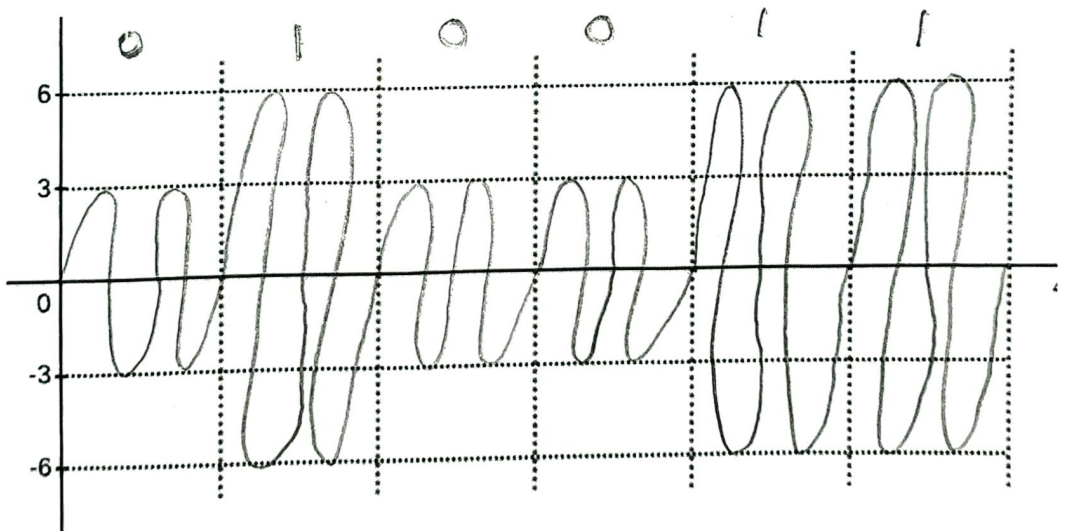# Amplitude Shift Keying (ASK)

Binary ASK:

1. Determine the digital bit stream from the analog signal below. The signal was modulated using Binary ASK where 0 means signal element with no amplitude and 1 means signal element with amplitude of 3v.
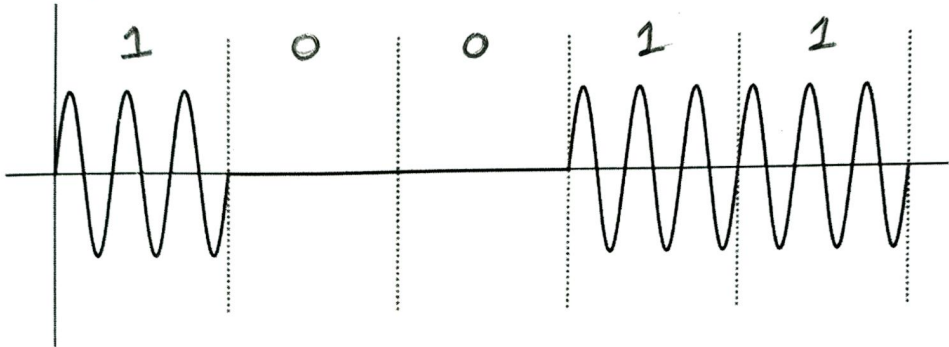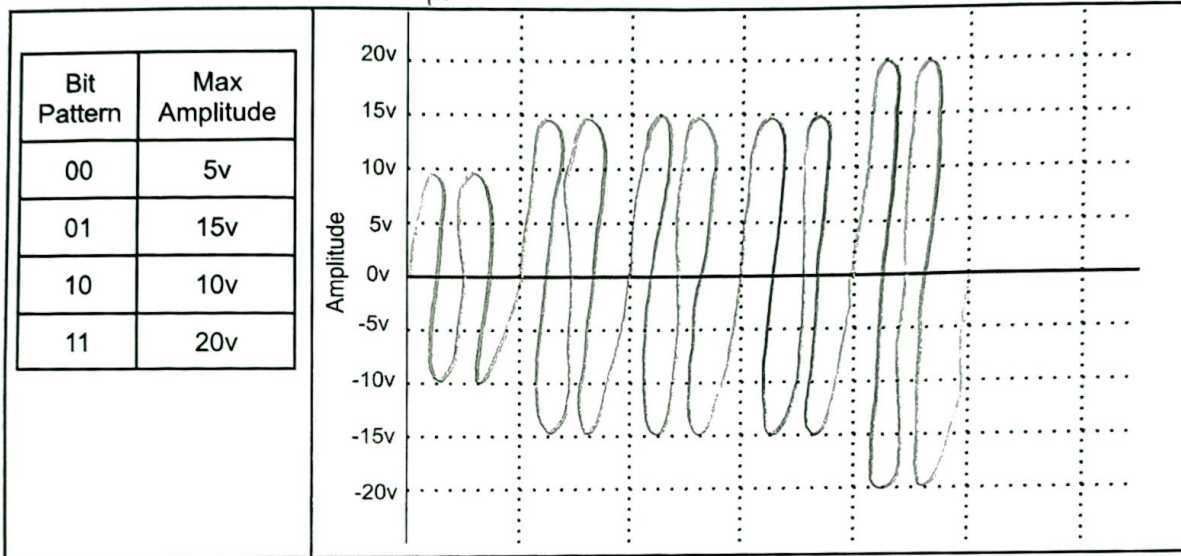

2. Draw the analog signal for the digital bit stream 010011 using Binary ASK where 0 means signal element with amplitude of 3v and 1 means signal element with amplitude of 6v.
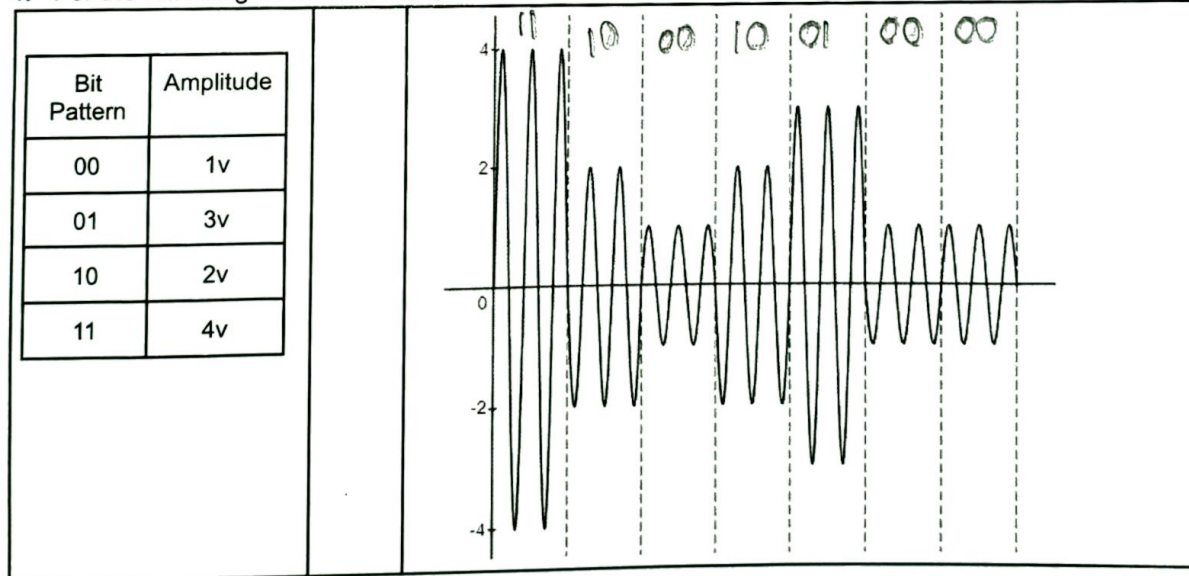   [frequency = 2 for each signal element and phase 0 rad]

Multi-level ASK

3. In a Multi level ASK, for each signal element, we want to send 2 bits at a time. We have used a carrier signal that has a frequency of 10 Hz (Each signal element has 2 cycles) and phase is 0 rad. If the amplitude changes according to the following table, draw the modulated signal for the bit sequence 1001010111

| Bit Pattern	Max Amplitude
00	5v
01	15v
10	10v
11	20v

4. For the following Multi-level ASK, find the bitstream form the signal below:

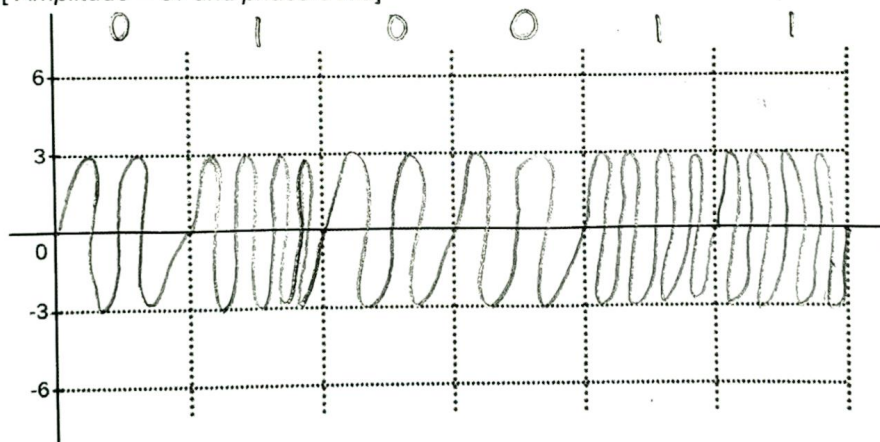| Bit Pattern	Amplitude
00	1v
01	3v
10	2v
11	4v

Frequency Shift Keying (FSK)

Binary FSK:

5. Determine the digital bit stream from the analog signal below. The signal was modulated using Binary FSK where 0 means signal element with frequency of 2 and 1 means signal element with frequency of 4.
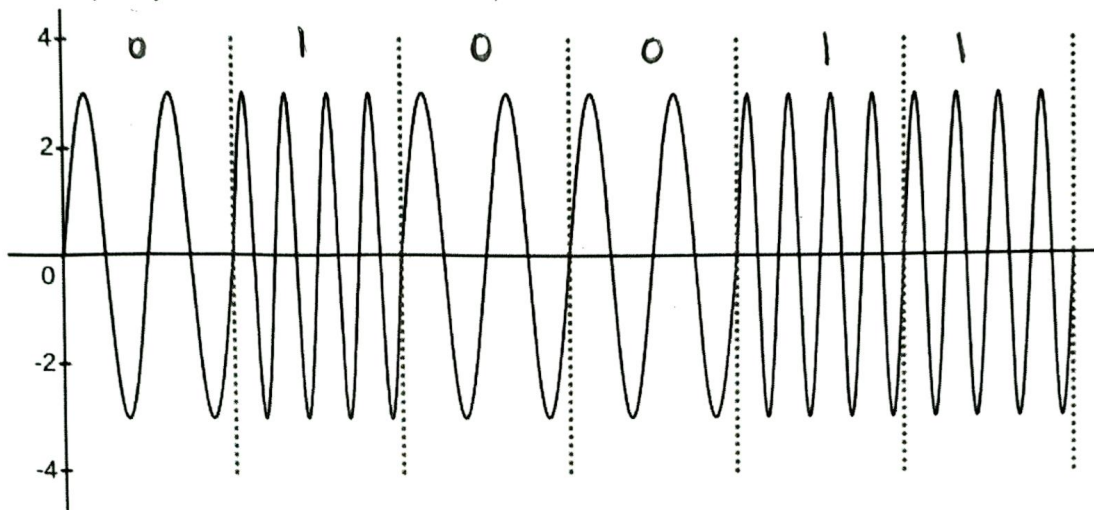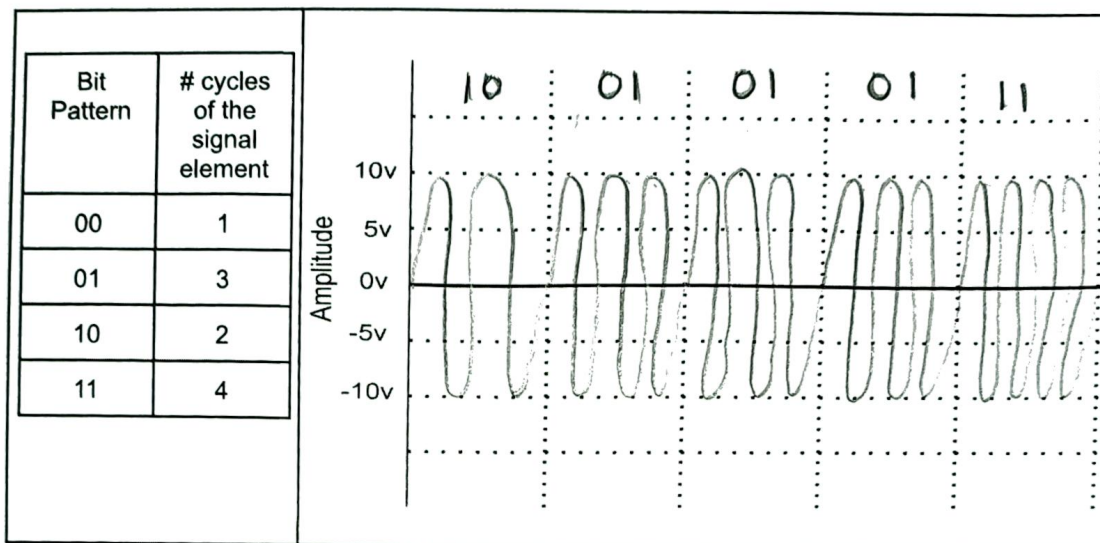

6. Draw the analog signal for the digital bit stream 010011 using Binary FSK where 0 means signal element with frequency of 2 and 1 means signal element with frequency of 4.
[*Amplitude = 3v and phase 0 rad*]

Multi level FSK

7. In a Multi level FSK, for each signal element, we want to send 2 bits at a time. We have used a carrier signal that has an amplitude of 10v and phase is 0 degree. If the frequency changes according to the following table, draw the modulated signal for the bit sequence 1001010111

Bit Pattern	# cycles of the signal element
00	1
01	3
10	2
11	4

8. For the following Multi-level FSK, find the bitstream form the signal below:

| Bit Pattern	Frequency (each signal element)
00	1
01	3
10	2
11	4
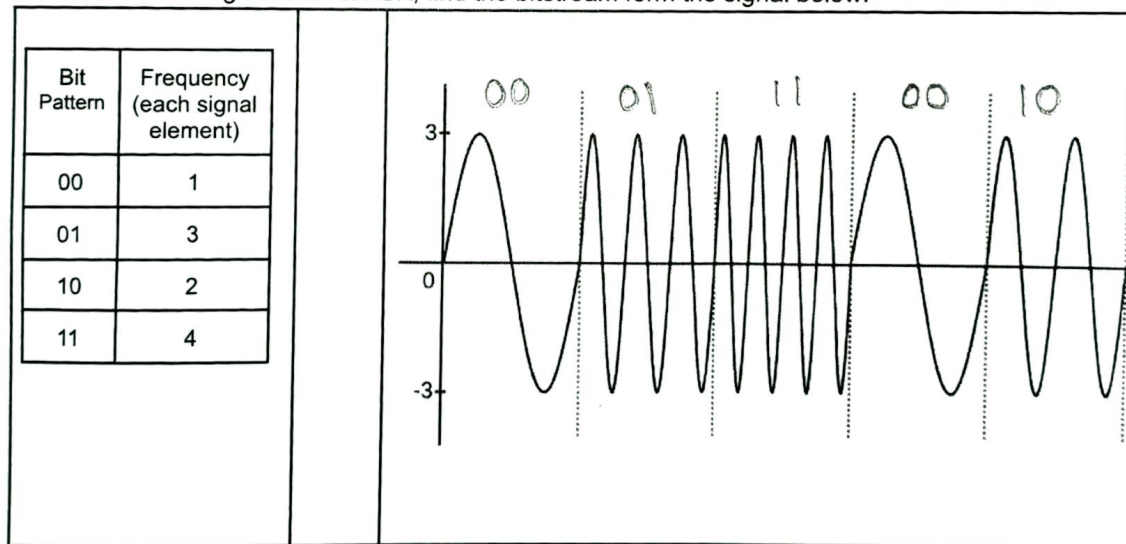
Phase Shift Keying (PSK)

Binary PSK

9. Determine the digital bit stream from the analog signal below. The signal was modulated using Binary PSK where 0 means signal element with phase of 0 rad and 1 means signal element with phase of π rad.
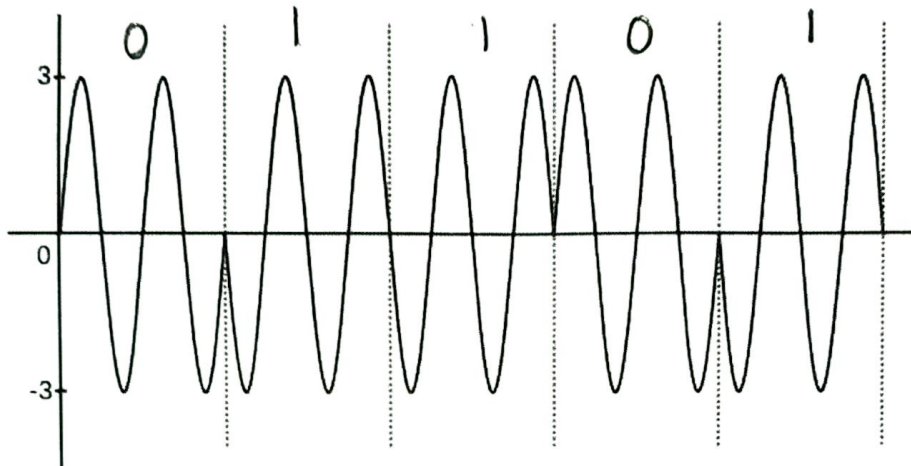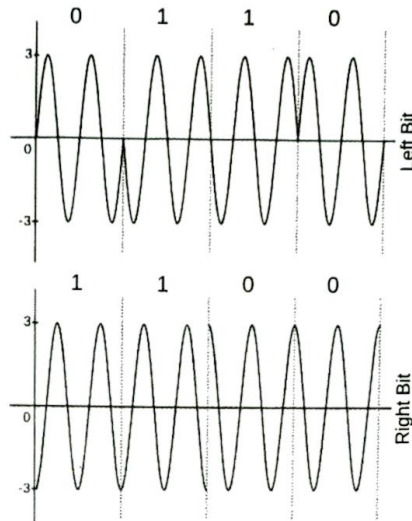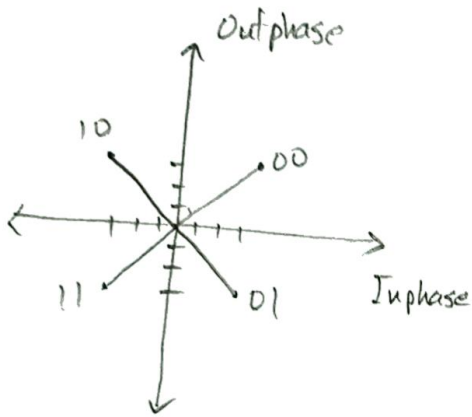

10. Draw the analog signal for the digital bit stream 010011 using Binary PSK where 0 means signal element with phase of 0 rad and 1 means signal element with phase of π rad.
     [*Amplitude = 3v and freq = 2 (for each signal element)*]
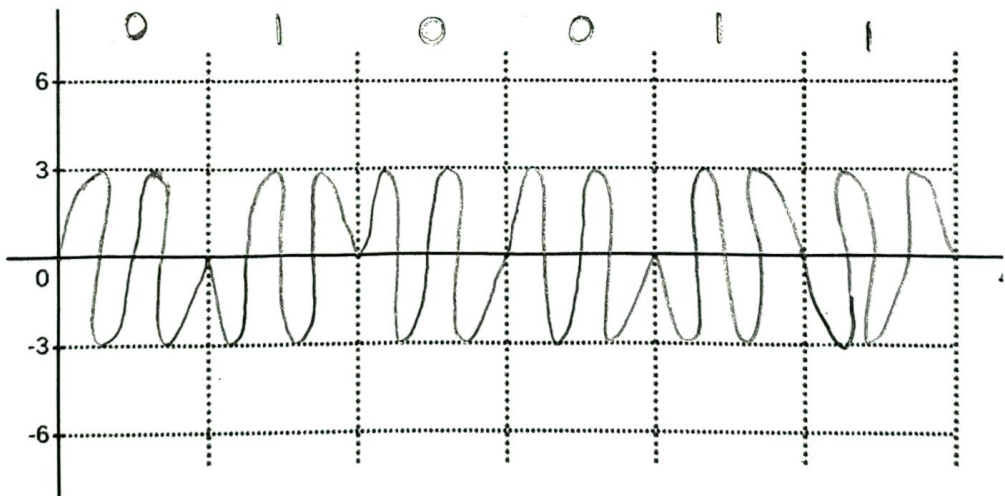
QPSK & Constellation Diagram:

11. Draw the constellation diagram for the QPSK given below:

Outphase

10

.00

11 · ·01

Inphase

0   1   1   0

Left Bit

1   1   0   0

Right Bit

amplitude = $\sqrt{2}$

01	−45°
11	−135°
10	135°
00	45°

12. Draw the analog signal for the bit stream 1011001011 using the constellation diagram given below
[frequency = 2 for each signal element]

10 ● (1,0)

(0,0)
-10

-5   0   5   10

(1,1)

-10 ● (0,1)

10   11   00   10   11

10v
5v
Ov
-5v
-10v

Amplitude