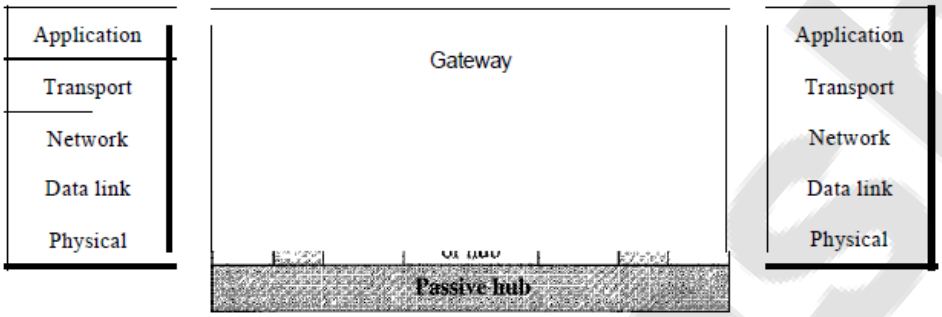
Q.1	What are Connectivity devices: passive & active device?
Ans	We divide **connecting devices** into five different categories based on the layer **in** which they operate **in** a network,

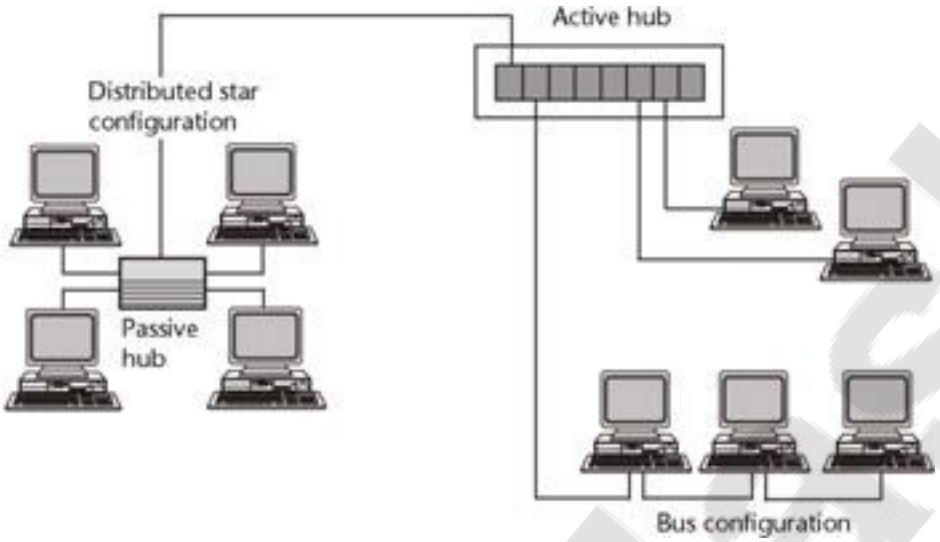
Figure 15.1 *Five categories of connecting devices*



The five categories contain devices which can be defined as
1. Those which operate below the physical layer such as a passive hub.
2. Those which operate at the physical layer (a repeater or an active hub).
3. Those which operate at the physical and data link layers (a bridge or a two-layer switch).
4. Those which operate at the physical, data link, and network layers (a router or a three-layer switch).
5. Those which can operate at all five layers (a gateway).

What is Hub: A Hub is a networking device which receives signal from the source, amplifies it and send it to multiple destinations or computers. Sometimes, hubs are also called Ethernet Hub, Repeater Hub, Active Hub and Network Hub. Basically it is a networking device which is used multiple devices like Computers, Servers etc to each other and make them work as a single network segment.

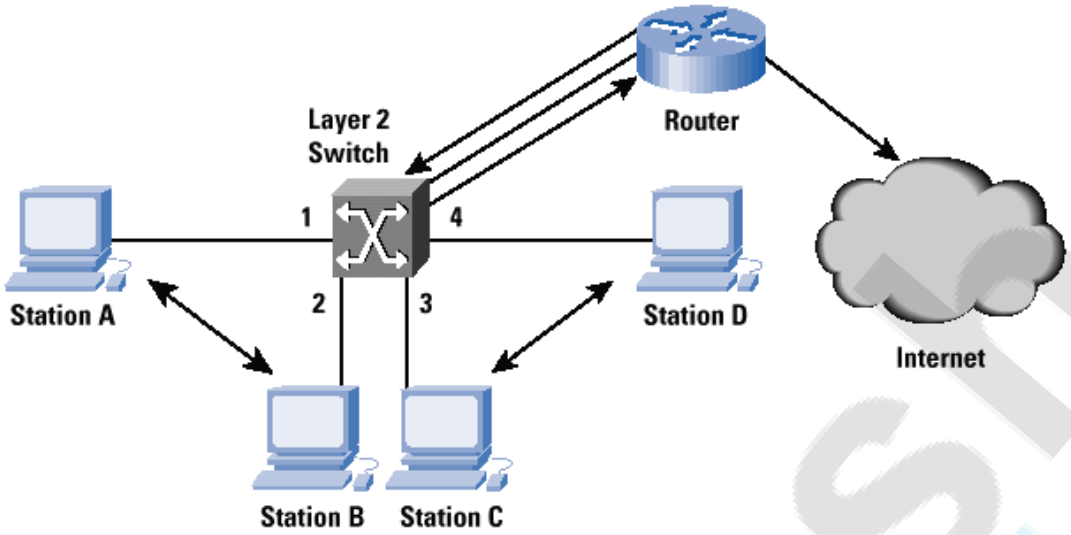
Active Hubs
An active hub is actually a multipart repeater. It is normally used to create connections between stations in a physical star topology. We have seen examples of hubs in some Ethernet implementations (lOBase-T, for example). However, hubs can also be used to create multiple levels of hierarchy, as shown in Figure 15.4. The hierarchical use of hubs removes the length limitation of 10Base-T (100 m).
It is also calld as multiport repeaters.
It Needs electrical power supply to run repeaters.



Passive Hubs
A passive hub is just a connector. It connects the wires coming from different branches. In a star-topology Ethernet LAN, a passive hub is just a point where the signals coming from different stations collide; the hub is the collision point. This type of a hub is part of the media; its location in the Internet model is below the physical layer.
It does not need electrical power to run.

Q2.	Transparent bridge , tree bridge and source route bridge
Ans	**Bridge:** A bridge is a computer networking device that builds the connection with the other bridge networks which use the same protocol. It works at the Data Link layer of the OSI Model and connects the different networks together and develops communication between them. It connects two local-area networks; two physical LANs into larger logical LAN or two *segments* of the same LAN that use the same protocol. Types of bridge: There are mainly three types in which bridges can be characterized: 1>Transperent Bridge. 2> Translational Bridge. 3> Source-route Bridge. **Transparent Bridge:** As the name signifies, it appears to be transparent for the other devices on the network. The other devices are ignorant of its existence. It only blocks or forwards the data as per the MAC address.

	Source Route Bridge: It derives its name from the fact that the path which packet takes through the network is implanted within the packet. It is mainly used in Token ring networks. **Translational Bridge:** The process of conversion takes place via Translational Bridge. It converts the data format of one networking to another. For instance Token ring to Ethernet and vice versa.
Q.3	Explain Two Layer switch and three layer switch.
Ans.	**Switch:** A network switch is a small hardware device that links multiple computers together within one local area network, wide area network and different network topology. Network switches work at Data Link Layer of the OSI model. A **switch** is a piece of a physical circuitry component that governs the signal flow. Having a switch or **toggle switch** allows a connection to be opened or closed. When opened the switch allows a signal or power to flow through the connection. When closed the switch stops the flow and breaks the circuit connection. On a network, a **switch** is a hardware device that filters and forwards network packets, but often not capable of much more. **Two Layer Switch:** A two-layer switch is a bridge, a bridge with many ports and a design that allows better (faster) performance. A bridge with a few ports can connect a few LANs together. A bridge with many ports may be able to allocate a unique port to each station, with each station on its own independent entity. This means no competing traffic (no collision, as we saw in Ethernet). **Disadvantages of layer 2** What Layer 2 switches can't do is apply any intelligence when forwarding packets. They can't route packets based on IP address or prioritise packets sent by particular applications to, for example, guarantee bandwidth to Voice over IP users.



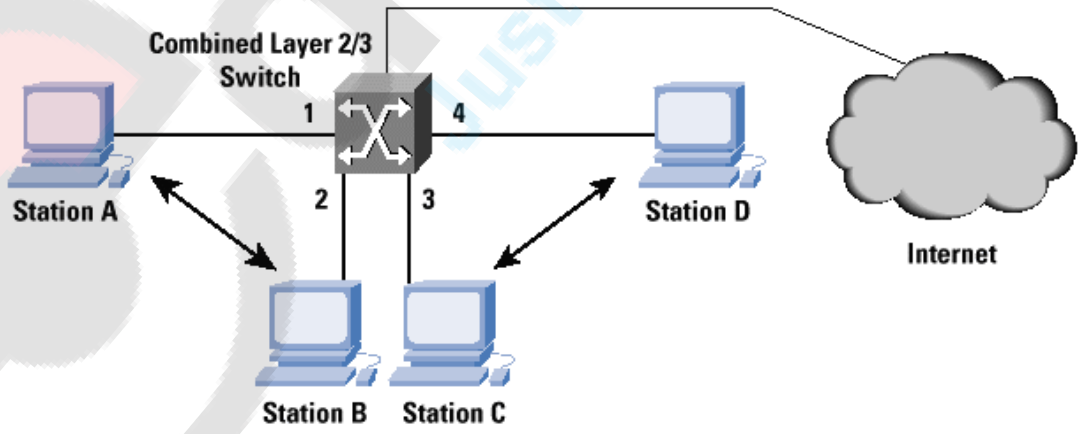
Layer 3 :

A Layer 3 switch is a specialized hardware device used in network routing. Layer 3 switches technically share much in common with traditional routers. Both can support the same routing protocols. Both inspect incoming packets and make dynamic routing decisions based on the source and destination addresses inside.

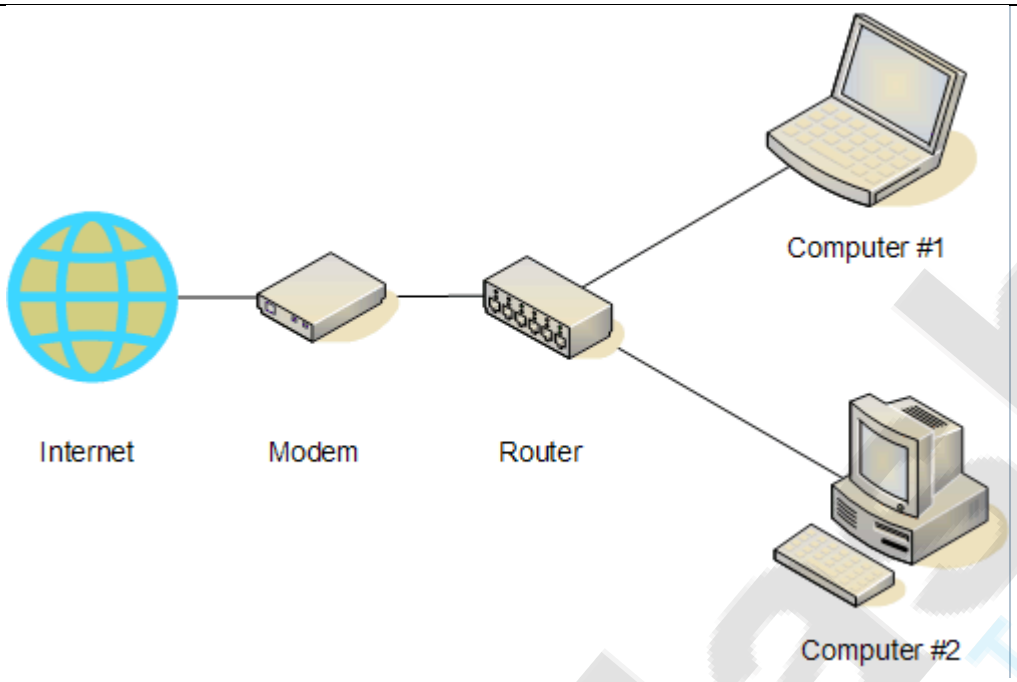
Example:

Router:

A router is a three-layer device that routes packets based on their logical addresses (host-to-host addressing). A router normally connects LANs and WANs in the Internet and has a routing table that is used for making decisions about the route. The routing tables are normally dynamic and are updated using routing protocols.



	Layer 3 advantages Intelligent packet forwarding (routing) based on Layer 3 information is traditionally the function of routers. It's here that IP addresses are found, for example, enabling a router to link different subnets together. Specialised routing protocols also use Layer 3, enabling routers to "learn" routes between networks.
Q.4	What is Router?
	Router: A router (including a wireless router) is a specialized networking device connected to two or more networks running software that allows the router to move data from one network to another. Router functions in an Internet protocol based network operate at the network layer (OSI Model's layer 3). The primary function of a router is to connect networks together and keep certain kinds of broadcast traffic under control. There are several companies that make routers: Cisco, Linksys, Juniper, Netgear, Nortel (Bay Networks), Redback, Lucent, 3Com, HP, Dlink and Belkin just to name a few. **WHY DO I NEED A ROUTER?** Routers are used to connect networks together and routers perform the following network functions, whish you should be able to identify and describe on the Network+, CCNA or JNCP exam: **FUNCTIONS OF A ROUTER (identify and describe)** 1. Restrict broadcasts to the LAN 2. Act as the default gateway. 3. Perform Protocol Translation (Wired Ethernet to Wireless/WiFi, or Ethernet to CATV) 4. Move (route) data between networks 5. Learn and advertise loop free paths 6. Calculate 'best paths' to reach network destinations.



HOW DO ROUTERS WORK?

Let's use a home wireless router connected to a cable provider's internet network in a very simplified example.

1. The router powers on and loads it's OS from flash
2. The router loads the configuration file last saved to NVRAM and sets up the network interfaces and routing protocols it will run.
3. The router adds the network address and subnet for each interface to it's routing table along with the name of the interface itself.
4. The router has a simple static default route to send all non-local data out the network port connected to the cable company.
5. When the router receives a web page request from your computer, it checks the destination IP address against its routing table.
6. The bits forming the destination IP address in the IP packet are used as a hash key to point to the correct route, which in turn points to the correct network interface that the packet should be forwarded out of.
7. The router transmits the packet out the correct interface, to the next router, which repeats the process until the packet reaches the destination.

The process is *mostly* the same for any router.

Q.5	Gateway
Ans.	**Gateway** gateway is a network node connecting two networks that use different protocols. Gateways can take several forms -- including routers or computers -- and can perform a

variety of tasks. These range from simply passing traffic on to the next hop on its path to offering complex traffic filtering, proxies or protocol translations at various network layers.

The most common gateway is the internet gateway, which connects a home or enterprise network to the internet. An internet gateway also often acts as a security node, variously filling one or more security roles, such as proxy server, firewall or network address translation (NAT) server. Software-defined WAN (SD-WAN) and virtual WAN systems serve as gateways between an enterprise network and two or more wide area networks (WANs).

- gateway is normally a computer that operates in all five layers of the Internet or seven layers of OSI model.
- A gateway takes an application message, reads it, and interprets it. This means that it can be used as a connecting device between two internetworks that use different models.
- For example, a network designed to use the OSI model can be connected to another network using the Internet model. The gateway connecting the two systems can take a frame as it arrives from the first system, move it up to the OSI application layer, and remove the message.