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PART-A

1. (a) **PSK**: The phase is shifted which is relative to its previous transmission of the signal instead of having some reference signal.

(b) **QAM**:

2. **Data rate**: It is the rate at which the data is transmitted in bits per second.

Signal rate: It is the rate at which a signal is transmitted from one point to another.

3. frequency range = $2MH_z$ to $4MH_z$

$SNR_{dB} = 30dB$

bandwidth = ?

$SNR_{dB} = 10 \log_{10}(SNR)$

$\Rightarrow 30 = 10 \log_{10}(SNR)$

$\Rightarrow \log_{10}(SNR) = 3$

$\therefore SNR = 1000$

Bandwidth = $4MH_z - 2MH_z$

$= 2MH_z$

For maximum theoritical capacity

$C = B \log_2(1+SNR)$

$\Rightarrow C = 2MH_z \log_2(1+1000)$

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$C = 2 \times 10^6 \log_2 (1001)$

$C \approx 2 \times 10^6 \times 10$

$\therefore C \approx 20 \text{ Mbps}$

4. Bandwidth, $B = 300 \text{ Hz}$

$SNR_{dB} = 3 \text{ dB}$

$SNR_{dB} = 10 \log_{10} (SNR)$

$\log_{10} (SNR) = 0.3$

$SNR = 2$

Now

Channel capacity, $C = B \log_2 (1 + SNR)$

$\rightarrow C = 300 \text{ Hz} \log_2 (1+2)$

$\rightarrow C = 300 \text{ Hz} \log 3_2$

$\rightarrow C = 300 \times 1.58$

$\rightarrow C \approx 474 \text{ bps}$

5. In case of half duplex operations the signals are transmitted ~~one~~ in one direction only whereas in case of full duplex operation the transmission is both the ways i.e., bidirectional.

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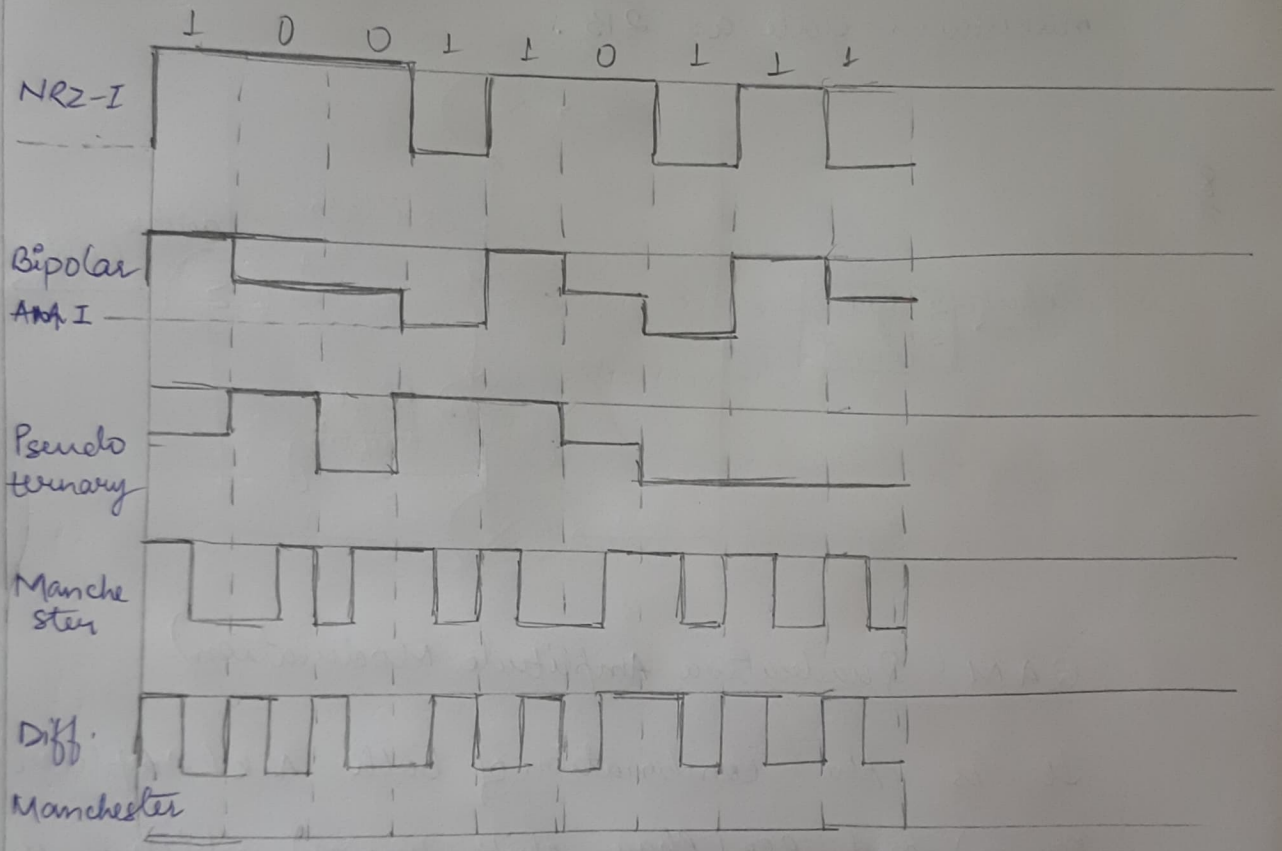
PART-B

6. i. Given binary data - 100110111



7(a) Shanon's capacity formula gives a relation between data rate, error rate and noise to calculate maximum data rate on ~~to~~ same communication channel.

The formula is

Capacity = $B \log_2 (1 + SNR)$ where

B is the bandwidth

SNR is signal to noise ratio.

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Nyquist bandwidth is the maximum ~~sig~~ rate of signal that can be transmitted is twice the bandwidth or frequency of the signal. The frequency cannot be greater than B, say bandwidth, to achieve maximum rate as 2B.

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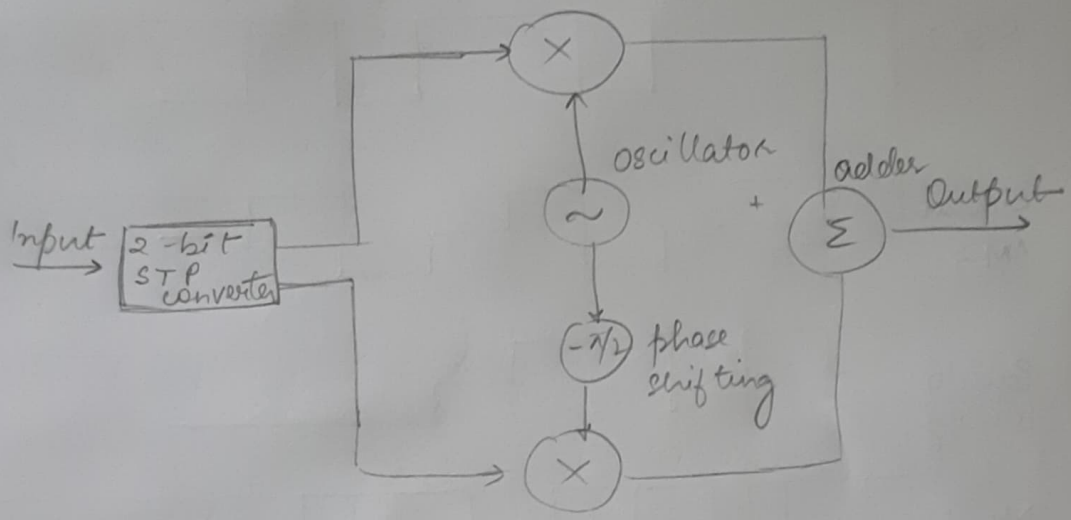

QAM (Quadrature Amplitude Modulation)

It is the combination of both ASK (Amplitude Shift Keying) and PSK (Phase shift keying) which is used in case of asymmetric digital subscriber line (ADSL) It propogates two different signals simultaneously on same carrier frequency. One of them has a phase shift of 90° and then both the signals are demodulated.