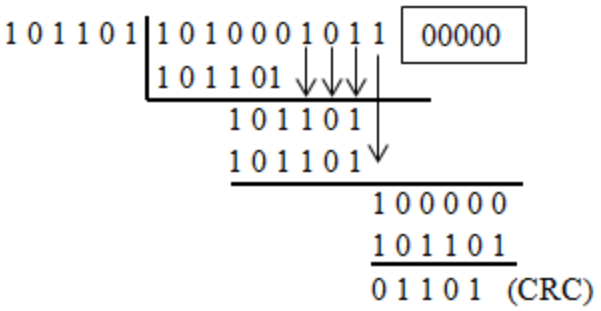
**3.** Consider the following message M=1010001011. The cyclic redundancy check(CRC) for this message using the divisor polynomial $x^5 + x^3 + x^2 + 1$ is:

(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




**4.** What could be the network mask if direct broadcast address of a network is 168.17.07.255?

(a) 255.255.248.0
(b) 255.255.252.0
(c) 255.255.254.0
(d) 255.255.255.0
(e) All the above

**Solution:** Option (e)

**5.** A broadcast channel has 10 nodes and total capacity of 16Mbps. It uses polling for medium access. Once a node finishes transmission, there is a polling delay of 100 μseconds to poll the next node. Whenever a node is polled, it is allowed to transmit a maximum of 1500 Bytes. The maximum throughput of broadcast channel is:

(a) 8 Mbps
(b) 14 Mbps
(c) 100/11Mbps
(d) 750/85 Mbps

**Solution:** Option (b)

**Explanation:**

B = 16 Mbps
$T_{poll}$ = 100μsec
L = 1500 bytes = 12000 bits

$T_{trans} = \frac{L}{B} = \frac{12000bits}{16\times10^6 b/sec} = \frac{3}{4}\times 10^{-3}sec = 0.75 = 750\mu sec$

Cycle time = $T_{trans}$ + $T_{poll}$ = 750 + 100 = 850 μsec

Utilization = $\frac{750}{850} = 0.8823$

Throughput = 0.8823 × 16 Mbps = 14.1176 Mbps

**6.** Which of the following uses UDP as the transport layer protocol?

(a) HTTP
(b) Telnet
(c) SMTP
(d) DNS

**Solution:** Option (d)

**Explanation:**

Protocols like HTTP, FTP, Telnet, SMTP, HTTPS, etc uses TCP at transport layer.
Protocols like DNS, RIP, SNMP, RTP, BOOTP, TFTP, NIP etc uses UDP at transport layer.

**7.** In Ethernet, when Manchester Encoding is used, the bit rate is

(a) Half the Baud Rate
(b) Twice the Baud Rate
(c) Same as Baud Rate
(d) None of the above

**Solution:** Option (a)

**8.** Station A needs to send a message consisting of 15 packets to station 'B' using a sling window (window size 4) and go-back-N error control strategy. All packets are ready and immediately available for transmission. If every $6^{th}$ packet that 'A' transmits gets lost (but no Acks from 'B' ever gets lost), then what is the number of packets that 'A' will transmit for sending the message to 'B' ?

(a) 29
(b) 33
(c) 27
(d) 25

**Solution:** Option (b)

**9.** A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for few control. The send and receive window size are four(4) packets each. Data packets (sent only from A to B) are all 1500 Bytes long and the transmission time for such a packet is 60 µseconds. Acknowledgement packets are very small(sent from B to A) and require very negligible time. The propagation delay over the link is 170 µseconds. What is the maximum achievable throughput in the communication?

(a) 3.75 x $10^6$ Bps
(b) 7.5 x $10^6$ Bps
(c) 15 x $10^6$ Bps
(d) 12.75 x $10^6$ Bps

**Solution:** Option (c)

**Explanation:**

Transmission rate = $\frac{1500 \text{ bytes}}{60 \text{ μsec}} = 200 \times 10 + 5 = 200\text{Mbps}$

Efficiency = $\frac{4 \times 60}{60+340} = 0.6$

Max achievable throughput = 0.6 × 200 Mbps = 120 Mbps = 15 Mbytes per sec.

**10.** Suppose a CSMA/CD network is operating at 1 Gbps, and suppose there are no repeaters and the length of cable is 1Km. Determine the minimum frame size is the signal propagation speed is 200 Km/ms.

**Solution:** 10000 bits

**Explanation:**

1 msec → 200 km
1 sec → ?

$$V = \frac{200 \text{ km}}{1 \text{ msec}} = 200 \times 10^3 \text{km/sec}$$

$$T_x = 2T_p$$

$$\frac{L}{B} = 2 \cdot \frac{d}{v} \Rightarrow L = \frac{2 \times 1\text{km} \times 1 \times 10^9 \text{bps}}{100 \times 10^3 \text{kmps}} = 10^4 \text{bits}$$

L = 10000 bits

**11.** Station 'A' uses 64 Byte packets to transmit messages to station 'B' using a sling window protocol. The round trip delay between A and B is 80 milliseconds and the bottleneck bandwidth on the path between 'A' and 'B' is 128 Kbps. What is the sender window size for maximum efficiency?

**Solution:** 21

**Explanation:**

$$T_x = \frac{L}{B} = \frac{64 \text{ bytes}}{128 \text{ Kbitsps}} = \frac{64 * 8b}{128 * \text{Kbps}} = 2 * 10^{-3}\text{sec} = 4 \text{ msec}$$

Round trip delay = 80 msec
$2T_p$ = 80 msec
$T_p$ = 40 msec

Optimal window size = $\frac{(T_x+2T_p)}{T_x} = \frac{4+80}{4} = 210$

**12.** In a sliding window ARQ scheme, the transmitter's window size is 'N' and the receiver's window size is 'M'. The minimum number of sequence numbers (distinct) required to ensure correct operation of the ARQ scheme is:

(a) Min(M, N)
(b) max(M,N)
(c) M+N
(d) M*N

**Solution:** Option (c)

**13.** A 25 Kbps satellite link has a propagation delay of 400 ms. The transmitter employs "Selective Repeat" scheme with N set to 8. Assume each frame is 100 Bytes long, what is maximum bandwidth utilization? (where N is window size)
(a) 5Kbps
(b) 7.7Kbps
(c) 15 Kbps
(d) 10 Kbps

**Solution:** Option (b)

**Explanation:**

Tx=100*8 bits/25Kbps=32 ms
Tp = 400ms, a=Tp/Tx = 400/32 = 12.5
Efficiency of GBN = W/(1+2a), where w= window size = 8
= 8/(1+25) = 8/26
BW utilization or throughput or max data rate = efficiency * BW
= (8/26) * 25 = 7.69Kbps

**14.** A channel has a bit rate of 4Kbps and one –way propagation delay of 20ms. The channel uses stop-&-wait protocol. The transmission time of acknowledgement frame is negligible. To get a channel efficiency of at least 75%, the minimum frame size should be:

(a) 480 Bytes
(b) 480 bits
(c) 160 Bytes
(d) 160 bits

**Solution:** Option (b)

**Explanation:**

Efficiency of Stop & Wait protocol = $\frac{1}{1+2a}$

$$0.75 = \frac{1}{1+2a}$$

$$\frac{3}{4} = \frac{1}{1+2a}$$

$3(1 + 2a) = 4$

$6a = 1$

$a = 1/6$

$$\frac{T_p}{T_x} = \frac{1}{6}$$

$$T_x = 6T_p$$

$$\frac{L}{B} = 6T_p \Rightarrow L = 6 \times B \times T_p = 6 \times 4\text{Kbps} \times 20\text{ms} = 480\text{bits}$$

**15.** Which of the following is an application layer service?

(a) Remote login
(b) File transfer and access
(c) Mail Service
(d) All of above

**Solution:** Option (d)

**Explanation:**

Remote login – Telnet,
mail service – SMTP,
File transfer and access – FTP are application layer protocols

**16.** In TDM medium access control bus LAN, each station is assigned one time slot per cycle for transmission. Assume that the length of each time slot is time to transmit 100 bits plus end-to-end propagation delay. Let propagation speed is $2 * 10^8$ m/sec. Length of LAN is 1Km with a

bandwidth of 10 Mbps. Maximum number of stations that can be allowed in a LAN, so that the throughput of each station can be 2/3 Mbps is

(a) 3
(b) 5
(c) 10
(d) 20

**Solution:** Option (c)

**Explanation:**

Propagation delay = $\frac{1\text{ km}}{2\times10^8\text{m/sec}} = 5\mu\text{sec}$

$$T_x = \frac{L}{B} = \frac{1000\text{bits}}{10\times10^6\text{bits/sec}} = 10^{-5}\text{sec} = 10\mu\text{sec}$$

Let there are N stations

Length of cycle = N*(10+5) = 15Nμsec

In whole cycle, each user transmits only for 10μsec

∴ Efficiency = $\frac{10}{15N}$

Throughput = Efficiency * Bandwidth

$$\frac{2}{3}\text{Mbps} = \frac{10}{15N} * 10\text{Mbps}$$

N = 10

**17.** Assertion[A] and Reason[R]
(A) Data link protocols always put CRC in a trailer rather than in a header.
(R) CRC is computed during transmission and appended to the output stream as soon as the last bit goes out.

(a) Both (A) and (R) are true and (R) is the correct reason for (A)
(b) Both (A) and (R) are true but (R) is not the correct reason for (A)
(c) Both are false
(d) (A) is true but (R) is false

**Solution:** Option (a)

**18.** In Go-Back-N protocol, if the maximum window size is 127, what is the range of the sequence number?

(a) 0 to 127
(b) 0 to 128
(c) 1 to 127
(d) 1 to 128

**Solution:** Option (a)