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المادة: معالجة الإشارات الرقمية

18.5

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Q1.1 (2) "YES" we can increase Received SNR without increasing in Pt.

Q1.2 (2) By using Multi-antenna techniques "MIMO" which will insure reliability of the transmitted signal.

and by using OFDM we can increase the efficiency of the bandwidth.

Q1.3 (2) (1) GSM (2) Wimax.

Q2.1 (2)
1. Pathloss
2. shadowing
3. fading

Q2.2 (2)
1. Multipath Propagation
2. Speed of the mobile.
3. Speed of the surronded objects.

Q3.1 (2)
1. high data rate.
2. "spactrum efficient" occupys less BW.
3. Low cost.
4. Power efficient.
5. low Bit Error Rate.

(2)

Q3.2 1. 16-PSK has higher data Rate the BPSK snice its using Less BW.

2. 16-PSK is more BW effecient than BPSK.

3. BPSK has a Lower BER than 16-PSK

Q4 1. QPSK. $M=4$ $k=\log_2 M$ $k=2$

Gray encoding

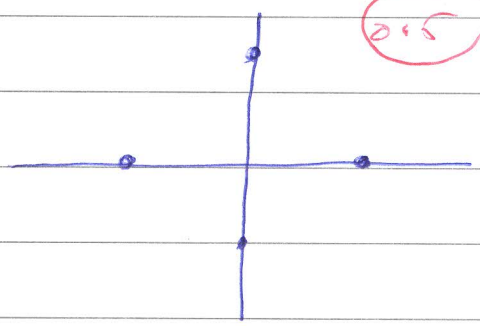
0 0

0 1

1 1

1 0

Constellation



(2.5)

(1)

Q4.2 Gray Encoding is better in Error detection since the change between levels happens in 1 Bit which make it easier to detact. and that mens its improves BER.

Q5 (3) $SNR_{dB} = ?$ 8PSK $k = 3$ $R_b = 12\,Kbps$

$$SNR = \frac{P_r}{N_0 B}$$

$$B = 2R_b/k = \frac{2 * 12 * 10^3}{3} = 1.33\,KHz$$!

$$C_N = 2B \log_{10} M = 2 * 1.33 * 10^3 \log_{10}(8) = 24 * 10^3\,dB$$

$$C_n \leq C_{sh.}$$

$$C_{sh} = B \log_{10}(1 + SNR)$$

~~$24 * 10^3 = 8 * 10^3$~~

$$24 * 10^3\,dB = 1.33 * 10^3 \log(1 + SNR)$$

$$\log(1 + SNR) = \frac{24 * 10^3\,dB}{1.33 * 10^3\,KHz} =$$

$$\log(1 + SNR) = 18.045\,dB/Hz$$

~~log SNR = 63.45 dB~~

$$SNR_{dB} \simeq 18.045\,dB$$