DC tut-7

19BCE245

1) A cable company uses one of the cable TV channels with a bandwidth of 6 MHz to provide digital communication for each resident. What is the available data rate for each resident if the company uses a 64 - QAM technique?

→ $B = 6\ MHz$

$B = (1+d)S$

$\therefore S = \frac{B}{1+d}$ where $d = 0$

$\therefore S = B$

$\therefore S = 6\ Mbps$ (baud per second).

$S = \frac{N}{r}$

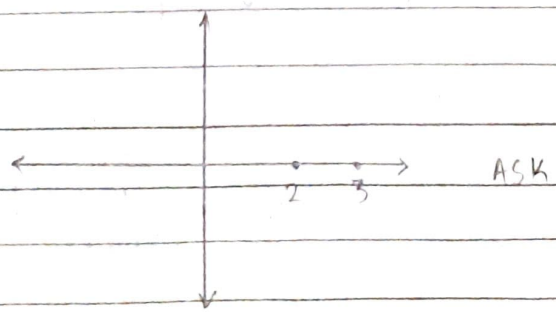
$N = 6M \times \log_2 64$

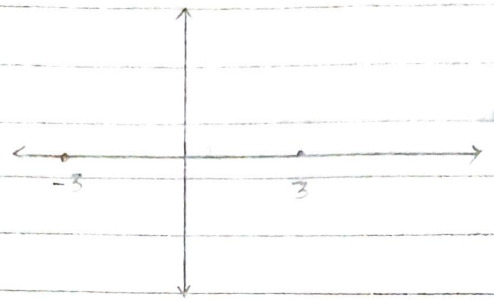
$\therefore N = 6M \times 6$

$\therefore N = 36\ Mbps$

2) Draw the constelation diagram for the following cases find the peak amplitude value for each case. and define the type of modulation.

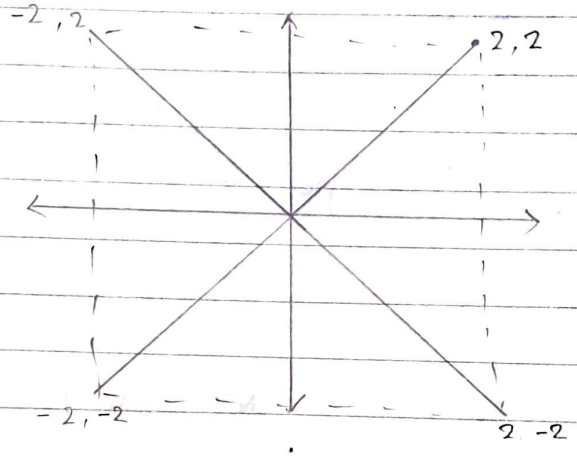
→ Two points at (2,0) and (3,0)





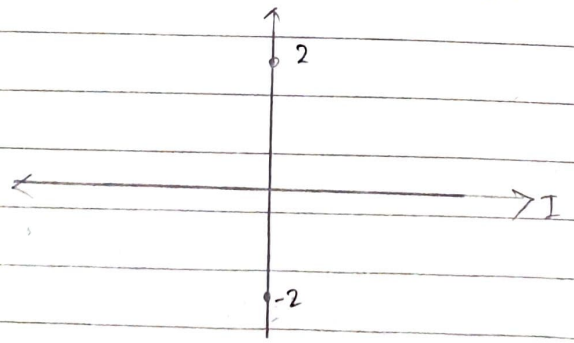
BPSK

c) four points at (2,2) (-2,2) (-2,-2) (2,-2)



QAM

d) two points at (0,2) and (0,-2)



PSK

3.) A corporation has medium with 1-MHz bandwidth. The corporation need to create 10 separate independent channels each capable of sending at least 10 mbps. The company has decided to use QAM technology. what is the maximum number of bits per baud for each channel? what is the number of points in constellation diagram for each channel? let d=0.

→ The number of bit per baud is:

here $B = (1+d)S$

$\therefore B = (1+d)\frac{N}{r}$

$\therefore B = \frac{N}{r}$ $(\because d = 0)$

$\therefore r = \frac{N}{B} = \frac{10/10}{1/10} = 10$

$\therefore$ Points in QAM $= 2^r = 1024$

$\therefore r \log_2 2 = \log_2 1024$

$\therefore r = 10$

∴ So that we need a 1024 - QAM to achieve that data rate.

4) The telephone line has a 4 kHz bandwidth. what is the maximum number of bits we can send using each of the following techniques:
let $d = 0$

→ (a) ASK

$B = (1+d)S$

$= S$ $(\because d = 0)$

$= \frac{N}{r}$

$\therefore N = Br$

$\therefore N = 4$ Kbps $(\because r = 2$

b) QPSK

$r = \log_2 4$

$r = 2$

Formula to be use:

$N = \frac{1}{(1+d)} \times r \times B.$

a) $r = \log_2 2 = 1$

$N = \frac{1}{(1+0)} \times 1 \times (4\text{ kHz}) = \boxed{4\text{ Kbps}}$

$B = (1+d)\frac{N}{r}$

$\therefore N = Br$

$\therefore N = 8$ Kbps.

b.) $r = \log_2 16 = 4$

$N = \frac{1}{1+0} \times 2 \times (4\,KHz) = \boxed{8 \text{ Kbps}}$

(d.) $r = \log_2 16 = 4$

$N = \frac{1}{(1+0)} \times 4 \times (4\,KHz) = \boxed{16 \text{ Kbps}}$

d.). $r = \log_2 64 = 6$

$N = \frac{1}{(1+0)} \times 6 \times (4\,KHz) = \boxed{24 \text{ Kbps}}$

5.) How many bits per baud can we send in each of the following cases if the signal constellation has one of the following number of points?

a. 2 b. 4 c. 16 d. 1024

→ formula to be used:

$r = \log_2 L$

a. $r = \log_2 2 = \boxed{1}$

b. $r = \log_2 4 = \boxed{2}$

c. $r = \log_2 16 = \boxed{4}$

d $r = \log_2 1024 = \boxed{10}$

6.) find the bandwidth for the following situations if we need to modulate a 5 kHz voice.

→ a.) AM

$B_{AM} = 2 \times B = 2 \times 5 = 10$ kHz

b.) fm (B=5)

$B_{fm} = 2 \times (1+B) \times B$

$= 2 \times 6 \times 5$

$= 60$ kHz

c.) pm (B=2)

$B_{pm} = 2 \times (1+B) B$

$= 2 \times 2 \times 5$

$= 20$ kHz

7.) What are two components of a signal when the signal is represented on a contellation diagram? which component is shown on the horizontal axis? which is shown on the vertick axis?

→ The two components of a signal are called I and Q. The I component, called inphase, is shown on the horizontal axis, the Q component, called quadrature, is shown on the vertickle axis.

19BCE245 tut - 7 B

1) Distinguish b/w multiple TDM, multiple slot TDM and pulse stuffed TDM

→ for the multilevel TDM, in which some lower rate lines are combined to make a new line with the same data rate as the other line. multiple slot TDM, on the other hand, uses multiple slots for higher data rate lines to make them compatible with the lower data rate line pulse stuffing TDM is used when the data rates of some lines are not an integral multiple of other lines.

2) Distinguish b/w synchronous and statistical TDM.

→ In synchronous TDM each input has a reversed slot in the output frame. This can be inefficeint if some input lines have no data to send. In statistical TDM, slots are dynamically allocated. to improve bandwidth efficeincy. only when an input lines has a slots worth of data to seend is it given a slot in the output frame.

3) Distinguish b/w a link and a channel in multiplexing.

→ Link is a physical path the coord channel refers to the partition of a link that carries a transmission b/w a given pair of lines. one link can have many channels.

4) Assume that voice channel occupies a bandwidth of 4 kHz. we need to multiplex 10 voice channeles with gaurd bands of 500 Hz using FDM. calculate the required bandwidth.

→ bandwidth = 4 kHz

n = 10 voice channel

guard bandwidth = 500 Hz.

required bandwidth : (4 kHz × 10) + (500 Hz × 9)

= 44.5 kHz