ID : 18004 1120

Name : Md Farhan Ishmam

CSE - 4405 (Data and telecommunications)

Date - 09-11-20

Ans. to Q.no. 1(a)

There are 5 layers in TCP/IP protocol suite.

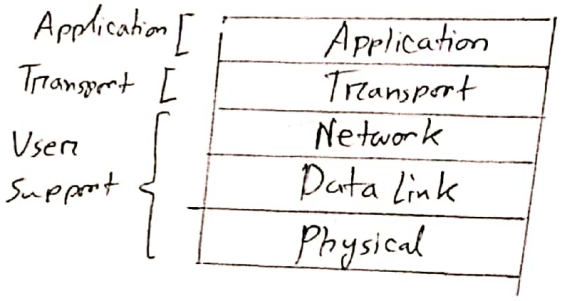


Fig: 5 layers of TCP/IP

(i)

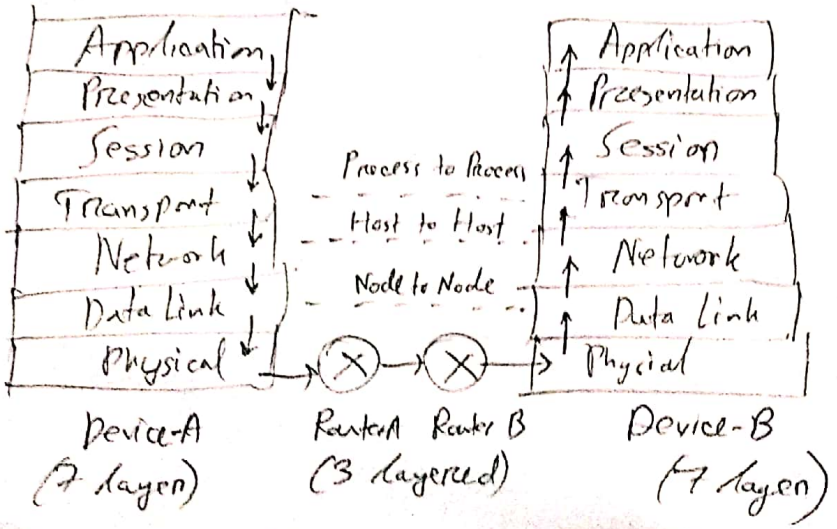
Process to Process: ~~The process~~ A device can run several application (process) during data communication and the data might be requested by only one particular process. To specify which process will receive the data, process address is encapsulated. This process address ~~(PD)~~ encapsulation is done by the transport layer. The way by which transport layer enables communication between process of sender with the process of receiver is process to process delivery.

(ii)

Host to host delivery: During data communication, data can be transferred from one network to another network. A logical address or IP address is required so that the data get delivered to correct receiver. The delivery method by network layer which delivers data from a source device to receiver device is called host to host delivery.

(iii)

Node-to-node: Various devices can be directly connected and act as nodes of a single system. The data link layer is responsible by attaching headers containing physical location, so that data from one node can go to another node. This delivery method of transferring from one node to another by network layer is node to node delivery.



Ans. to Q.no. 01(b)

The physical arrangement of devices or nodes in a network and the way they are linked together is called network topology.

The basic topologies are -

(i) Mesh
(ii) Star
(iii) Ring
(iv) Bus

My ID is 120.

$N = (120 \bmod 10) + 2 = 0 + 2 = 2$ devices

For 2 devices, we need one link in mesh topology.
" 2 devices, " " one link in star "
" " " " " one link " ring "

For 2 devices we need 2 links in bus topology
and 1 extra link for common bus
3 link for bus topology

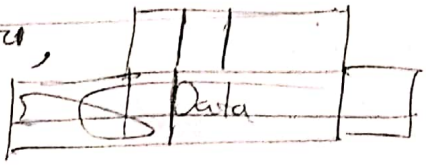
In case of mesh, star and ring the topologies will look same.

Ans. to Q. no. 1(c)

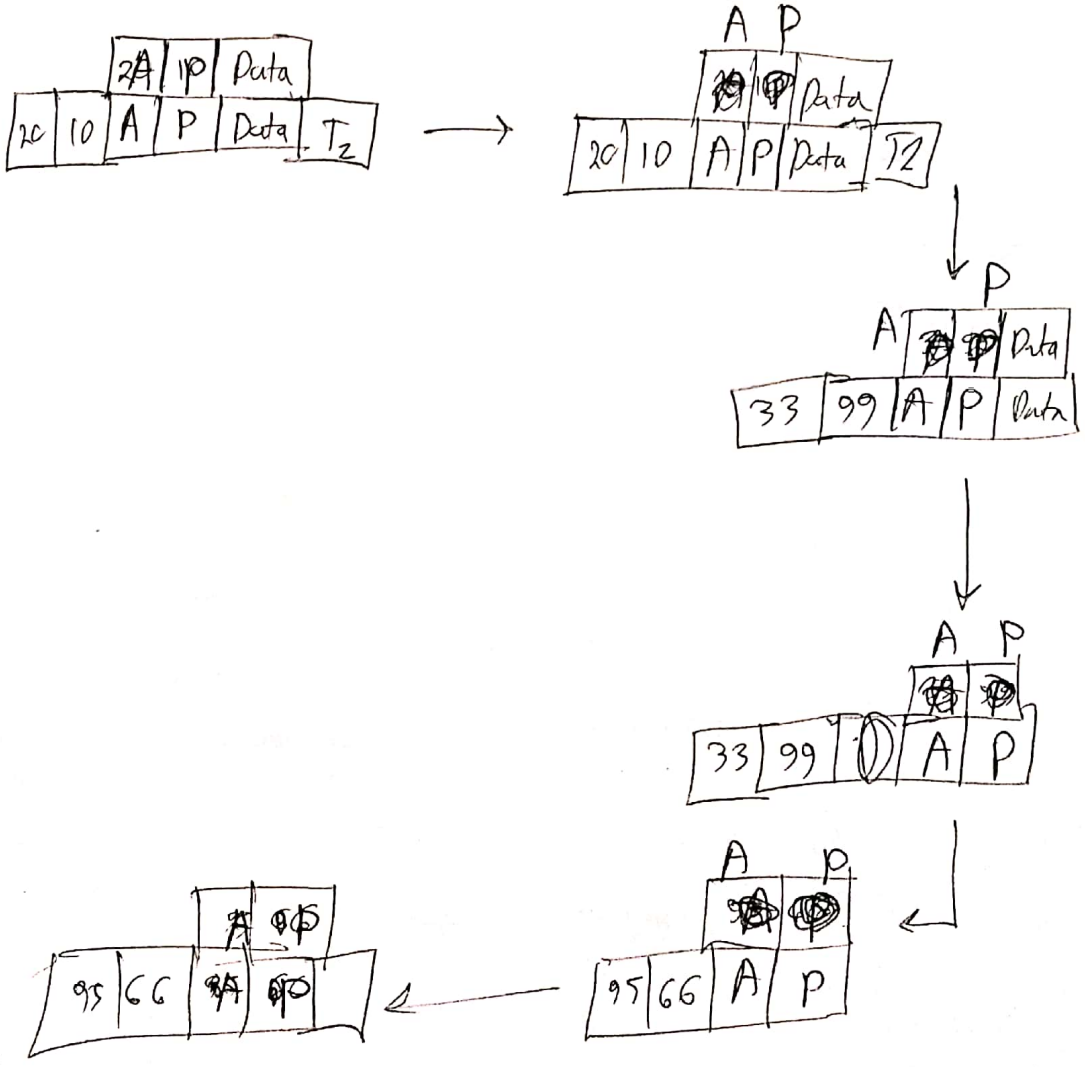
Port Address	Logical Address	Physical Address
(i) Address that identifies a process for port to port delivery	(i) Address that uniquely identifies a device in any number of interconnected network.	(i) Uniquely identifies a device in a single network
(ii) Assigned by transport layer.	(ii) Assigned by network layer	(ii) ~~Assigned by physical layer~~ (ii) Assigned by data link layer
(iii) Port address remains unchanged after changing networks. Ex- Port number	(iii) Remain unchanged after changing networks Ex- IP address	(iii) Get changed after changing networks Ex- MAC address

In the given figure,

For sender,



Sender



Ans. to Q.no. 1(d)

OSI → Open Source Interconnection

ISO → International Organization of Standardization

ISO is a standardization organization that sets the standards for various things including data communication. OSI is a standerdization protocal established by ISO to ensure proper devica to devica communiation in any interconnection of networks.

$$N = (120 \% 5) + 1 = 1$$

The first layer is physical layer.

The functionalities are:

(i) Transforming the bit stream into electromagnetic signal and sending through the physical medium.

~~(ii) Tha synchronization~~

(ii) Physical layer depends on interconnecting medium and interface

(iii) Transmission mode and bits depend on this layer

(iv) ~~Physics~~ Responsible for physical topology.

Ans. to Q.no. 2(a)

Given, non-periodic signal has 200 kHz bandwidth the middle frequency is @140 kHz.

So, Bandwidth, $B = f_{max} - f_{min} = 200$ kHz

and, $\frac{f_{max} + f_{min}}{2} = 140$ kHz

$\therefore f_{max} = 240$ kHz

$f_{min} = 40$ kHz.

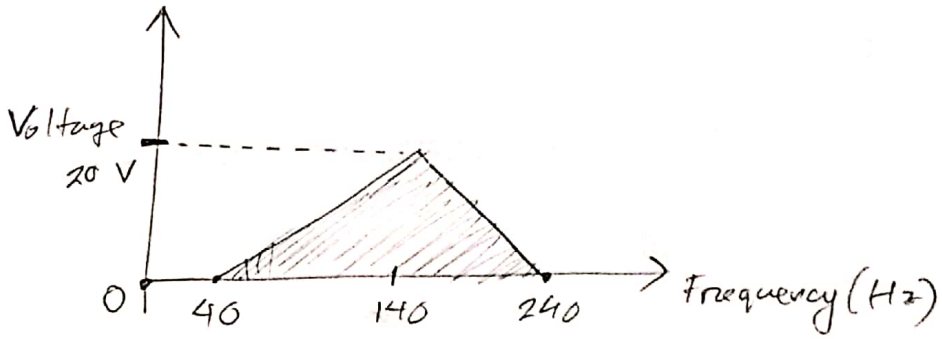
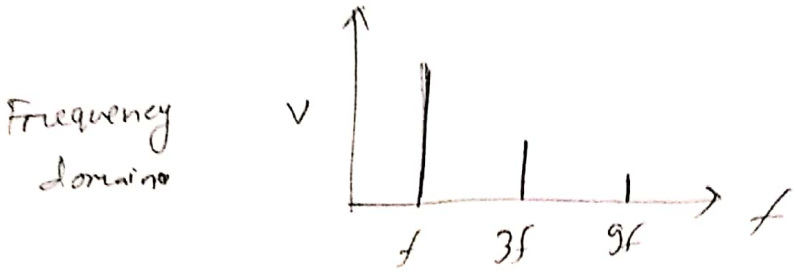
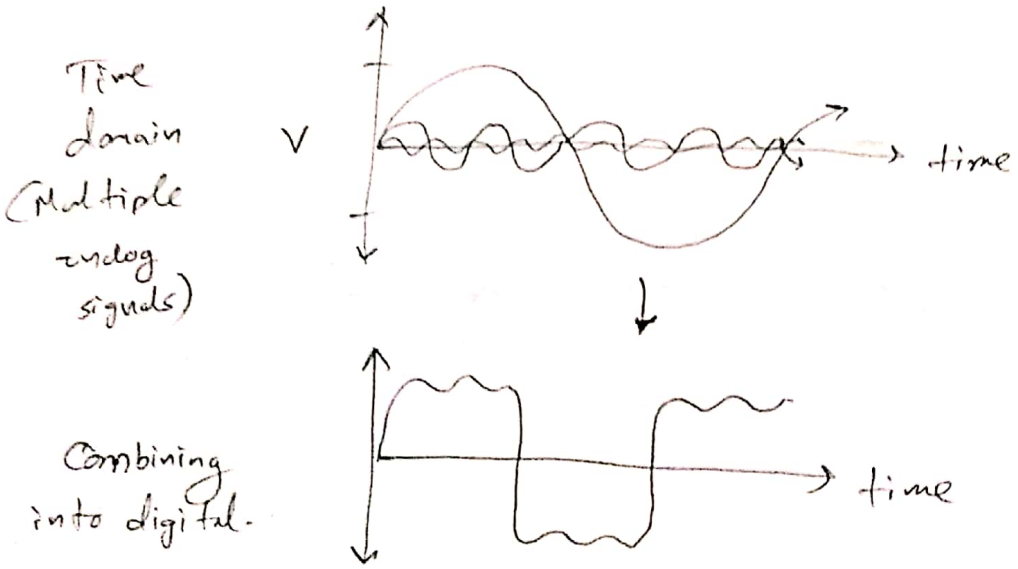


Fig:- Frequency Domain.

Ans. to Q.no. 2(b)

By interfering or combining ~~digitals~~ infinite analog signals, a digital signal can be formed. This signal formed by combining multiple analog signal is called a composite analog signal.





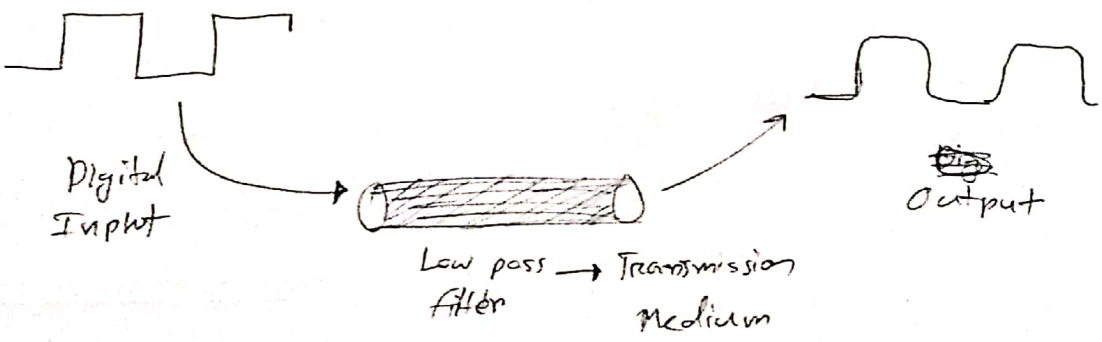
Baseband transmission:

In baseband transmission, the digital signal is converted to analog signal. ~~The non-periodic~~ digital signal is transmitted as it is. For this reason to properly transmit this digital signal infinite bandwidth is require

Baseband transmission:

In baseband transmission, the digital signal is not converted to analog and ~~transferred~~ transmitted as it is. No digital-to-analog conversion is done and transmission is done directly. A non-periodic digital signal requires infinite bandwidth, It is not possible, so some data loss occurs.

In baseband a transmission, bandwidth starts from zero and uses a low-pass filter in transmission medium.



Bandpass transmission doesn't let all the data flow. Results in loss of data. Low-pass filter is expensive and this method is ~~used~~ replaced by broadband transmission.

Ans. (c) to Q.no. 2(c)

Nyquist bit rate formula is,

$$N = 2 \times B \times \log_2 L$$

N → Bitrate, B → Bandwidth, L → No. of signal levels

Nyquist is noiseless ~~channel~~ and used to find no. of ~~levels~~ signal levels. Shannon capacity considers noise and uses SNR in the formula. It is used in ~~practical~~ practical scenario to calculate ~~maximum~~ bandwidth.

Given, SNR = 120

Bandwidth = 2 MHz.

~~i. Bitrate~~

∴ Shannon Capacity, $C = B \times \log_2 (1 + SNR)$

$= ~~2 \times 10^6 \times \log_2 (120+1)~~$

$= 2 \times 10^6 \times \log_2 (120+1)$

$= 13.83$ Mbps

So, bit rate is

$$N = 13.83 \text{ Mbps (Ans.)}$$

Again, $N = 2 \times B \times \log_2 L$

$$\Rightarrow \frac{13.83 \times 10^6}{2 \times 2 \times 10^6} = \log_2 L$$

$$\Rightarrow \log_2 L = 3.4575$$

$$\Rightarrow L = 2^{3.4575}$$

$$\Rightarrow L = 10.985$$

$$L \simeq 11$$

So, approximate signal level is 11. (Ans.)

Ans. to Q.no 2(d)

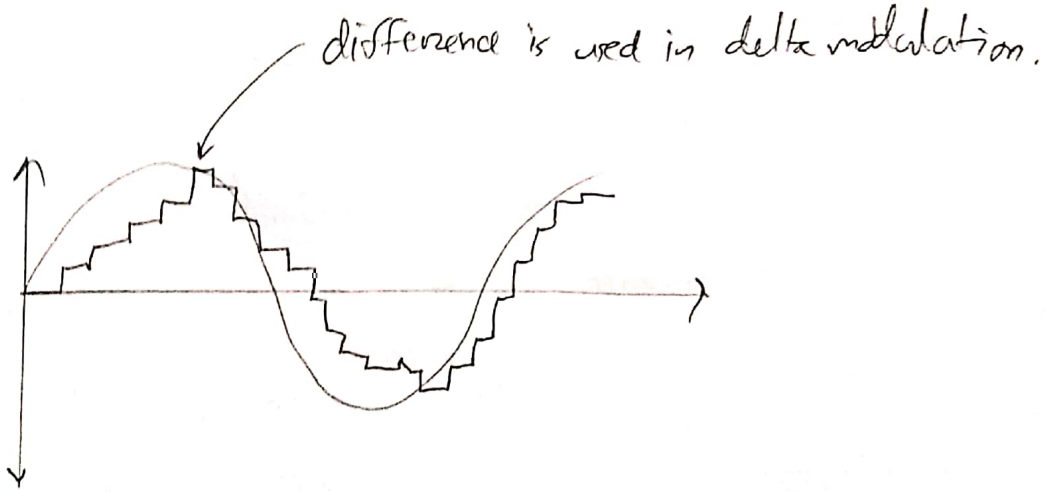
The different causes of transmission impairement are:

(i) Attentuation (loss of signal power)
(ii) Distortion (change of form or shape of signal)
(iii) Noise (unwanted signals)

Ans. to Q.no. 3(a)

PCM - pulse Mod

PCM → Sampling
→ Quantization
→ Encoding



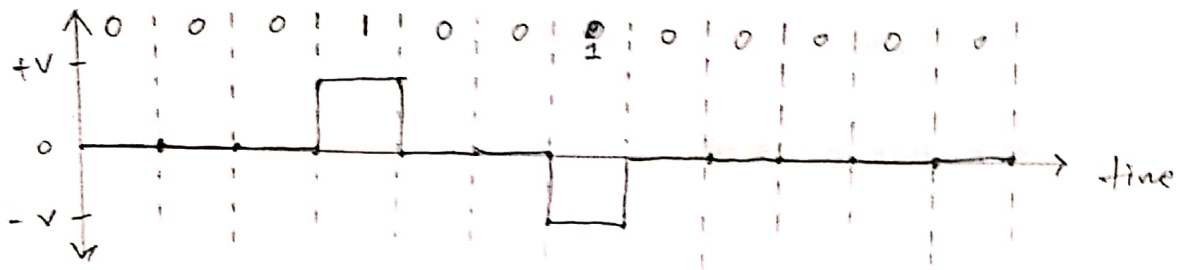
Ans to Q.no.3(b)

120
- 0000
- 0010
- 0001

So, hexadecimal stream is

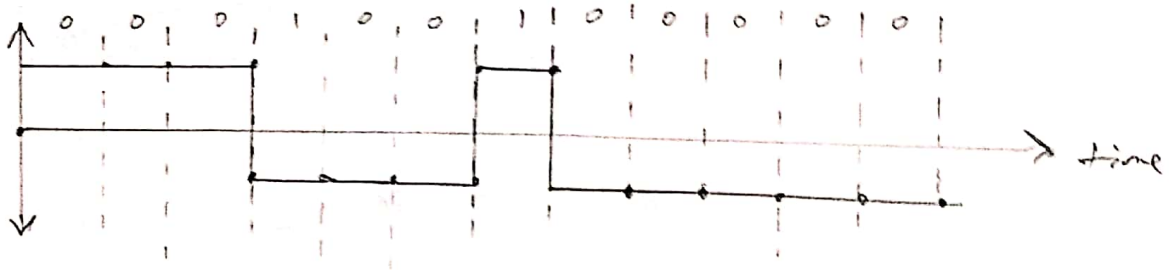
0001 0010 0000

(i) AMI



Bandwidth is $N/2$; N is bitrate

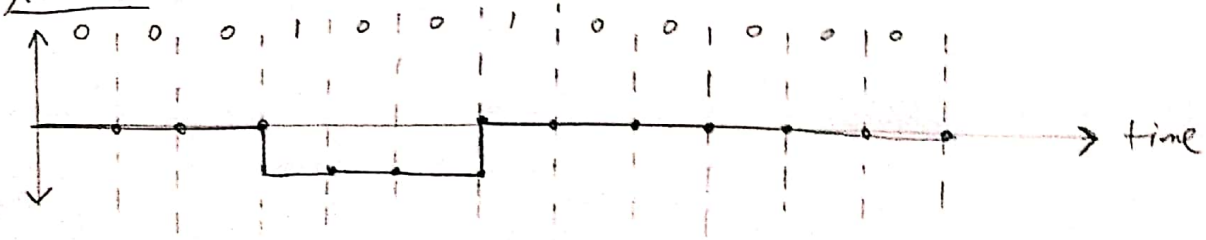
(ii) NRZ-I



Next bit: 0 – constant ; 1 – inversion

Bandwidth is $N/2$

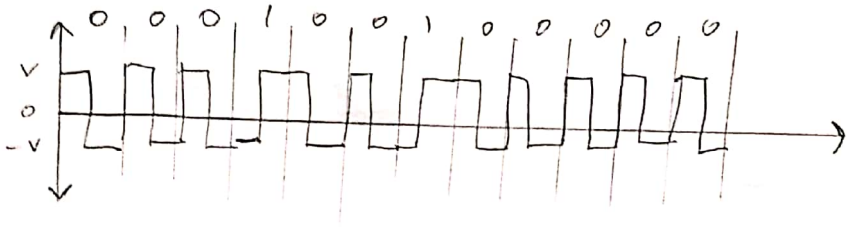
(iii) MLT-3



Bandwidth = $N/3$

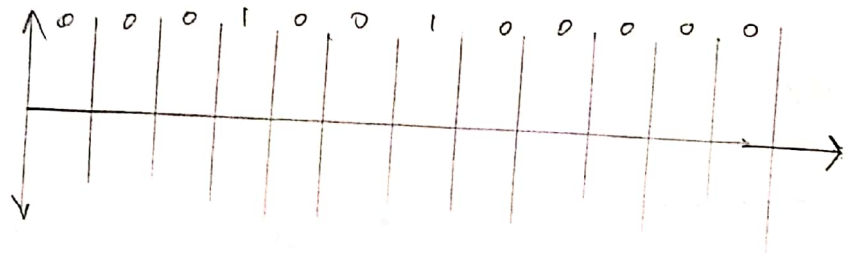
(iv) Manchester

⌋ - zero ⌈ - one



Bandwidth is N

(v) Polar RZ



Bandwidth is N/2

Ans. to Qno. 3(e)

Scrambling is the process by which long sequences of zeros are changed to remove DC component from the signal. Some scrambling schemes are B8ZS and HDB3.

Block coding is another scheme which replaces m bits of signal with n bits by adding some redundant bits. Scrambling is different from block coding because it doesn't add redundant bits but instead changes the sequence of long zeroes.

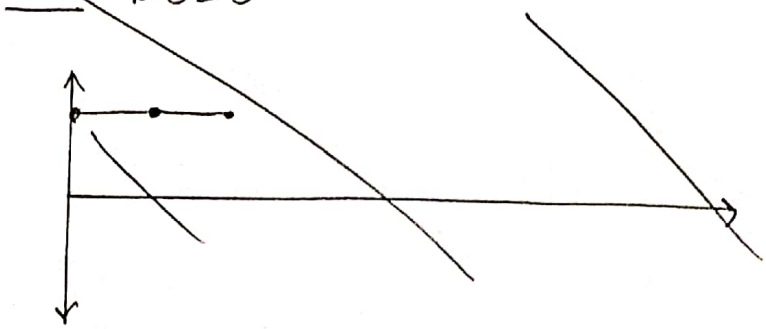
For B8ZS, 8 consequite zeroes are replaced by

000 VB0 VB.

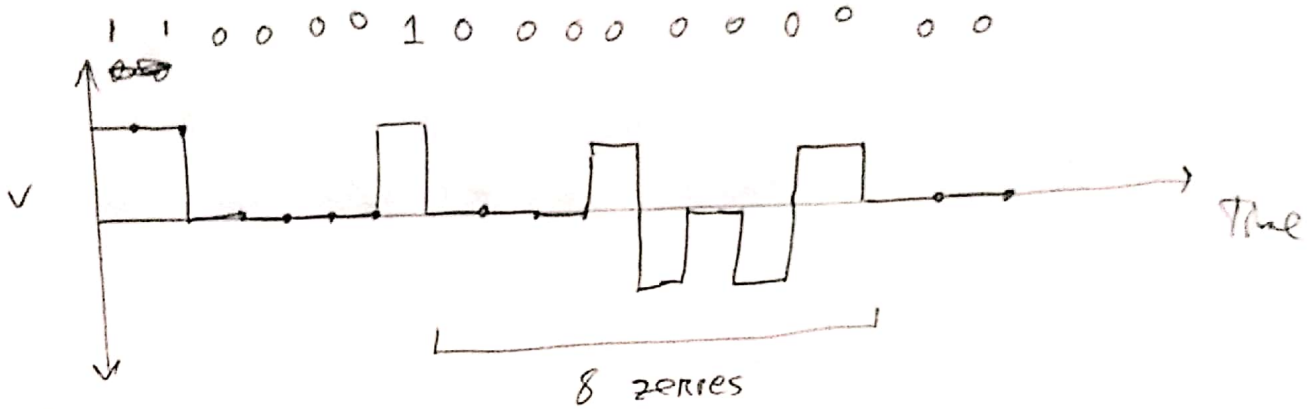
and for, HDB3 4 consequtives zeroes are replaced by either 000V or B00V depending on the number of nonzero pulses in the previous substitution.

For bit stream 1100001000000000.

(i) B8ZS



(i) B8ZS



(ii) ~~HOB3~~ HOB3