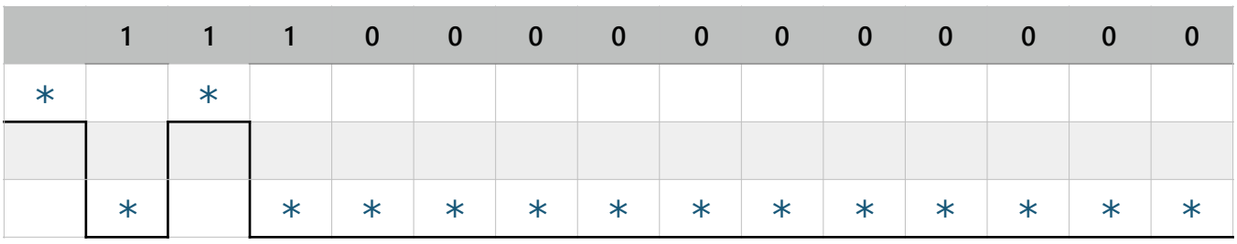
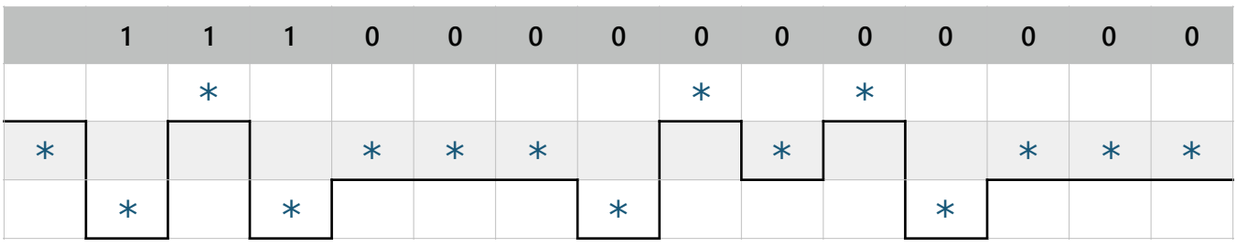
# DC Assignment II

1. What is the result of scrambling the sequence 11-10-00-00-00-00-00 using each of the following scrambling techniques. Assume last non zero signal level was +ve.

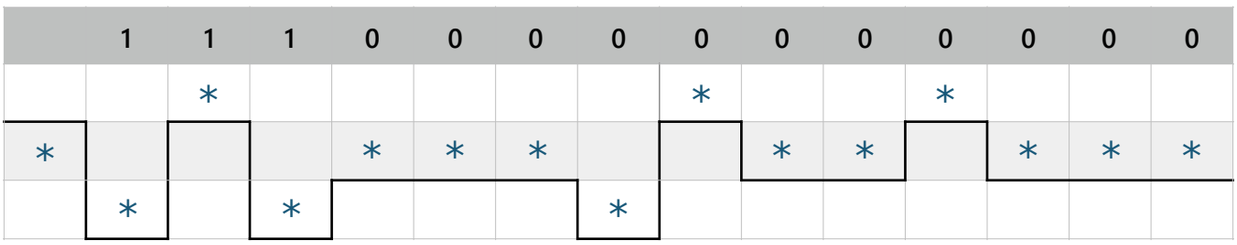
   A. NRZ-I




   B. B8ZS




   C. HDB3 (The number of non zero pulses is odd after last submission.)

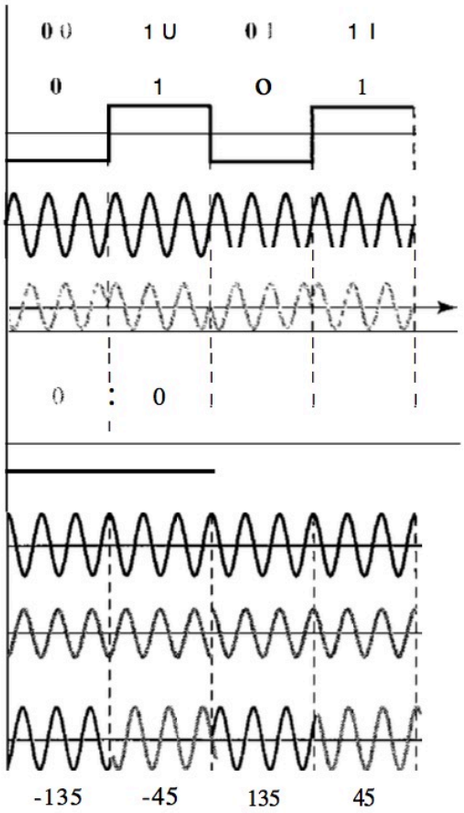


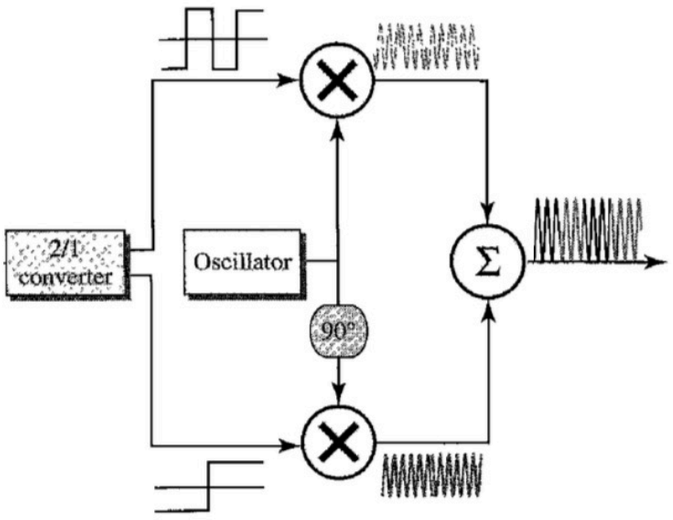
**2. Explain quadrature phase shift keying with neat diagrams.**

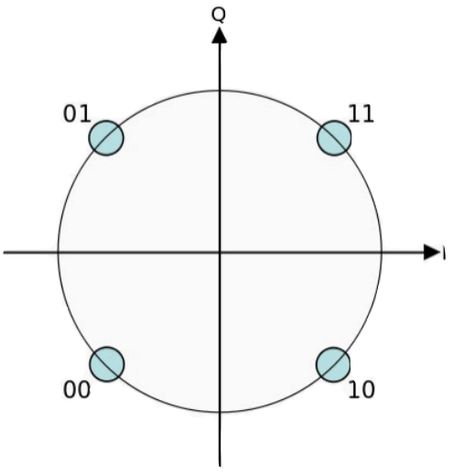
Quadrature Phase Shift Keying (QPSK) is a form of Phase Shift Keying in which two bits are modulated at once, selecting one of four possible carrier phase shifts (0, 90, 180, or 270 degrees). QPSK allows the signal to carry twice as much information as ordinary PSK using the same bandwidth.

The incoming bits are first passed through a serial-to-parallel conversion that sends one bit to one modulator and the next bit to the other modulator. If the duration of each bit in the incoming signal is T, the duration of each bit sent to the corresponding BPSK signal is 2T; this means that the bit to each BPSK signal has one-half the frequency of the original signal.

The two composite signals created by each multiplier are sine waves with the same frequency, but different phases. When they are added, the result is another sine wave, with one of four possible phases: 45º, -45º, 135º and -135º.



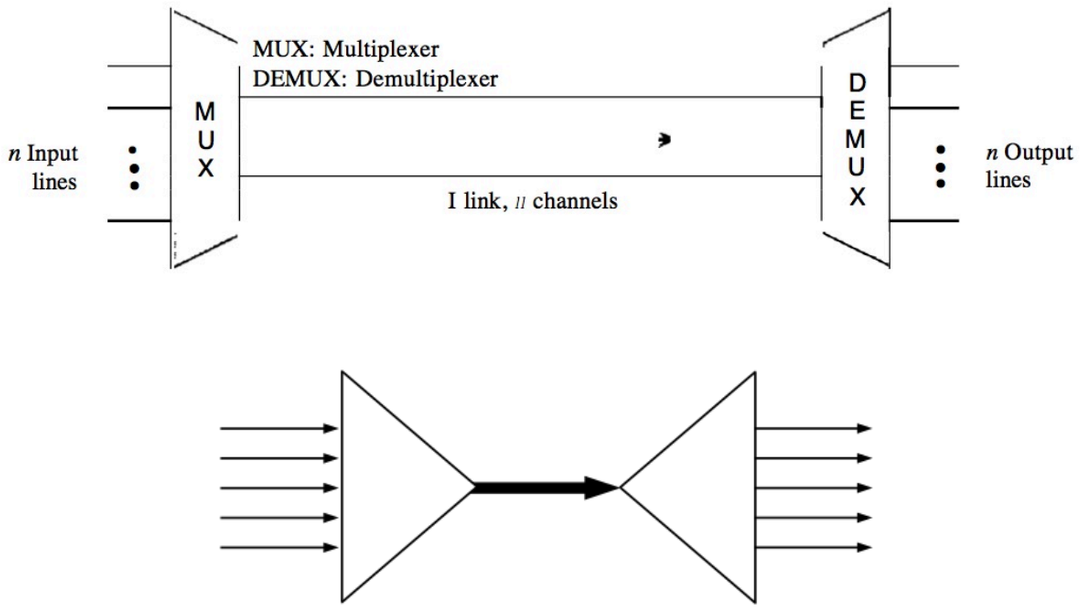

Constellation diagram for QPSK with Gray coding. Each adjacent symbol only differs by one bit.

3. **Explain multiplexing process and demultiplexing process with neat diagrams.**

Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link.

In a multiplexed system, *n* lines share the bandwidth of one link. The lines on the left direct their transmission streams to a multiplexer (MUX), which combines them into a single stream (many-to- one).

At the receiving end, that stream is fed into a demultiplexer (DEMUX), which separates the stream back into its component transmissions (one-to-many) and directs them to their corresponding lines.






There are three basic multiplexing techniques: frequency-division multiplexing, wavelength-division multiplexing, and time-division multiplexing.

**4. Explain statistical time division multiplexing with neat diagrams.**

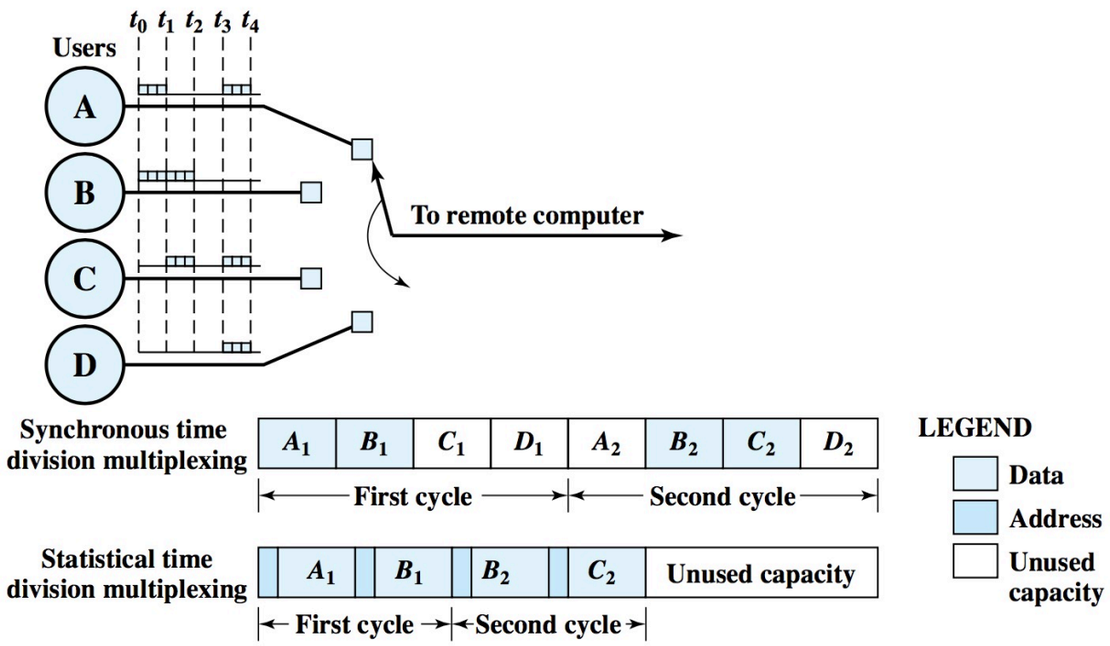
In statistical multiplexing, a communication channel is divided into an arbitrary number of variable bitrate digital channels or data streams. The link sharing is adapted to the instantaneous traffic demands of the data streams that are transferred over each channel. This is an alternative to creating a fixed sharing of a link, such as in general time division multiplexing (TDM) and frequency division multiplexing (FDM).

In statistical multiplexing, each packet or frame contains a channel/data stream identification number, or (in the case of datagram communication) complete destination address information.

Statistical multiplexing allows the bandwidth to be divided arbitrarily among a variable number of channels (while the number of channels and the channel data rate are fixed in TDM).

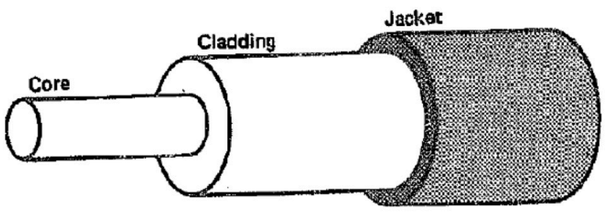
It ensures that slots will not be wasted (whereas TDM can waste slots). The transmission capacity of the link will be shared by only those users who have packets.

Because statistical TDM takes advantage of the fact that the attached devices are not all transmitting all of the time, the data rate on the multiplexed line is less than the sum of the data rates of the attached devices. Thus, a statistical multiplexer can use a lower data rate to support as many devices as a synchronous multiplexer.



5. **Explain construction, propagation modes and performance of optical fiber cable communication.**

Optical fibers are long, thin strands of very pure glass about the size of a human hair. They are arranged in bundles called optical cables and used to transmit signals over long distances.




Physically based on total internal reflection (critical angle, using Snell's law).

Optical fiber consists of a core and a cladding layer, selected for total internal reflection due to the difference in the refractive index between the two. The cladding is usually coated with a layer of acrylate polymer or polyimide.

Propagation modes include:

***Multi Mode***

Step-index – Core and Cladding material has uniform but different refractive index.

Graded Index – Core material has variable index as a function of the radial distance from the center.

***Single Mode***

The core diameter is almost equal to the wave length of the emitted light so that it propagates along a single path.

Performance:

The plot of attenuation versus wavelength shows a very interesting phenomenon in fiber-optic cable. Attenuation is flatter than in the case of twisted-pair cable and coaxial cable. The performance is such that we need fewer (actually 10 times less) repeaters when we use fiber-optic cable.