1. a. loss = 30 = 10log10(P2/P1) -> P2 = 600 w

S/N in db= 10log10(600/2*10^-6) = 84.77 db

7

b. C = Blog2(1+S/N), here B = 4500- 500 = 4000

C = 4000log2(1+600/2*10^-6) = 112641.5 bits/s

c. Ndb = 10log10(0.003/0.6) = 2x

x = 11.5 km

So, the phone line can be 11.5 km long.

2. a. 64 data = 6 bits

bit rate = 6* baud rate = 12000 bps

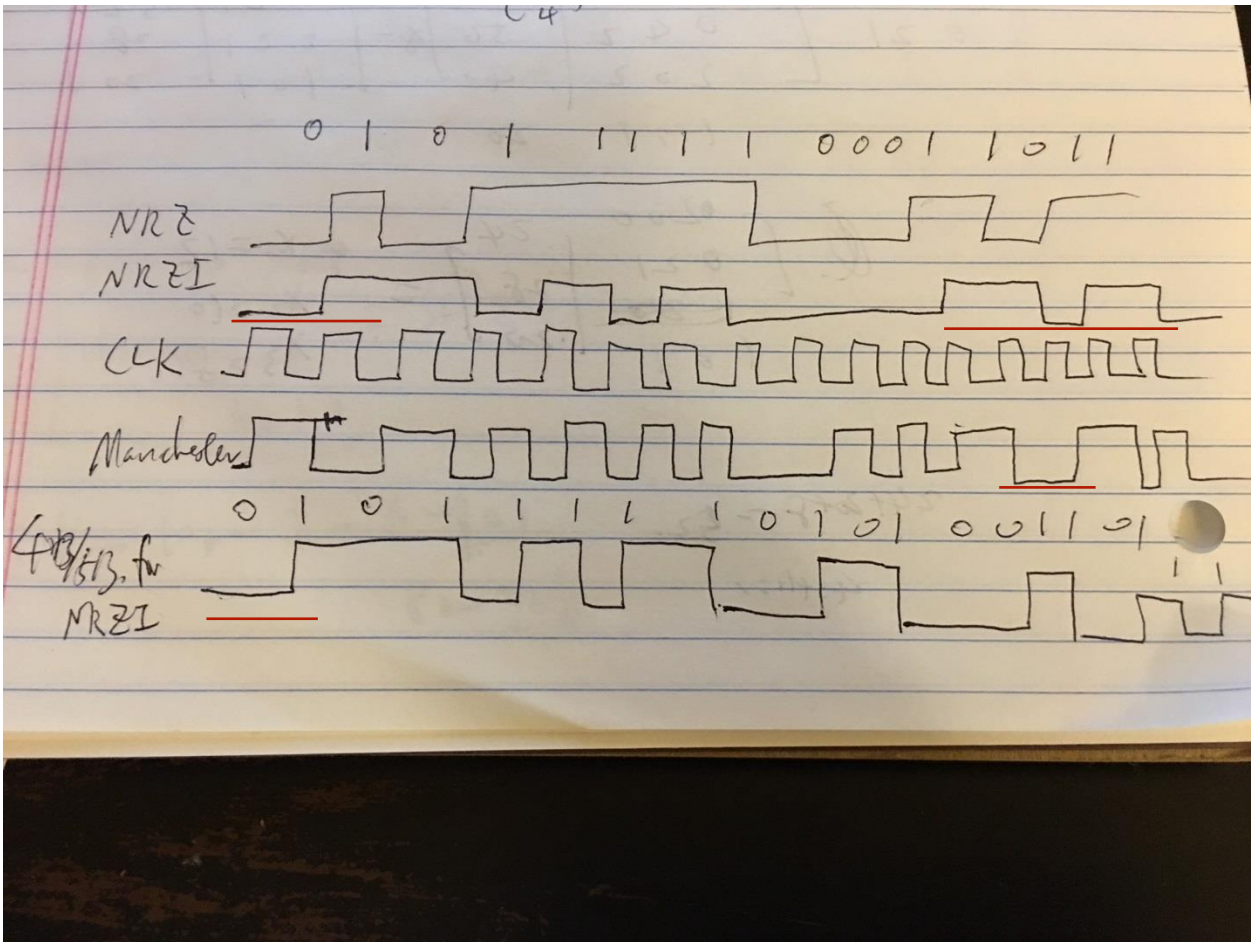
10

b. C = Blog2(1+S/N), here B = 400*10^6, C = 2*10^9

S/N = 31

S/N in db = 10log10(31) = 14.9 db

6 3. a.



b. C = B log2

(1 + S/N) 45*106 = 25*106 * log2(1 + S/N)

S/N in db = 10 * log10 (S/N) = 3.95 db

4. a. 2000 signals/sec ; 1 signal = 2bits

As a result, bit rate = 4000 bps

10

b. It uses amplitude modulation, because these two points have different amplitude but same phase.

5. a. 0000 0010 0000 1010 0000 1010 1111 1111 0101 0000 0110 0000 1111 1111 0000 1110 0000 0011

b. 0111 1110 0000 1010 1111 10111 0101 0000 0110 0000 1111 10111 0000 1110 0111 1110

c. 10000 10100 11111 11110 10101 00000 10110 00000 11111 11110 10000 11100

d. efficiency for a: 66.67%

efficiency for b: 72.73%

efficiency for c: 80%

10

5. a. 0000 0010 0000 1010 0000 1010 1111 1111 0101 0000 0110 0000 1111 1111 0000 1110 0000 0011

b. 0111 1110 0000 1010 1111 10111 0101 0000 0110 0000 1111 10111 0000 1110 0111 1110

c. 10000 10100 11111 11110 10101 00000 10110 00000 11111 11110 10000 11100

d. efficiency for a: 66.67%

efficiency for b: 72.73%

efficiency for c: 80%

10

6. a. M(x) = 10000110100 = x^10+x^5+x^4+x^2; C(x) = 10001 = x^4+1

T(x) = 100001101000000; R(x) = 0011; P(x) = 100001101000011

Received Polynomial = 100001101000111

Received Polynomial/C(x) has reminder 100, so there is error

b. 10010110011/C(x) = 101, so it is not correctly coded.

c. P = $\frac{C_k^2 * C_n^2}{C_{k+n}^4}$

7. a.

8

Site	Average ping(ms)
Cs.illinois.edu	39.436
Illinois.edu	55.349
Stanford.edu	73.528
Sydney.edu.au	207.819

b.

Site	route
Cs.illinois.edu	4
Illinois.edu	6
Stanford.edu	19
Sydney.edu.au	21