Computer Networks (CS30006)

Practice Questions

Q 1. A telephone line normally has a bandwidth of 3000 Hz (300 to 3300 Hz) assigned for data communication. The SNR is usually 3162. What will be the capacity for this channel?

Q. 2 The SNR is often given in decibels. Assume that SNR(dB) is 36 and the channel bandwidth is 2 MHz. Calculate the theoretical channel capacity.

Q 3. A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is x^3+1.

1. What is the actual bit string transmitted?
2. Suppose the third bit from the left is inverted during transmission. How will receiver detect this error?

Q 4. A and B are the only two stations on Ethernet. Each has a steady queue of frames to send. Both A and B attempts to transmit a frame, collide and A wins first back off race. At the end of this successful transmission by A, both A and B attempt to transmit and collide. What is the probability that A wins the second back off race?

Q 5. Suppose nodes A and B are on same 10 Mbps Ethernet segment and the propagation delay between two nodes is 225 bit times. Suppose A and B send frames at t=0, the frames collide then at what time, they finish transmitting a jam signal. Assume a 48 bit jam signal.

Q 6. Suppose nodes A and B are attached to opposite ends of the cable with propagation delay of 12.5 ms. Both nodes attempt to transmit at t=0. Frames collide and after first collision, A draws k=0 and B draws k=1 in the exponential back off protocol. Ignore the jam signal. At what time (in seconds), is A's packet completely delivered at B if bandwidth of the link is 10 Mbps and packet size is 1000 bits.

Q 7. If the packet size is 1 KB and propagation time is 15 msec, the channel capacity is 10^9 b/sec, then find the transmission time and utilization of sender in stop and wait protocol.

Q 8. Host A is sending data to host B over a full duplex link. A and B are using the sliding window protocol for flow control. The send and receive window sizes are 5 packets each. Data packets (sent only from A to B) are all 1000 bytes long and the transmission time for such a packet is 50 μs. Acknowledgement packets (sent only from B to A) are very small and require negligible transmission time. The propagation delay over the link is 200 μs. What is the maximum achievable throughput in this communication?

Q 9. Consider a token ring topology with N stations (numbered 1 to N) running token ring protocol where the stations are equally spaced. When a station gets the token it is allowed to send one frame of fixed size. Ring latency is t_p, while the transmission time of a frame is t_t. All other latencies can be neglected. What is the maximum utilization of the token ring when t_t = 36 ms, t_p = 30 ms, N = 15.

Q 10. A 2 km long broadcast LAN has 10^7 bps bandwidth and uses CSMA / CD. The signal travels along the wire at 2 x 10^8 m/sec. What is the minimum packet size that can be used on this network?

Q 11. On a wireless link, the probability of packet error is 0.2. A stop and wait protocol is used to transfer data across the link. The channel condition is assumed to be independent from transmission to transmission. What is the average number of transmission attempts required to transfer 100 packets?

Q 12. Consider 1 Mbps error free line. The maximum frame size is 1000 bits. New packets are generated about 1 sec apart. The time out interval is 10 msec. If the ack timer is eliminated. How many times the average message be transmitted?

Q. 13. A token ring LAN network interconnects M stations using Star Topology in the following way. All the input and output lines of the token ring station interface are connected to a cabinet where the actual ring is placed. Suppose that distance from each station to a cabinet is 100 m and ring latency per station is 8 bits, packets are 1250 B and bandwidth is 25 Mbps.

1. Find the ring latency normalized to packet transmission time.
2. Find the minimum number of packets transmitted by stations, if stations are allowed to transmit an unlimited number of packet / token. (v = 2 x 10^8 m/sec)

Q 14. Consider a 10 Mbps Ethernet LAN that has stations attached to a 2.5 km long coaxial cable. Given that the transmission speed is 2.3 x 10^8 m/sec, the packet size is 128 bytes out of which 30 bytes are overhead, find the effective transmission rate and maximum rate at which the network can send data.

Q 15. Suppose 5 machines are trying to transmit using p-persistent CSMA with p = 0.02. If they all sense the medium to be free at the same time, what is the probability that one of them will be able to transmit with no collision?

Q 16. We have 14 sources, each creating 500 8-bit characters per second. Since only some of these sources are active at any moment, we use statistical TDM to combine these sources using character interleaving. Each frame carries 6 slots at a time, but we need to add four-bit addresses to each slot. Answer the following questions:

a. What is the advantage of using statistical TDM over synchronous TDM

b. What is the size of an output frame in bits?
c. What is the output frame rate?
d. What is the duration of an output frame?
e. What is the output data rate?

Q. 17. Assume that a voice channel occupies a bandwidth of 7 Hz. We need to multiplex 20 voice channels with guard bands of 1000 Hz using FDM. Calculate the required bandwidth.

Q. 18. 7 data sources, 2 with a bit rate of 200 kbps, and 3 with a bit rate of 400 kbps are to be combined using TDM. The sources are bit-multiplexed (1 slot in a frame = 1 bit), with 1 control/synchronizing bit per frame. What is the duration of the frame?

Q 19. A group of N stations shares a 56-kbps pure ALOHA channel. Each station outputs a 1000-bit frame on an average of once every 100 sec, even if the previous one has not yet been sent (e.g., the stations can buffer outgoing frames). What is the maximum value of N?

Q 20. A switch designed for use with fast Ethernet has a backplane that can move 10 Gbps. How many frames/sec can it handle in the worst case? Hint: the worst case is an endless stream of 64-byte frames.