1. Determine the number of subnets and hosts per subnet possible for the network 192.168.1.0/27? List their subnet’s Nework ID,Host ID and Broadcast ID.

Given the network address 192.168.1.0/27, the subnet mask can be determined by converting the prefix length to binary:

11111111.11111111.11111111.11100000

This subnet mask indicates that the first 27 bits of the IP address are the network address, and the remaining 5 bits are the host address. Therefore, the number of bits available for the host address is 2^5 - 2 = 30, since 2 bits are reserved for the network and broadcast addresses.

To calculate the number of subnets, we need to look at the bits in the fourth octet of the network address, which are used for subnetting. In this case, the first 27 bits are fixed, so the subnet bits are located in the last 5 bits of the fourth octet:

Network address: 192.168.1.0 Subnet mask: 255.255.255.224 (or /27) Subnet bits: 00011111

The number of subnets can be calculated as 2^5 = 32.

To calculate the number of hosts per subnet, we use the formula 2^h - 2, where h is the number of bits available for the host address. In this case, h = 5, so the number of hosts per subnet is 2^5 - 2 = 30.

The subnet details can be summarized as follows:

Subnet 1: Network ID: 192.168.1.0 First usable IP: 192.168.1.1 Last usable IP: 192.168.1.30 Broadcast ID: 192.168.1.31

Subnet 2: Network ID: 192.168.1.32 First usable IP: 192.168.1.33 Last usable IP: 192.168.1.62 Broadcast ID: 192.168.1.63

Subnet 3: Network ID: 192.168.1.64 First usable IP: 192.168.1.65 Last usable IP: 192.168.1.94 Broadcast ID: 192.168.1.95

And so on, up to Subnet 32.

2. Explain Pulse code modulation and delta modulation

Pulse Code Modulation (PCM) is a digital modulation technique used to represent an analog signal by converting it into a digital signal. In PCM, the analog signal is sampled at regular intervals, and each sample is then quantized to a digital value using a specified number of bits. The resulting digital signal consists of a stream of binary numbers, each of which represents the amplitude of the analog signal at a specific point in time.

Delta Modulation (DM) is a type of analog-to-digital conversion technique that is used to encode an analog signal into a digital signal by transmitting the difference between successive samples instead of the actual sample values. In DM, the analog signal is approximated using a staircase waveform, and the changes in the staircase height are used to represent the analog signal. Each change in the staircase height is quantized to a single bit, with a value of either 0 or 1, depending on whether the change is positive or negative.

The main difference between PCM and DM is that PCM represents the actual sample values of the analog signal, while DM represents only the differences between successive samples. This makes DM more efficient than PCM in terms of the amount of data that needs to be transmitted or stored, but it also makes DM more prone to quantization errors and signal distortion.

In summary, Pulse Code Modulation (PCM) is a digital modulation technique that converts an analog signal into a digital signal by sampling and quantizing the analog signal at regular intervals, while Delta Modulation (DM) is an analog-to-digital conversion technique that represents the analog signal by transmitting the differences between successive samples.

3. An organization is grant4ted with IP address 192.16.2.0/24. The administration wants to create 4 subnets. Calculate the following

1) **Find the subnet mask**
2) **Number of hosts in each subnet**
3) **First & Last host address of each subnet**
4) **Network & Broadcast address of each**

1. Subnet mask: To create 4 subnets, we need to borrow 2 bits from the host bits of the given /24 network address. This gives us a subnet mask of 255.255.255.192.
2. Number of hosts in each subnet: With a /26 subnet mask (borrowing 2 bits), we have 6 host bits remaining in each subnet. This gives us 2^6 - 2 = 62 hosts per subnet (excluding the network and broadcast addresses).
3. First & Last host address of each subnet: The first host address in each subnet is obtained by adding 1 to the network address. The last host address is obtained by setting all the host bits to 1, except for the last bit which is set to 0. So, the first and last host addresses in each subnet are as follows:

Subnet 1: First host = 192.16.2.1, Last host = 192.16.2.62 Subnet 2: First host = 192.16.2.65, Last host = 192.16.2.126 Subnet 3: First host = 192.16.2.129, Last host = 192.16.2.190 Subnet 4: First host = 192.16.2.193, Last host = 192.16.2.254

4. Network & Broadcast address of each subnet: The network address of each subnet is the same as the network address of the original /24 network. The broadcast address of each subnet is obtained by setting all the host bits to 1. So, the network and broadcast addresses of each subnet are as follows:

Subnet 1: Network address = 192.16.2.0, Broadcast address = 192.16.2.63 Subnet 2: Network address = 192.16.2.64, Broadcast address = 192.16.2.127 Subnet 3: Network address =

192.16.2.128, Broadcast address = 192.16.2.191 Subnet 4: Network address = 192.16.2.192, Broadcast address = 192.16.2.255

4. List the different types of guided media used in communication channel and explain them in detail

Guided media, also known as wired media, are physical media through which data is transmitted in communication channels. Guided media are generally more reliable and secure than unguided media as they are protected from electromagnetic interference and signal loss. There are several types of guided media used in communication channels:

1. Twisted Pair Cable: Twisted pair cable consists of two insulated copper wires twisted around each other. It is commonly used in local area networks (LANs) and telephone systems. Twisted pair cables are available in two types: unshielded twisted pair (UTP) and shielded twisted pair (STP). UTP cables are commonly used in LANs, while STP cables are used in more demanding applications that require higher data rates and greater noise immunity.
2. Coaxial Cable: Coaxial cable consists of a central conductor surrounded by an insulating layer, a metallic shield, and an outer sheath. It is commonly used in cable television (CATV) systems, LANs, and high-speed internet connections. Coaxial cables offer greater bandwidth and longer transmission distances than twisted pair cables.
3. Fiber Optic Cable: Fiber optic cable consists of thin strands of glass or plastic fibers that transmit data using light. It is commonly used in high-speed internet connections, long-distance telephone networks, and cable television systems. Fiber optic cables offer higher bandwidth and longer transmission distances than twisted pair and coaxial cables.
4. Waveguide: Waveguide is a hollow metal tube that guides electromagnetic waves at microwave frequencies. It is commonly used in satellite communication systems, radar systems, and microwave ovens. Waveguides offer low signal loss and high power handling capabilities.
5. Parallel Wire: Parallel wire is a type of guided media that consists of multiple parallel wires. It is commonly used in low-speed data transmission applications.

In summary, guided media provide a secure and reliable means of transmitting data in communication channels. The choice of guided media depends on the application, distance, bandwidth requirements, and budget.

5. Mention the NRZ-L and NRZ-I using the data stream 00000000,assuming that last signal level has been positive,

NRZ-L (Non-Return-to-Zero Level) and NRZ-I (Non-Return-to-Zero Inverted) are two types of line encoding schemes used for digital data transmission.

In NRZ-L, the signal level is held constant during the bit interval if the data is a 0 and changes polarity if the data is a 1. Therefore, in this case, the NRZ-L signal would be a series of eight consecutive positive signal levels because the input data stream is all zeros and the last signal level is positive. The NRZ-L encoded signal would be:

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In NRZ-I, the signal level changes during the bit interval if the data is a 1 and remains the same if the data is a 0. In this case, the NRZ-I signal would alternate between positive and negative signal levels for each consecutive 1 in the input data stream. Therefore, the NRZ-I encoded signal would be:

−+−−+−+−

6. Compare and Contrast TDM,FDM and WDM

Aspect	TDM	FDM	WDM
Definition	Multiplexing technique where multiple signals are interleaved in time	Multiplexing technique where multiple signals are combined onto different frequencies and transmitted simultaneously	Multiplexing technique where multiple signals are combined onto different wavelengths of light and transmitted simultaneously
Type of Multiplexing	Digital	Analog	Optical
Bandwidth allocation	Each signal is given a time slot and uses the full available bandwidth during that slot	Each signal is given a specific frequency band and uses that band of the available bandwidth	Each signal is given a specific wavelength of light and uses that wavelength of the available bandwidth
Signal Interference	There is no interference between signals as they are transmitted in different time slots	Signals can interfere with each other if they overlap in frequency	Signals can interfere with each other if they overlap in wavelength
Equipment Complexity	Requires equipment to switch between different signals at high speed	Requires equipment to separate different frequency bands and combine them into one signal	Requires equipment to separate different wavelengths of light and combine them into one signal
Examples of Use	Telecommunications networks, digital audio, video conferencing	Analog radio and television broadcasting, cable television	Fiber optic communications networks, long haul telecommunications

In summary, TDM, FDM, and WDM are all techniques used to increase the amount of data that can be transmitted over a single communication channel. They differ in how they allocate bandwidth to different signals, and in the type of signal they are used for. TDM is used for digital signals and allocates bandwidth based on time slots, FDM is used for analog signals and allocates bandwidth based on frequency bands, and WDM is used for optical signals and allocates bandwidth based on wavelengths of light.