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ANSWER1(a)

For 10 channels, we have need at least 9 guardbands This means that the required bandwidth is at least

$$10 \times 4 + 0.5 \times 9 = 44.5 \text{ kHz}$$

ANSWER4(b)

A sine wave is defined by three characteristics, amplitude, frequency and phase.

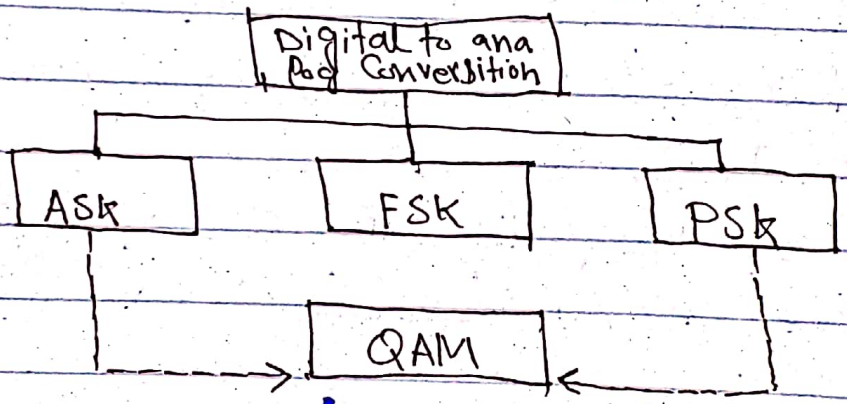
When we vary any one of these characteristics, we create a diff version of that wave.

So, by changing one characteristic of a simple electric signal we can use it to represent digital data.

Any of the three characteristics of a simple can be altered in this way, giving us at least three machanism for modulating digital

(2)

dat into an analog signal
Amplitude shift keying (ASK)
frequency shift keying (FSK)
phase shift keying (PSK)
in addition there is a fourth mechanism that combines changing both the amplitude and phase called quadrature amplitude (QAM)
QAM is the most efficient of these options and is the mechanism commonly used today.



ANSWER 1(b)

In case $\gamma = 4$, $S = 3000$ and N is unknown lets find the value of N from below formula.

$S = N \times 1/\gamma$ or $N = S \times \gamma$

$N = 3000 \times 4 = 12000$ bps

③

ANSWER1(D)

Link refers to the physical path while channel refers to the portion of a link that carries a transmission between a given pair of lines.

one link can have many(n) channels.

ANSWER1(C)

A data element is the smallest piece of information to be exchanged the bit.

A signal element is the smallest unit of a signal that is constant.

ANSWER1(e)

Asynchronous, inthis we send 1 start bit at the beginning and 1 or more stop bits at the end of each byte

Synchronous, inthis, we send bits in a serial order with out any gaps.

Isynchrounous, it sends a block of data synchronously

④

ANSWER4(A)

In FDM the total bandwith is divided to a set of frequency bands that do not overlap. Each of these bands that do not is carrier of a different signal that is generated and modulated by one of the sending devices. The frequency bands are seperated from one another by strips of unused frequenc ies called the guard bands, to prevent ovelaping of signals. The modulated signals are combined together using a multiplexer (MUX) inthe sending end. The combi ned signal is transmitted over the communication channel, thus allowing multiple independent data streams to be transmitted simultaneously. At the receiving end, the individual signals are extracted from the combined signal bythe process of demultiplexing (DEMUX)

(5)

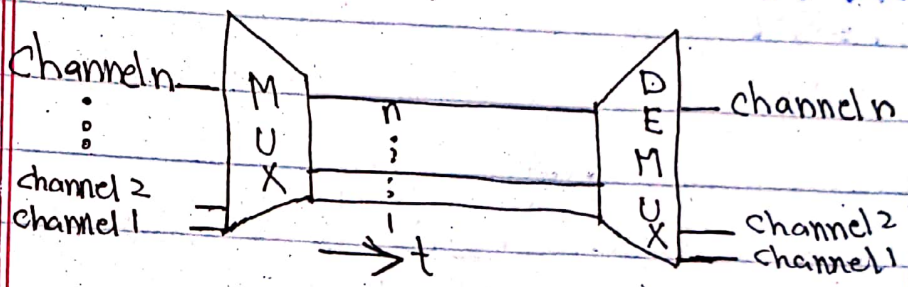
TDM

TDM stands for time division multiplexing.
TDM works with digital signals as well as analog signals.
TDM has low conflict.
Wiring or chip of TDM is simple
TDM is efficient.
In TDM, time sharing takes place.
In TDM synchronization pulse is necessary.

FDM

stands for frequency division multiplexing.
while FDM works with only analog signals.
while it has high conflict
while it's wiring or chip is complex rather than simple
while it is inefficient
while in this frequency sharing takes place.
while in it Guard band it necessary.

(6)



ANSWER 3(a)

The modle of the bandwith is located at 650 kHz. This mean that our frequency can be at $f_c = 650 kHz$

we can use the formula for bandwith to find the bit rate with d=1 are

$R = 300 kHz$

500 to 800 kHz

$B = (1 + d) \times S$.

$B = 2S$

$B = 2(N \times 1/8)$

$B = 2(N)$

$800 = 2N$

$N = 2/300$

$N = 150$ kbs

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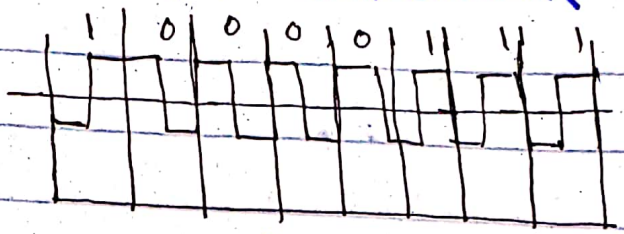
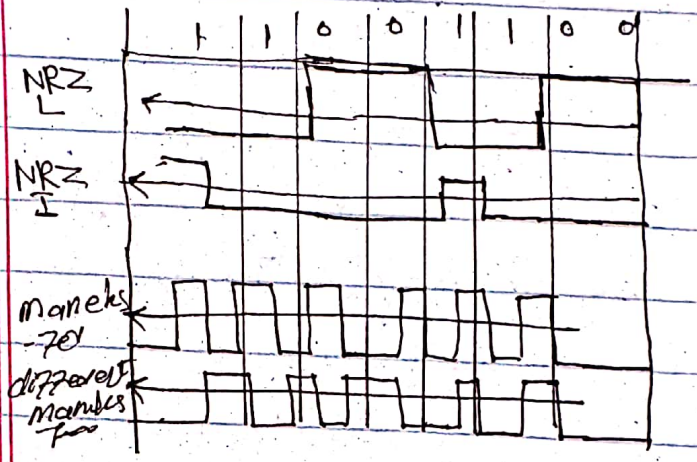
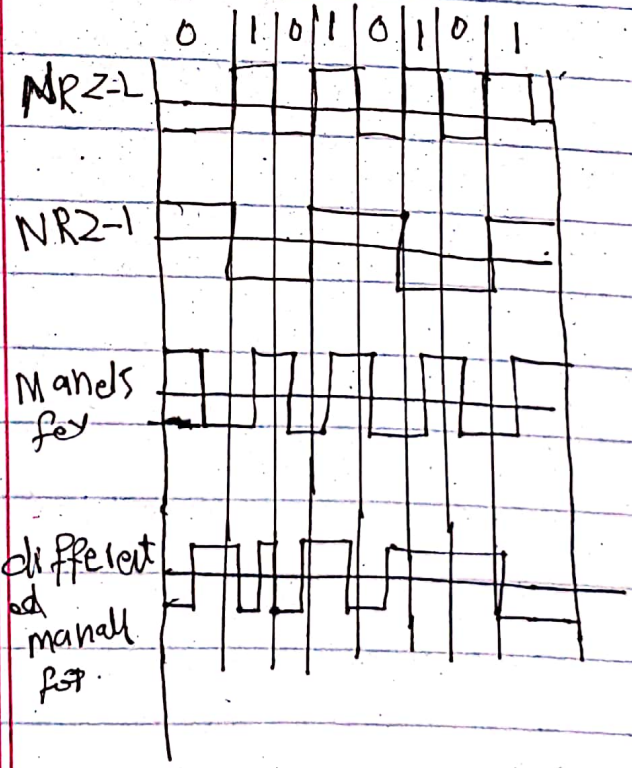
ANSWER2(a)



ANSWER2(sec b)





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Answer 3(b)

Although we can have several levels (kinds) of signal elements, each with a different amplitude, ASK is normally implemented using only two levels.

This is referred to as binary amplitude shift keying or on-off keying (OOK).

The peak amplitude ~~shift keying~~ of one signal level is 0; the other is the same as the amplitude of the carrier frequency.