Assignment - 3

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Section: 32

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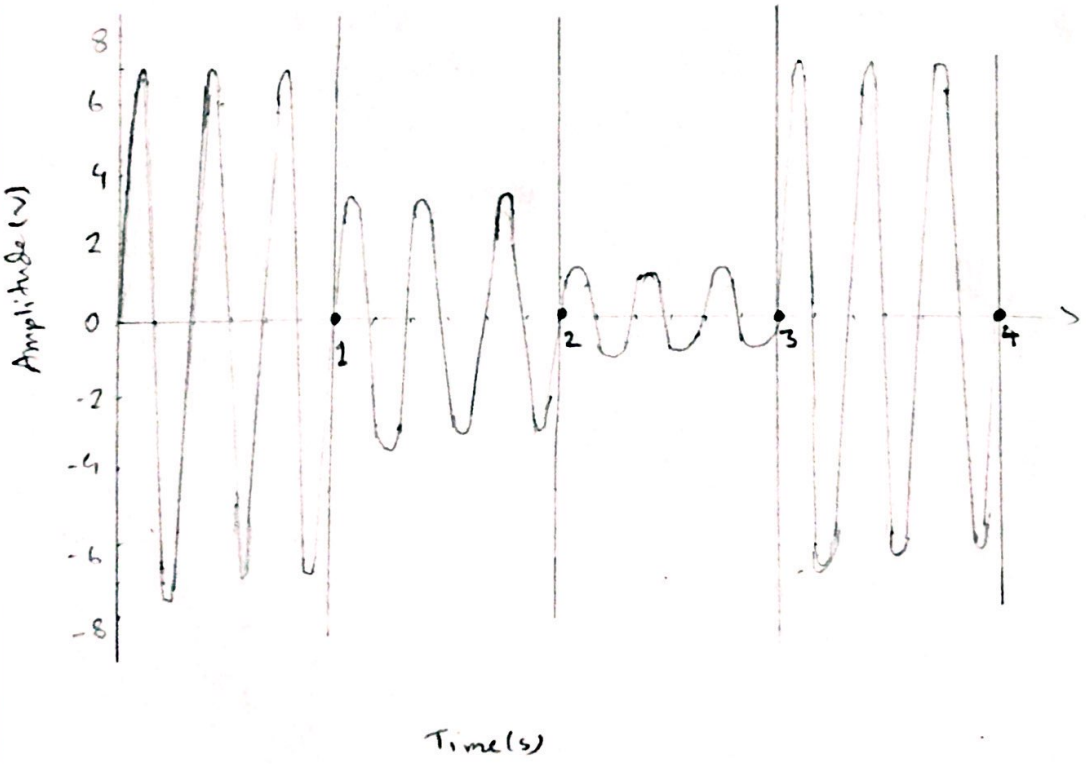
Ans. to the Ques. No. - 1

PSK is more robust than ASK in noisy environments because PSK relies on changes in the phase of the carrier signal, which is less affected by amplitude noise commonly present in transmission. But ASK is susceptible to noise because it relies directly on amplitude variations, which can easily be distorted by interferences.

Ans to the Ques. No - 2

11010011 → the transmitted amplitudes in sequence → 7V, 3V, 1V, 7V



Ans. to the Ques No. 3

a

$f_c = 12$ Hz

$\Delta f = 4$ Hz

$\therefore f_1 = f_c + \Delta f = 12 + 4 = 16$ Hz (for binary 1)

$\therefore f_0 = f_c - \Delta f = 12 - 4 = 8$ Hz (for binary 0)

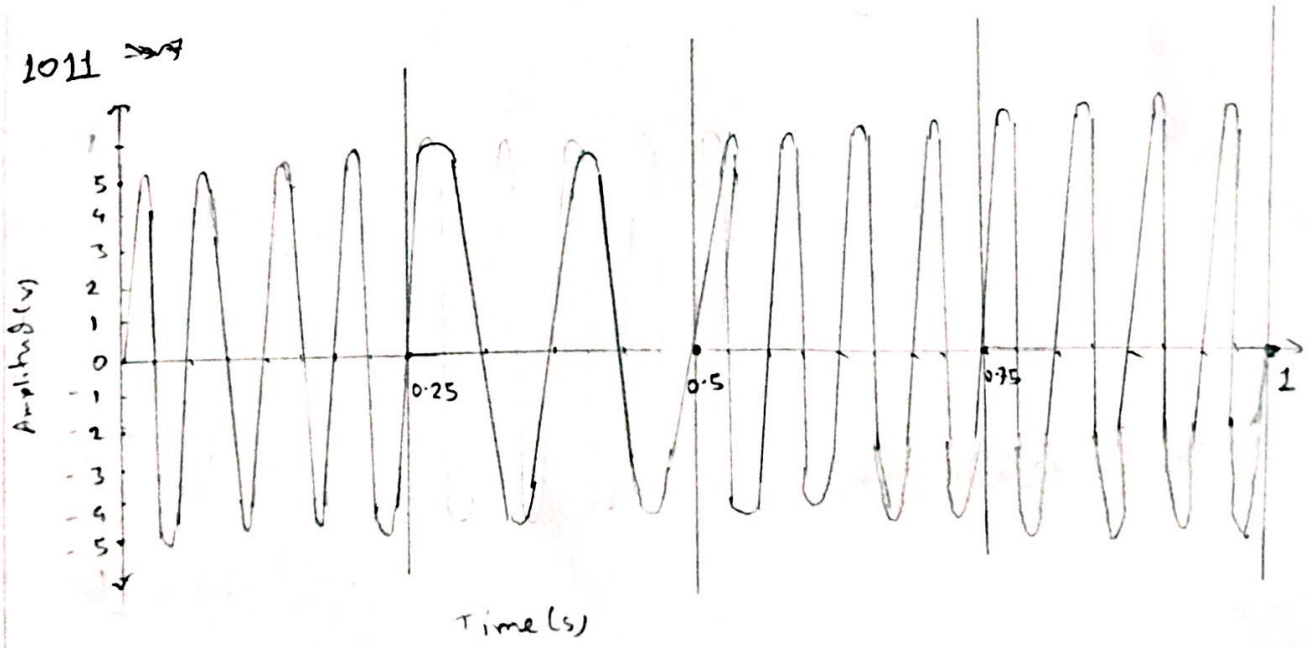
b

$T = 1$ s

number of bits = 4

$\therefore T_c = \frac{T}{4} = \frac{1}{4} = 0.25$ s

c



g

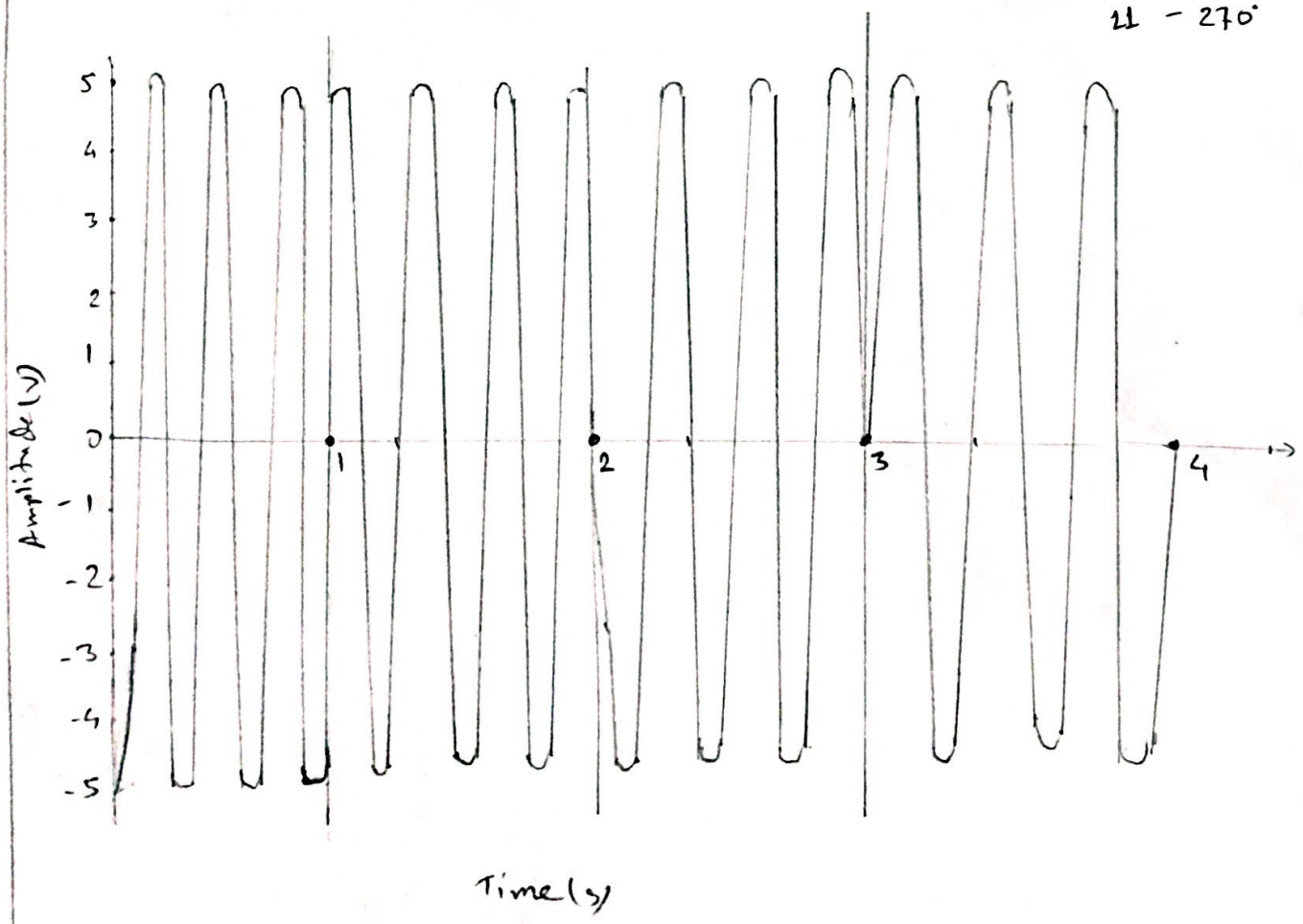
The signal is coherent. Because the phase continuity between frequency shifts is maintained. Coherent FSF ensures that there are no abrupt changes in a phase. Thus, the signal is coherent.

Ans. to the Ques. No. - 4

11010100

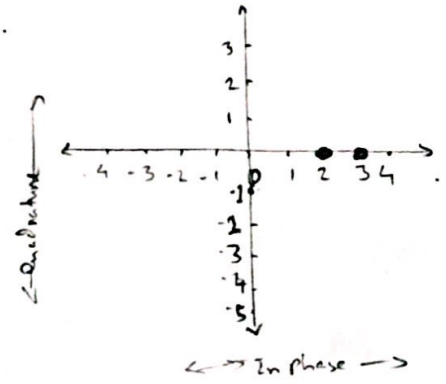
peak amplitude = 5V

00 - 0°
01 - 90°
10 - 180°
11 - 270°



Ans. to the Ques No.- 5

a.

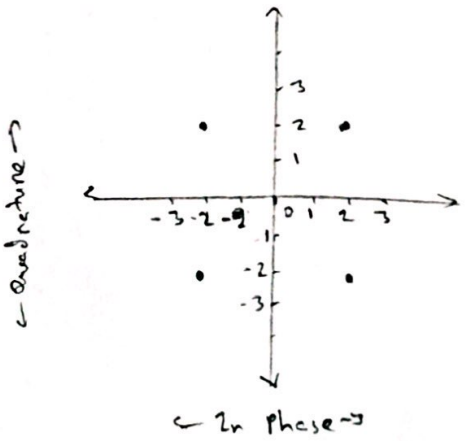


$\sqrt{(2-0)^2} = 2$

$\sqrt{(3-0)^2} = 3$

- Peak amplitude = 3
- Modulation type : ASK

c.



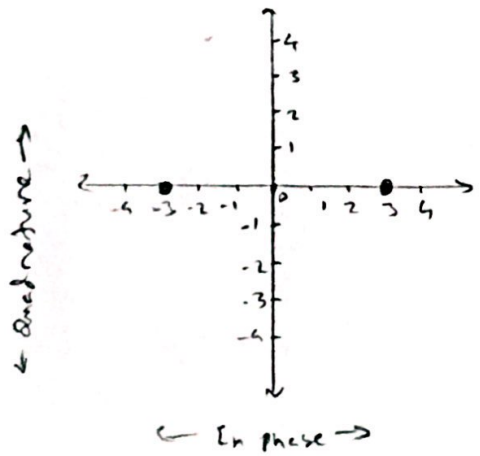
$\sqrt{(2-0)^2+(2-0)^2} = \sqrt{(0+2)^2+(2-0)^2}$

$= \sqrt{(0+2)^2+(0+2)^2} = \sqrt{(2-0)^2+(0+2)^2}$

$= 2\sqrt{2}$

- Peak amplitude = $2\sqrt{2}$
- Modulation type : QAM

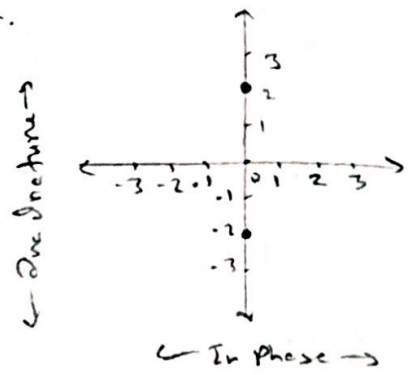
b.



$\sqrt{(3-0)^2} = \sqrt{\{0-(-3)\}^2} = 3$

- Peak amplitude = 3
- Modulation type : PSK

d.



$\sqrt{(2-0)^2} = \sqrt{(0+2)^2} = 2$

- Peak amplitude = 2
- Modulation type: PSK

Ans. to the Ques No:- 6

a

$f_{max} = 15$ kHz

minimum sampling rate $= 2 \times f_{max}$

$= 2 \times 15 = 30$ kHz

b

$\because 30 < 45$

$\therefore$ 45 kHz is oversampling.

Oversampling occurs when the sampling rate exceeds the Nyquist rate/minimum sampling rate.

Ans. to the Ques. No. 7

a

signal range $= 10 - (-10) = 20$ V

Levels $= 16$

width of each quantization zone, $\Delta = \frac{20}{16} = 1.25$ V

b

Levels $= 16$

$= 2^4$

$\therefore$ 4 bits required.

Ans. to the Ques. No- 8

signal range = -24V to +24V

Levels = 2^3

$= 8$

width, $\Delta = \frac{48}{8} = 6$ V

8 zones are: -24 to -18, -18 to -12, -12 to -6, -6 to 0, 0 to +6, +6 to +12, +12 to +18, +18 to +24.

midpoints are: -21, -15, -9, -3, +3, +9, +15, +21.

Quantization code: 0, 1, 2, 3, 4, 5, 6, 7

Encoded words: 000, 001, 010, 011, 100, 101, 110, 111

Time (ms)	Analog signal value (V)	Normalized PAM values	Normalized quantized values	Quantization code	Encoded words
0	8.6	1.43	$1.5(\frac{9}{6})$	5	101
1	-12.3	-2.05	$-2.5(\frac{-15}{6})$	1	001
2	15.7	2.62	$2.5(\frac{15}{6})$	6	110
3	-19.8	-3.3	$-3.5(\frac{-21}{6})$	0	000
4	5.4	0.9	$0.5(\frac{3}{6})$	4	100