{Assignment :- 01}

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Subject - DCN (Data Computer Network)

1.) Define Network & Bandwidth.

Ans A Network consists of two or more computers that are linked in order to share resources, such as exchange files, or allow electronic communication.

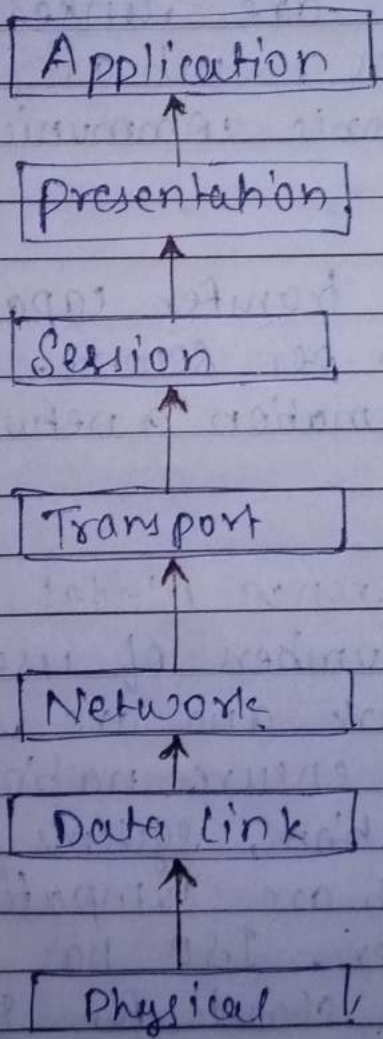
Bandwidth
It is the data transfer capacity of a computer network in bits per second. It measures of how much information a network can transfer.

2.) Draw OSI reference Model & Explain.

Ans There are 'n' number of users who use computer network and are located over the world. So to ensure national and woldwide data communication, systems must be developed which are compatible to communicate with each other. ISO has developed a Standard. ISO stands for International organisation of Standaridization. This is called a model for open system intercomection (OSI) and is commonly known as OSI model.

It has seven layer in OSI model. :-

(i) Application Layer [7]
(ii) Presentation Layer [6]
(iii) Session Layer [5]
(iv) Transport Layer [4]
(v) Network Layer [3]
(vi) Data Link Layer [2]
(vii) Physical Layer [1]



3.) What is Framing ? Explain character count method of framing.

Ans

Framing is a node to node connection b/w two computers or devices consists of a wire in which data is transmitted as a stream of bits.
This method is rarely used and is generally required to count total number of character that are present in frame. This is be done by using field in header character count method ensures data link layer at the receiver or destination about total number of character that follow, and about where the frame ends.

4.) Explain CRC error-detection method with example.

Ans

In CRC, a sequence of redundant bits, called cyclic redundancy check bits, are appended to the end of data unit so that the resulting data unit becomes exactly divisible by a second, predetermined binary number. At the destination, the incoming data unit is divided by the same number. If at this step there is no remainder, the data units is assumed to be correct and is therefore accepted.

Example - data - 1010000

$x^3 + 1 = 1x^3 + 0x^2 + 0x^1 + 1x^0$

CRC generator = 1001

```
1001 | 1010000.000
       1001
       -----
       001100
         1001
         ----
         01010        <- Sender
          1001
          ----
          001100
            1001
            ----
            01010
             1001
             ----
             0011
```

Message to be transmitted

```
  1010000000
+        011
  ----------
  1010000011
```

```
1001 | 10100000 11
       1001
       -----
       001100
         1001
         ----
         01010
          1001
          ----
          001101
           1001
           ----
           0100
```

Reciever ⇒

```
01001
1001
----
0000
```

↑ Accepted

5.) Explain Checksum and ~~Simple~~ Parity check - error - detection method with example.

Ans

Parity Check - Error Detection

1.) Simple Parity Check :

Blocks of data from the source are subjected to a check bit or parity bit generator form, where a parity of :-

* 1 is added to the block if it contains odd number of 1's and
* 0 is added if it contains even number of 1's

Example :-

Sender

100011 => [100011][1] => even parity check

10010 => [10010][0] => odd parity check.

2.) Two - Dimensional Parity Check

Parity check bits are calculated for each row, which equivalent to a simple parity check bit. Parity check are also calculated for all columns, then both are sent along with the data. At the receiving and these are compound with the parity bits calculated on the received data.

10011001	11100010	00100100	10000100

Checksum :
For error detection by checksum, data is divided into fixed sized frames or segments.

* Sender's End - the sender adds the segments using 1's complement arithmetic to get the sum. It then complement the sum to get the checksum and sends it along with the data frames.

* Recieve's End - the receiver adds the incoming segments along with the checksum using 1's complement arithmetic to get the sum and then complements it. If the results is zero, the received frames are accepted, Otherwise they are discarded.

6) Explain error control with its 3 techniques with an example.

Ans Error control in the data link layer is a process of detecting and retransmitting the data which has been lost or corrupted during the transmission of data.
These are the 3 techniques :—

(i) Stop-and-wait ARQ
A timeout counter is maintained by the sender, which is started when a frame is sent. If the sender receives acknowledgement of the sent frame, within time, the sender is confirmed about successful delivery of the frame.

It then transmits the next frame in queue. If the sender doesn't recieve the acknowledgement within time, the sender assumes that either the frame or its acknowledgment is lost in transit. It then retransmits the frame.
If the sender recieves a negative acknowledgment, the sender retransmits the frame.

(ii) Go-Back-N ARQ
The sender sends multiple frames based upon the sending-window size, without receiving the acknowledgment of the previous ones.
* The Reciever receive frames one by one. It keeps track of incoming frames sequence numbers and sends the corresponding acknowledgment frames.
* After the sender has sent all the frames in window, it checks up to what sequence no. it has recieved positive acknowledgment for all the frames it sends next set of frames
* If sender recieves NACK or has not recieve any ACK for a particular frame, it retransmits all the frames after which it does not recieve any +ve acknowledgment.

(iii) Selective Repeat ARQ
Both the sender and the reciever have buffers called sending window and receiving window respectively.

* The senders sends multiple frames based upon the sending window size, without receiving the acknowledgment of the previous ones.
* The reciever also receives multiple frames within the receiving window size. The receiver keeps track of incoming frames sequence number, buffers the frames in memory. It send acknowledgment for all succesfully recieved frames and sends Negetive acknowledgment for only frames which are missing.
* The sender in this case, sends only packet for which negetive acknowledgment is recieved.

7.) Explain Sliding window protocol with an example.

Ans The Sliding window is an technique for sending multiple frames at a time. It controls the data packets b/w the two devices where reliable and gradual delivery of data frames is needed. It is also used in TCP, In this technique, each frame has sent from the sequence number. The sequence numbers are also ~~called~~ used to find the missing data in the receiver end. The purpose of the Sliding window technique is to avoid duplicate data, so it uses the sequence number.