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Sec: A Subject : Data Communications.

Examination : 3rd Sem Mid-Term Examination

Part - A (Four Question)

Q.1. Here no. of cables required = $2n+1$

Cable required for mesh = $\frac{(2n+1)(2n+1-1)}{2}$

$= n(2n+1)$

Cable links required for ring = $2n+1$

Cable links required for bus = $2n+1+1 = 2(n+1)$

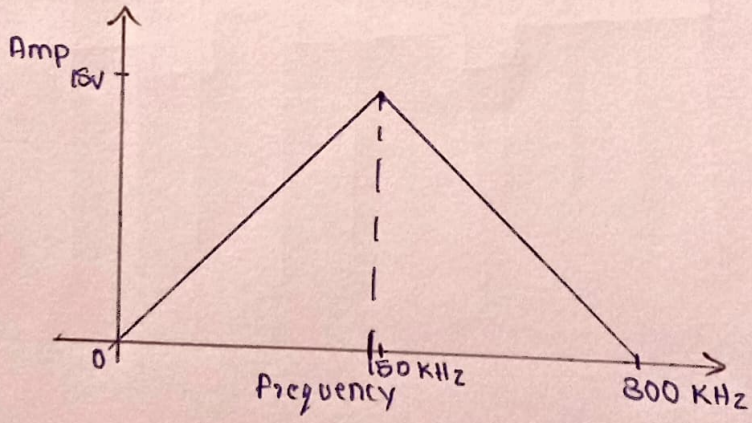
Cable links required for star = $2n+1$

Q.2. Bandwidth = 300 KHz

middle Frequency = 150 KHz

amplitude = 15V

extreme frequency amplitude = 0

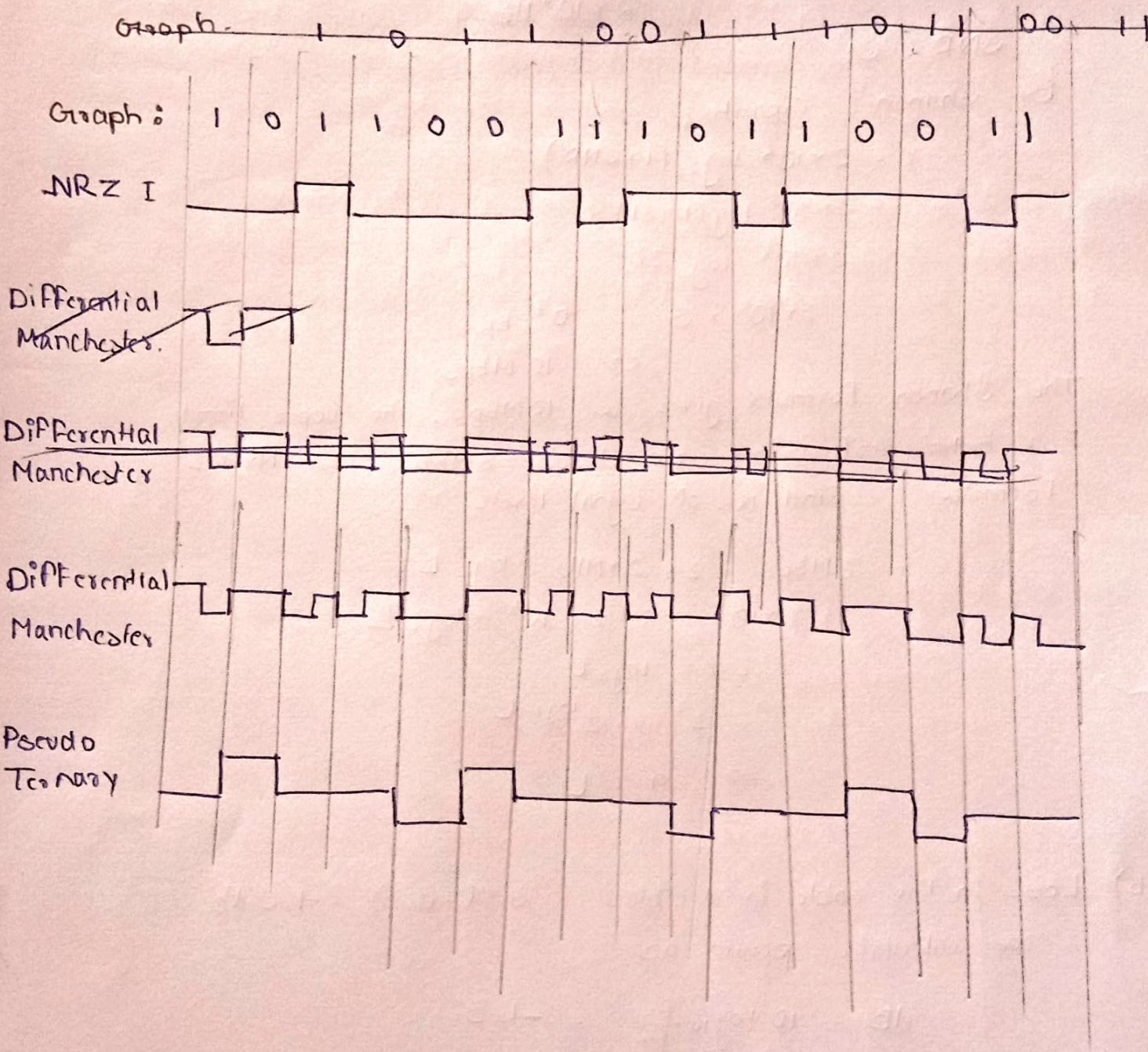


Q.3. The start and stop bits are used in asynchoronous communication as a means of timing or synchoronizing the data characters being transmitted. Without the use of these bits, the sending and recieving systems will not know where one character ends and another bgins.

Q.4. In data communication, we use periodic analog signals. because they need less bandwidth, and non-periodic because they can be used to represent the variation in data.

Part B (Four Question)

5.



Q.6.

(a) Given Bandwidth = 2 MHz
= 2×10^6 Hz

SNR = 31

By Shanon's capacity,

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

$= 2 \times 10^6 \log_2 (1 + 31)$

$= 2 \times 10^6 \log_2 (32)$

$= 2 \times 10^6 \times 5 = 10^7$ bps

or 10 Mbps

The Shanon Formula, gives us 10 Mbps, the upper limit, For better performance, we choose 8 Mbps, use Nyquist Formula to Find no. of signal levels.

$8 \text{ Mbps} = 2 \times 2 \times \text{MHz} \times \log_2 L$

$\rightarrow 4 \cancel{8 \times 10^6} = \cancel{2 \times 2 \times 10^6} \times \log_2 L$

$2 \cancel{4} = \log_2 L$

$\rightarrow 2^2 = 2^{\log_2 L}$

$\rightarrow 4 = L$

(b) Loss in the cable in decibles = $5 \times (-0.3) = -1.5$ db

∴ we calculate power as -

$dB = 10 \log_{10} \frac{P_2}{P_1} = -1.5$

$\frac{P_2}{P_1} = (10)^{-0.15} = 0.71$

$\rightarrow P_2 = 0.71 \times P$

$= 0.71 \times 2$

$= 1.42$ mW

Q.27. The first step in PCM is sampling. Analog signal is sampled in every T_s secs. T_s is referred to as the sampling interval. $f_s = \frac{1}{T_s}$ is called the sampling rate or frequency.

There are 3 sampling methods:

- Ideal: an impulse at each sampling instant.
- Natural: a pulse of short width with varying amplitude
- Flattop: sample and hold, like natural but with single amplitude value.

- The process is referred to as pulse amplitude modulation ~~(PAM)~~ PAM and outcome is a signal with analog (non-integer) values

Q.8. In communication system, analog signals travel through transmission media, which tends to ~~deteriorate~~ deteriorate the quality of analog signal at the begining of the medium is not same as the signal at the end of medium. This imperfection is called transmission impairment. Three types of transmission impairment are :-

(a) Attenuation : Means loss of energy of signals that travel through the medium overcoming the resistance of the medium. It can be corrected using amplifiers.

(b) Distortion : Means that the signal changes its form or shape. . Different components arrive at different delays.

(c) Noise : It refers to the different types of noises.

(i) Thermal : random noise of electrons in wire

(ii) Induced : Noise from motors and appliances which get interfered in transmitter and antenna.

(iii) Crosstalk : Noise from appliances in wires.

(iv) Impulse : Spikes that result from power lines and lightning.