MANIPAL INSTITUTE OF TECHNOLOGY

(Constituent Institute of Manipal University)

MANIPAL-576104

FIFTH SEMESTER B.E. DEGREE END SEMESTER . EXAMINATION – DEC 2009

SUBJECT: COMPUTER COMMUNICATION AND NETWORKING

(CSE 309)

EVALUATION SCHEME

1(A)

- The OSI and TCP/IP reference models have much in common.
- Both are based on the concept of a stack of independent protocols.
- Also, the functionality of the layers is roughly similar.
- For example, in both models the layers up through and including the transport layer are there to provide an end-to-end, network-independent transport service to processes wishing to communicate.
- the protocols in the OSI model are better hidden than in the TCP/IP model and can be replaced relatively easily as the technology changes.
- Being able to make such changes is one of the main purposes of having layered protocols in the first place. (1 marks)
- The OSI reference model was devised before the corresponding protocols were invented.
- This ordering means that the model was not biased toward one particular set of protocols, a fact that made it quite general.
- The downside of this ordering is that the designers did not have much experience with the subject and did not have a good idea of which functionality to put in which layer.
- With TCP/IP the reverse was true: the protocols came first, and the model was really just a description of the existing protocols. (2 marks)
- There was no problem with the protocols fitting the model.
- They fit perfectly.
- The only trouble was that the model did not fit any other protocol stacks.
- Consequently, it was not especially useful for describing other, non-TCP/IP networks.
- Another difference is in the area of connectionless versus connection-oriented communication.
- The OSI model supports both connectionless and connection-oriented communication in the network layer
- But only connection-oriented communication in the transport layer, where it counts (because the transport service is visible to the users).
- The TCP/IP model has only one mode in the network layer (connectionless)
- But supports both modes in the transport layer, giving the users a choice.
- This choice is especially important for simple request-response protocols

(2 marks)

1(B) LASER is used as source and photodiode is used as detector in case of single mode of fiber. (2 marks)

1(C) **Category 3**. UTP cables and associated connecting hardware whose transmission characteristics are specified up to 16 MHz.
Category 4. UTP cables and associated connecting hardware whose transmission characteristics are specified up to 20 MHz.
Category 5. UTP cables and associated connecting hardware whose transmission characteristics are specified up to 100 MHz. (1.5 marks)

Unshielded vs Shielded TP

- unshielded Twisted Pair (UTP)
  - ordinary telephone wire
  - cheapest
  - easiest to install
  - suffers from external EM interference
- shielded Twisted Pair (STP)
  - metal braid or sheathing that reduces interference
  - more expensive
  - harder to handle (thick, heavy)
- in a variety of categories - see EIA-568

(1.5 marks)

2(A) Manchester -----(1 marks)
Differential Manchester----------(1 marks)

2(B) for calculation of SNR formula
To be used is
$C= \log_2(1+SNR)$
(2 marks)

Then use
$SNR_{db}=10 \log_{10}(SNR)$
(1 marks)

2(C) Finding out the value of I(t) and Q(t)---------- (3 marks)

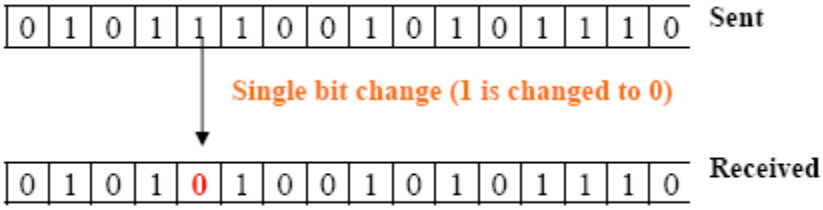
Diagram----(2 marks)

3(A)
Circuit Diagram
(including calculation of n, P and k and no. shift registers)---- 3 marks
Calculation at sender side----------
R= 11010
T= 1110001111010 (2 marks)
Calculation at receiver side----------
R= 0000 (2 marks)

3(B) errors can be divided into two types: Single-bit error and Burst error.

Single-bit Error

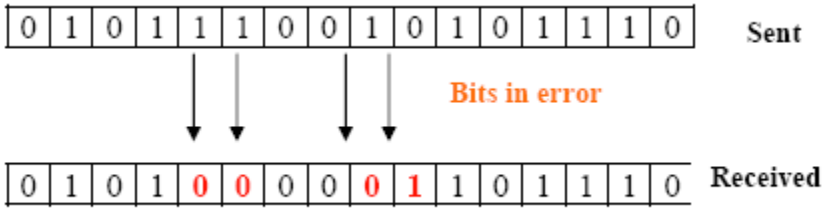
The term single-bit error means that only one bit of given data unit (such as a byte, character, or data unit) is changed from 1 to 0 or from 0 to 1 Single bit errors are least likely type of errors in serial data transmission



(1.5marks)

Burst Error

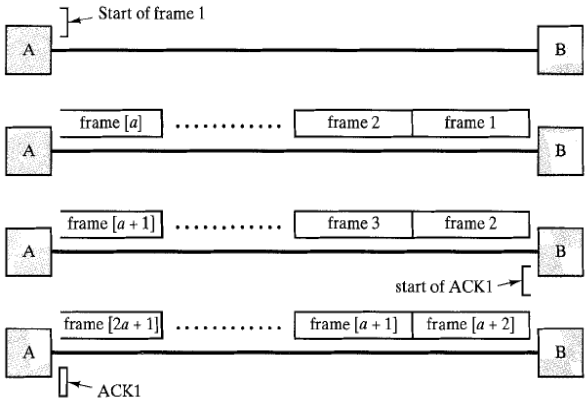
The term burst error means that two or more bits in the data unit have changed from 0 to 1 or vice-versa. Note that burst error doesn't necessary means that error occurs in consecutive bits. The length of the burst error is measured from the first corrupted bit to the last corrupted bit. Some bits in between may not be corrupted.



(1.5marks)

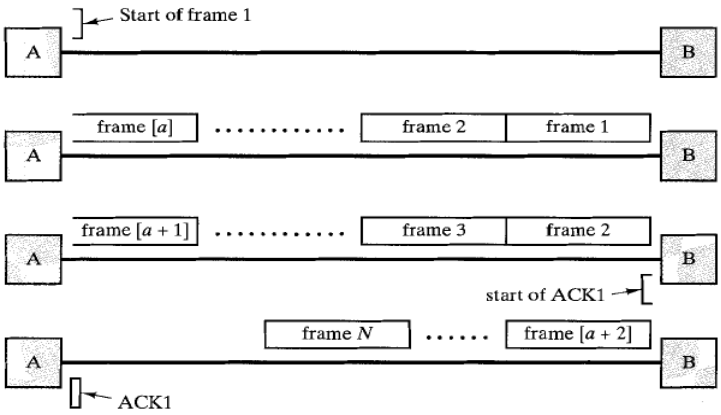
4(A)

- For sliding-window flow control, the efficiency of the line depends on both the window size, W, and the value of a.
- For convenience, let us again normalize frame transmission time to a value of 1; thus, the propagation time is a.
- The figure illustrates the efficiency of a full duplex point-to-point line.



- Station A begins to emit a sequence of frames at time t_0 or t=0
- The leading edge of the first frame reaches station B at t_0 +a or at a.

- The first frame is entirely absorbed by t_0 +a + 1 or by a+1.
- Assuming negligible processing time, B can immediately acknowledge the first frame (ACK1).
- Let us also assume that the acknowledgment frame is so small that transmission time is negligible.
- Then the ACK reaches A at t_0 + 2a + 1 or at 2a+1. (2.5 marks)
- To evaluate performance, we need to consider two cases:
- **Case 1 : W ≥ 2a + 1 :** The acknowledgment for frame 1 reaches A before A has exhausted its window. Thus, A can transmit continuously with no pause, and utilization is 1.0.
- **Case 2 : W < 2a + 1 :** 1. A exhausts its window at t=W and cannot send additional frames until t=2a + 1. Thus, line utilization is W time units out of a period of (2a + 1) time units.



- The line utilization for case **W ≥2a+1**
- **U = 1**
- The line utilization for case **W<2a+1**
- **U =(W/(2a+1))**

(2.5 marks)

4(B)

Ans: It dynamically allocates the time slots on demand to separate input channels, thus saving the channel capacity. As with Synchronous TDM, statistical multiplexers also have many I/O lines with a buffer associated to each of them. During the input, the multiplexer scans the input buffers, collecting data until the frame is filled and send the frame. At the receiving end, the demultiplexer receives the frame and distributes the data to the appropriate buffers.

In case of statistical TDM, the data in each slot must have an address part, which identifies the source of data.

(3 marks)

4(C)

Ans: In FDM, a number of signals are sent simultaneously on the same medium by allocating separate frequency band or channel to each signal. Guard bands are used to avoid interference between two successive channels.

(2 marks)

5(A) (i)

- \Switched Ethernet gives dedicated 10 Mb/s bandwidth on each of its ports.
- On each of the ports one can connect either a thick/thin segment or a computer.
- In Ethernet (IEEE 802.3) the topology, though physically is star but logically is BUS, i.e. the collision domain of all the nodes in a LAN is common.
- In this situation only one station can send the frame.
- If more than one station sends the frame, there is a collision.
- In Switched Ethernet, the collision domain is separated.
- The hub is replaced by a switch, which functions as a fast bridge.
- It can recognize the destination address of the received frame and can forward the frame to the port to which the destination station is connected.
- The other ports are not involved in the transmission process.
- The switch can receive another frame from another station at the same time and can route this frame to its own final destination.
- In this case, both the physical and logical topologies are star.
- There are two possible forwarding techniques that can be used in the implementation of Ethernet switches: store-and-forward and cut-through. (2 marks)

(ii)

Name	Cable	Max. segment	Advantages
100Base-T4	Twisted pair	100 m	Uses category 3 UTP
100Base-TX	Twisted pair	100 m	Full duplex at 100 Mbps
100Base-FX	Fiber optics	2000 m	Full duplex at 100 Mbps; long runs

` (2 marks)

(iii) **C**onsider a situation where B is transmitting to A, and C sense the medium and detects the ongoing transmission between B and A. C falsely conclude that it cannot transmit to D, when the fact is that such transmission would cause on problem. A transmission could cause a problem only when the destination is in zone between B and C. This problem is referred as ***Exposed station Problem.*** In this scenario as B is exposed to C, that's why C cannot transmit to D. So this problem is known as *Exposed station problem* (i.e. problem caused due to exposing of a station).

The problem here is that before transmission, a station really wants to know that whether or not there is any activity around the receiver. CSMA merely tells whether or not there is any activity around the station sensing the carrier. (2 marks)

5(B) With pure ALOHA the usable bandwidth is 0.184 *56 kbps = 10.3 kbps.

Each station requires 10 bps,

so N =10300/10 =1030 stations. (4 marks)

6(A)

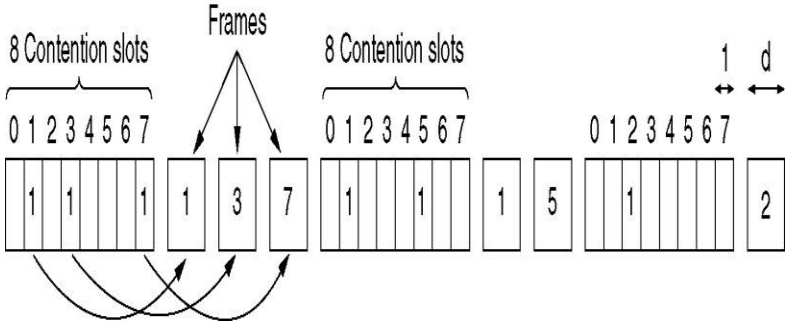
Issue	Datagram subnet	Virtual-circuit subnet
Circuit setup	Not needed	Required
Addressing	Each packet contains the full source and destination address	Each packet contains a short VC number
State information	Routers do not hold state information about connections	Each VC requires router table space per connection
Routing	Each packet is routed independently	Route chosen when VC is set up; all packets follow it
Effect of router failures	None, except for packets lost during the crash	All VCs that passed through the failed router are terminated
Quality of service	Difficult	Easy if enough resources can be allocated in advance for each VC
Congestion control	Difficult	Easy if enough resources can be allocated in advance for each VC

(2 marks)

6(B) The minimum Ethernet frame is 64 bytes, including both addresses in the Ethernet frame header, the type/length field, and the checksum. Since the header fields occupy 18 bytes and the packet is 60 bytes, the total frame size is 78 bytes, which exceeds the 64-byte minimum. Therefore, no padding is used. (4 marks)

6(C) **Bit-Map protocol**

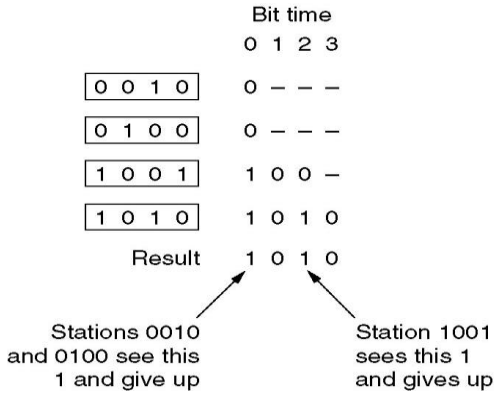
- The basic bit-map method, each contention period consists of exactly N slots.
- If station 0 has a frame to send, it transmits a 1 bit during the 0th slot.
- No other station is allowed to transmit during this slot.
- Regardless of what station 0 does, station 1 gets the opportunity to transmit a 1 during slot 1, but only if it has a frame queued.
- In general, station j may announce that it has a frame to send by inserting a 1 bit into slot j.
- After all N slots have passed by, each station has complete knowledge of which stations wish to transmit.
- At that point, they begin transmitting in numerical order



(2 marks)

Binary Countdown

- A problem with the basic bit-map protocol is that the overhead is 1 bit per station, so it does not scale well to networks with thousands of stations.
- We can do better than that by using binary station addresses.
- A station wanting to use the channel now broadcasts its address as a binary bit string, starting with the high-order bit
- All addresses are assumed to be the same length.
- The bits in each address position from different stations are BOOLEAN ORed together. We will call this protocol binary countdown



(2 marks)