Q1

a. - ①

A page is an Average of 24 lines with 80 characters in each line. If we assume that one character requires 8 bits, the bit rate is

= 100 x 24 x 80 x 8
= 1636000 bps
= 1.636 Mbps.

②:-

The bit rate of digitized voice channel can be calculated as

Bit rate = 2 x 4000 x 8
= 64000 bps
= 64 Kbps

③ HDTV uses digital signals to broadcast high quality video signals. The HDTV screen is normally a ratio of 16:9, which means the screen is wider. There are 1920 by 1080 pixels per screen, and the screen is renewed 30 times per second. Twenty-Four (24) bits represents one color pixel. We can calculate the bit rate as

bit rate = 1920 x 1080 x 30 x 24
= 1492992000
= 1.5 Gbps

The TV stations reduce this rate to 20 to 40 Mbps.

(4)

The loss in the cable is $5 \times (-0.3) = -1.5$ dB

we can calculate the power as

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

$$\frac{P_2}{P_1} = 0.71 \, P_1$$

$$= 0.7 \times 2$$

$$= 1.4 \text{ mW}$$

(5)

In this case $r = 4$, $S = 1000$ & N is Unknown. We can find the value of N from

$$S = N \times \frac{1}{r}$$

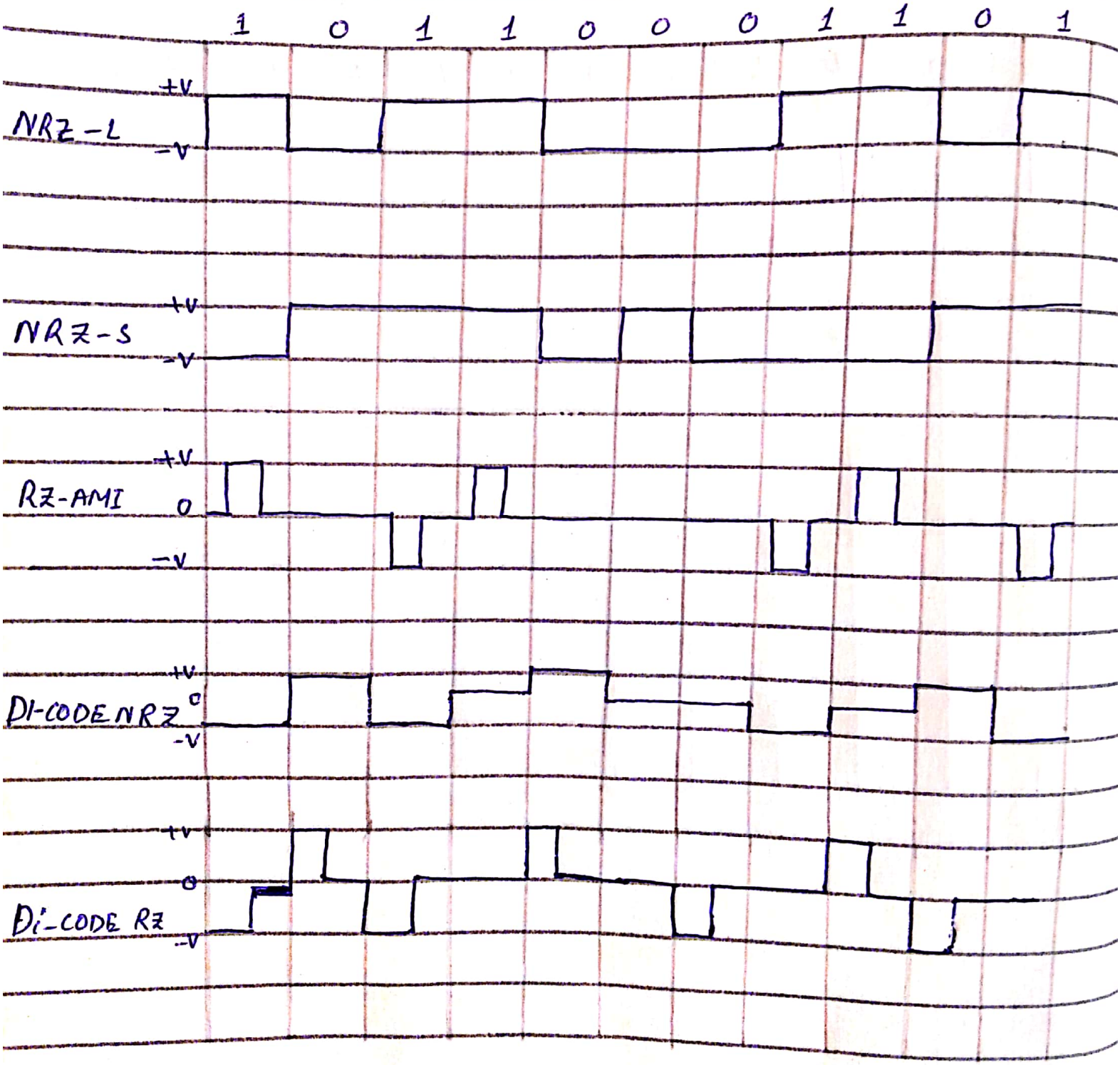
or $N = S \times r$

$$= 1000 \times 4$$

$$= 4000 \text{ bps.}$$

Q2

The Graph of NRZ-L, NRZ-S, RZ-AMI, Di-code NRZ & Di-code RZ are as follows.



Q3

a- (1)

$L >= 12 \rightarrow L = 16$

We need 4 bits; 1 bit for the sign and 3 bits for the value.

A 3 bit value can be represent $2^3 = 8$ levels. which is more than what we need.

A 2 bit value is not enough since $2^2 = 4$

A 4 bit value is too much because $2^4 = 16$

(2)

The sampling rate must be twice the highest frequency in the signal.

Sampling rate = 2 x (11000)

= 22,000 samples/sec.