28/7/21

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BCS (2CSE202)

Date
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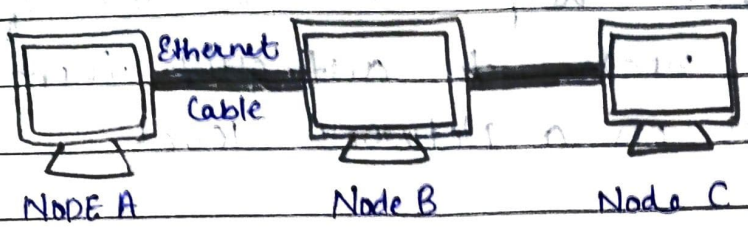
Ans 1



let physical address of Node A = 20
Node B = 30
Node C = 40

Physical Layer :-

- The main purpose of physical layer is that it transmits raw bit stream over the physical medium.
- For example, here, 3 nodes are connected in bus topology. Node A with physical address 20 needs to send packet to Node C with physical address 40.
- At this layer, it contains the information to be sent and the physical address of sender and receiver.

Logical address :-

- As there are 3 nodes connected in bus topology, we will need to give them IP address.

- IP address helps to give identifications to the nodes, to distinguish them from each other on a Network level.

Eg:- let IP for network is 192.168.0.0 and subnet mask = 255.255.255.0

∴ IP for foll. are,
Node A = 192.168.0.1
Node B = 192.168.0.2
Node C = 192.168.0.3

Port Address :-

- Port addresses are now necessary as computers simultaneously work on a number of processes.
- Therefore, a specific port address is required for a specific process.

Eg:- let us consider that at Node C, there are 3 instances running, for our process to get completed successfully, we need to get port address. So that the packet get transfered at right destination.

⇒ This is how the packet is transmitted from node A to Node C.

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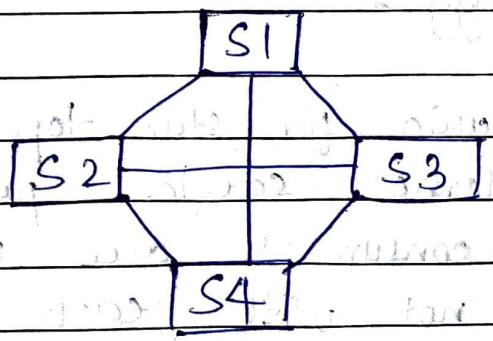
Ans 2 There are mainly 5 types of topology. They are - Ring Topology
- Bus Topology
- Star Topology
- Mesh Topology
- Hybrid Topology

Here we are going to discuss three topologies that are :-

(i) Mesh Topology :-

- The most significant eg: of Mesh topology is regional telephone office.
- We find mesh topology as best soln for telephone office, as in Mesh topology each node is connected by every node in network with dedicated link.
- It is most robust topology.
- Fault Identification is easy in Mesh.
- Mesh has fast data transfer.



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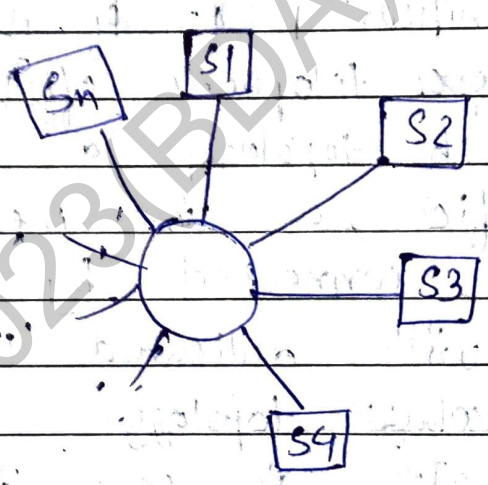
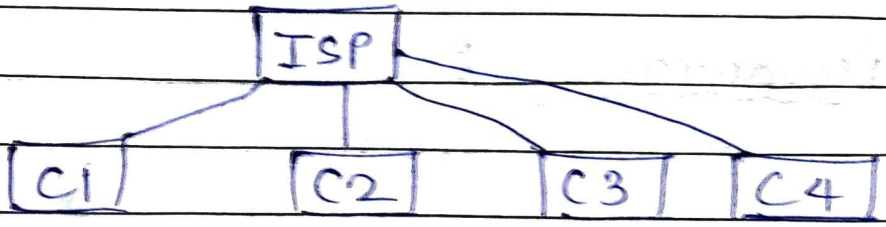
(ii) Ring Topology :-

- Ring topology was used in trains / railway systems.
- In the system, the information is sent through device-to-device until it is reached to the destination.
- At each node, a token is created if the process is followed throughout.
- Ring topology is still actively used in some railway systems.



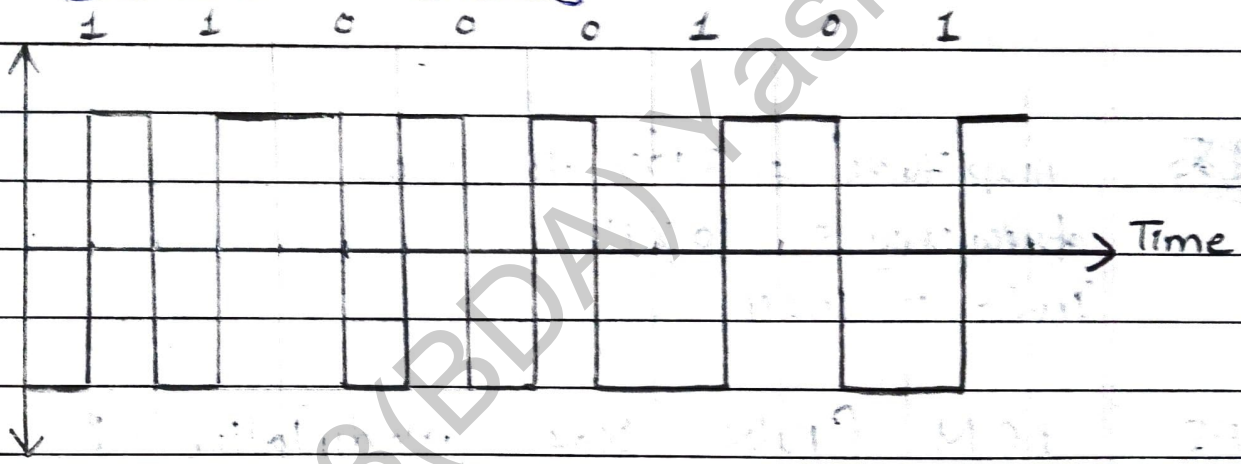
(iii) Star Topology :-

- The best scenario for star topology is ISP, i.e Internet service providers.
- As all the consumers are connected to ISP but not with each other
- They are connected to a central device we can call it hub.

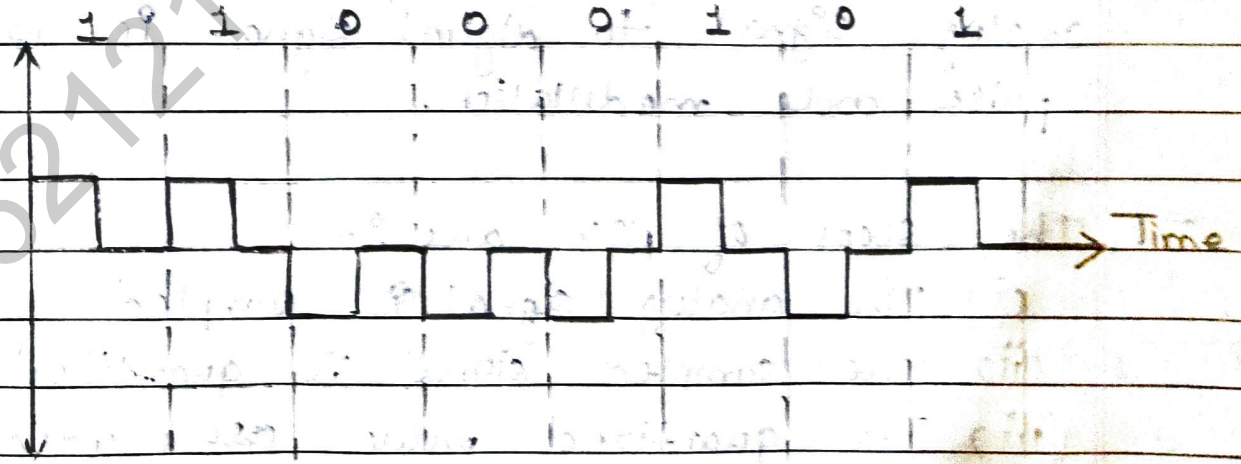


Ans 3 Data :- 11000101 (given)

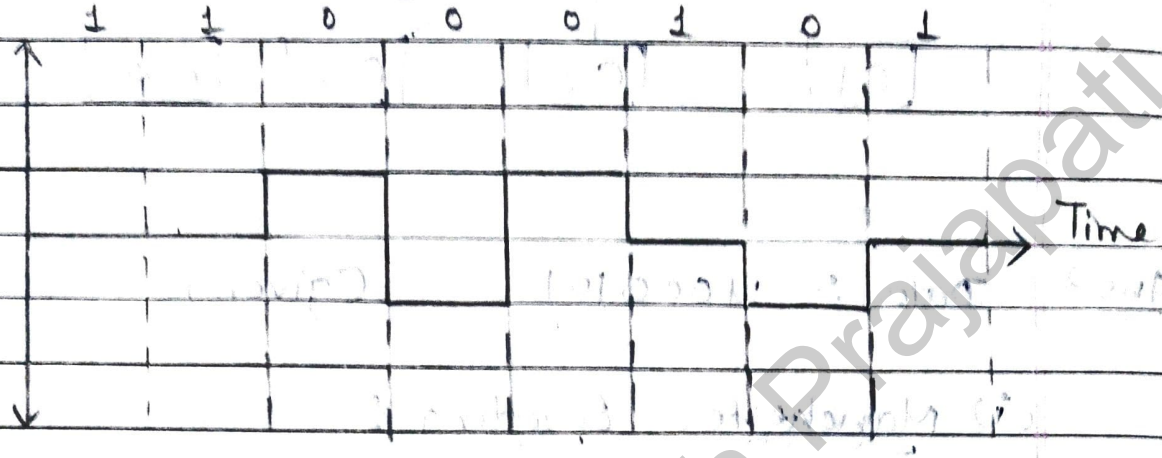
(i) Manchester Encoding :-



(ii) Polar - RZ :-



(iii) Pseudoternary :-



Amplitude = 10V to -10V
frequency = 10 kHz
levels = 1024

A5 PCM (Pulse Code Modulation) :-

- The most common technique to change an analog signal to digital signal is called pulse code modulation.

- The steps of PCM are :-
  (i) The analog signal is sampled
  (ii) The sampled signal is quantized
  (iii) The quantized values are encoded as streams of bits.

(i) Sampling :-

The first step in modulation is sampling.

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the analog signal is sampled every T_s sec where T_s is sample interval or period.

- Sampling is also called pulse amplitude modulation (PAM)

(ii) Quantization :-

- After sampling, the sampled signal is quantized as the sampled signal has max and min. amplitude values.

- The range is divided in L zones, each of height Δ, where

$$\Delta = \frac{V_{max} - V_{min}}{L}$$

(iii) Encoding :-

- The last step is encoding, After quantization the quantized values are encoded.

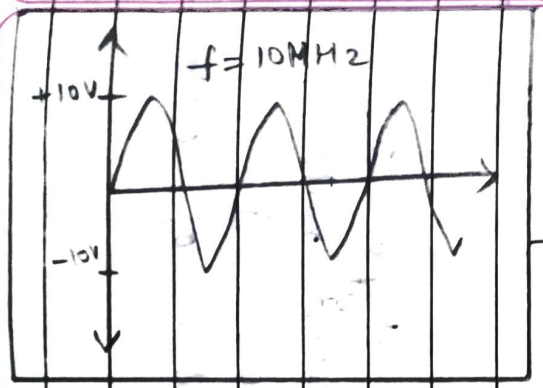
- The bitrate can be calculated by,

Bitrate = sampling rate × no. of bps

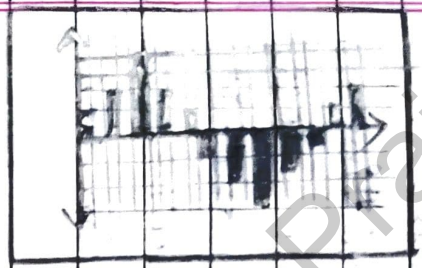
$= f_s \times n_b$

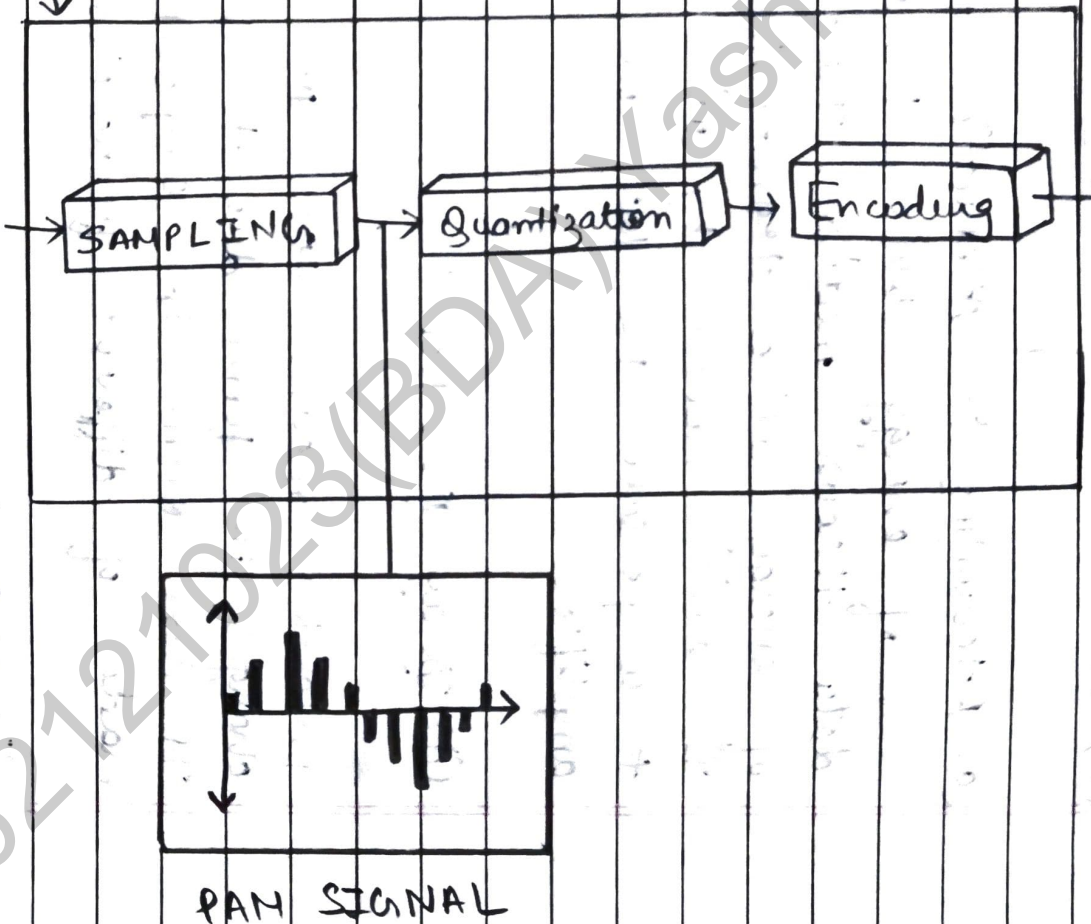
A5

Analog Signal



Quantized Signal





Acc. to question,

$V_{max} = 10V$.

$V_{min} = -10V$

$L = 1024$

$f = 10kHz$

Bitrate $= f_s \times n_b$ $\left\{ \because n_b = \log_2 L \right.$

$= f_s \times \log_2 L$

$= 2 \times 10 \times 10^3 \times \log_2 1024$

$= 200000$

Bitrate $= 2 \times 10^5$ bps

Bitrate = 200 kbps Ans

A4 Power is reduced to half.

loss of power $= 10 \log_{10} \frac{P_2}{P_1} = 10 \log \frac{\frac{1}{2} P_1}{P_1}$

$= 10 \log_{10} \frac{0.5 P_1}{P_1}$

$= 10(-0.3)$

$= -3dB$

⇒ The loss of power is 3dB.

Amplifier is used and power is increased by 20 times

$$\text{Power} = 10 \log_{10} \frac{P_2}{P_1}$$

$$= 10 \log_{10} \frac{20 P_1}{P_1}$$

$$= 10 (1.301)$$

$$\text{power} = 13.01 \text{ dB}$$

Now,

loss at -0.45 dB/km

$\therefore$ loss for 4km is 1.8 dBm

$$P_{(mw)} = 1mV \times 10^{(P_{(dBm)}/10)}$$

$$= 1 \times 10^{(1.8/10)}$$

$$= 1 \times 10^{0.18}$$

$$P = 1.5135 \text{ mW}$$

Initial power = 5mW

Now, after 4km power should be,

$$\text{Power} = 5mW - 1.5135mW$$

$$= 5mW - 1.514mW$$

$$\text{Power} = 3.486 \text{ mW}$$

$\therefore$ The power of signal at 4km will be 3.486mW.