Pre-workshop questions

Question 1

Give a sequence of Gray codewords for 16-ary modulation starting with {0000, 0001, . . .}.
A standard gray code starting form 0000,0001 is :

$$\{0000, 0001, 0011, 0010, 0110, 0111, 0101, 0100, 1100, 1101, 1111, 1110, 1010, 1011, 1001, 1000\}$$

Question 2

Consider a QPSK modulation scheme that uses Gray encoding, where the phase of the sinusoidal carrier takes on one of four equally spaced values, such as $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$.

a) **Give a sequence of Gray codewords for QPSK modulator starting with {00, . . .}**
The gray code is:

$$00, 01, 11, 10$$

b) **Complete the corresponding LUT below**
Here are the tables:

Index	Gray Codeword	Phase	Coordinate	Complex Number
0	00	$\frac{5\pi}{4}$	(-1,-1)	-1-1j
1	01	$\frac{7\pi}{4}$	(1,-1)	1-1j
2	11	$\frac{\pi}{4}$	(1,1)	1+1j
3	10	$\frac{3\pi}{4}$	(-1,1)	-1+1j

Table 1: Look Up Table

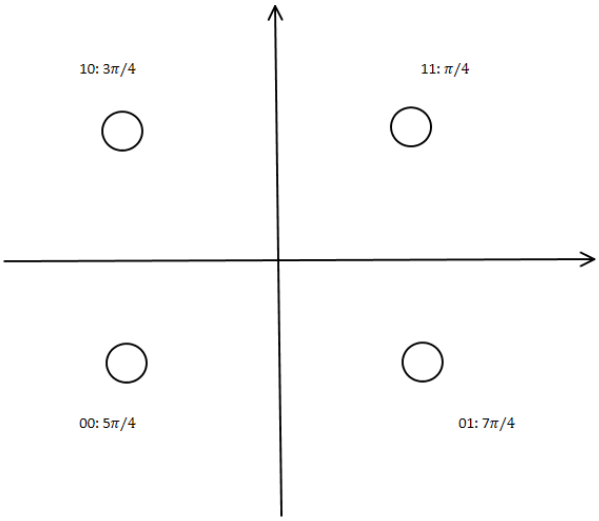

Figure 1: Constellation Diagram

Question 3

The Random Source is the bits to the s/p , the Constellation Object is the Look Up Table,The modulator uses this object to represent the s/p look up and sampling.The Throttle is the shaping filter and the signal source is the cosine function and multiply the signal after the filter which match the DDS multiply Inphase component and quadic component and sum them up.

Question 4

What is the decimal range that a byte can represent?
For an unsigned byte the range is 0 255

Question 5

Remembering that we are implementing a QPSK modulator, how many bits per symbol should we have?
For QPSK,we have 2 bits per symbol.