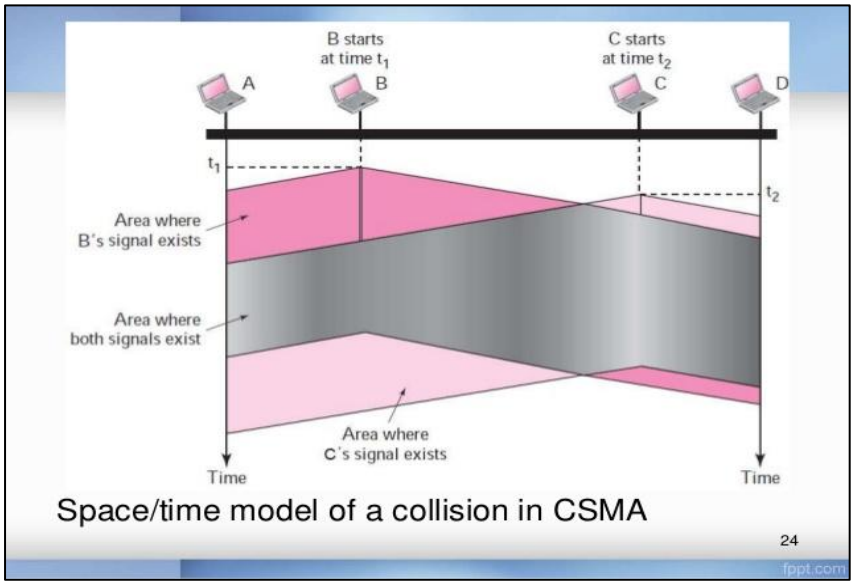
GWPC, BIKANER

MODEL PAPER

EL-207

Q.1 Explain CSMA.

Ans. CSMA- **Carrier sense multiple access. It is a type of media access method.** This method is used for minimize the chance of collision and increase the performance. The chance of collision can be reduced if a station senses the medium before trying to use it. **Carrier sense multiple access (CSMA)** requires that each station first listen to the medium before sending. In other words, CSMA is based on the principle "sense before transmit" or "listen before talk." CSMA can reduce the possibility of collision, but it cannot eliminate it. The possibility of collision still exists because of propagation delay; when a station sends a frame, it still takes time (although very short) for the first bit to reach every station and for very station to sense it. In other words, a station may sense the medium and find it idle, only because the first bit sent by another station has not yet been received. At time $t1$, station B senses the medium and finds it idle, so it sends a frame. At time $t2$ ($t2 > t1$), station C senses the medium and finds it idle because, at this time, the first bits from station B have not reached station C. Station C also sends a frame. The two signals collide and both frames are destroyed.



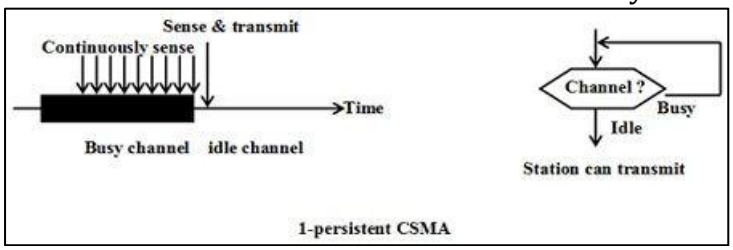
Persistence Methods

Persistence methods have been devised to answer questions like what should a station do if the channel is busy? What should a station do if the channel is idle?
There are three methods of Persistence-

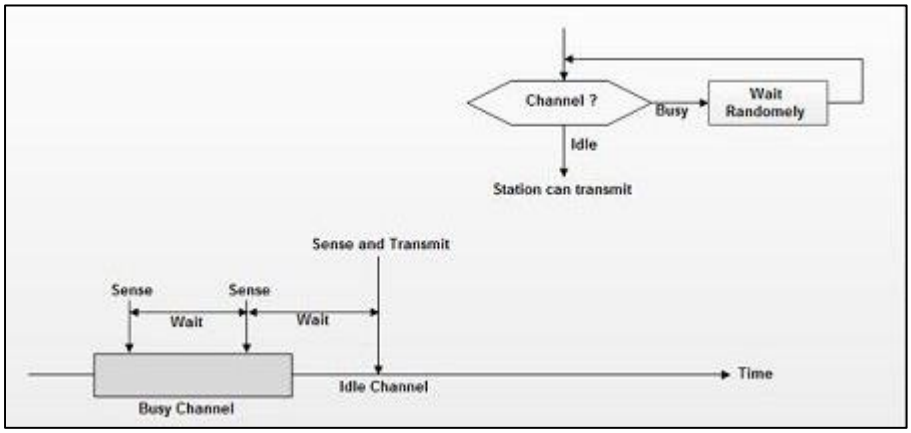
1. The 1-persistent method
2. The non persistent method
3. The *p*-persistent method.

1-Persistent: The **1-persistent method** is simple and straightforward. In this method,

after the station finds the line idle, it sends its frame immediately (with probability 1). This method has the highest chance of collision because two or more stations may find the line idle and send their frames immediately.



Non persistent: In the **non persistent method,** a station that has a frame to send senses the line. If the line is idle, it sends immediately. If the line is not idle, it waits a random amount of time and then senses the line again. The non persistent approach reduces the chance of illusion because it is unlikely that two or more stations will wait the same amount of time and retry to send simultaneously.

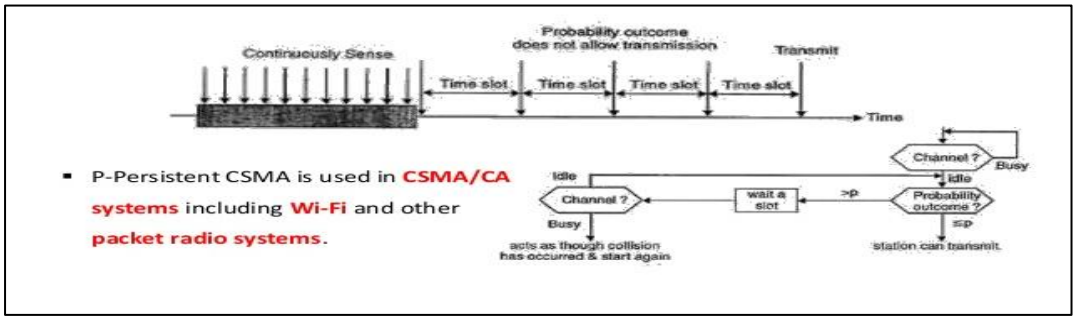


***P-Persistent*:** The ***p*-persistent method** is used if the channel has time slots with a slot duration equal to or greater than the maximum propagation time. The *p*-persistent approach combines the advantages of the other two strategies. It reduces the chance of collision and improves efficiency. In this method, after the station finds the line idle it follows these steps:

1. With probability *p*, the station sends its frame.
2. With probability $q = 1 - p$, the station waits for the beginning of the next time slot and checks the line again.

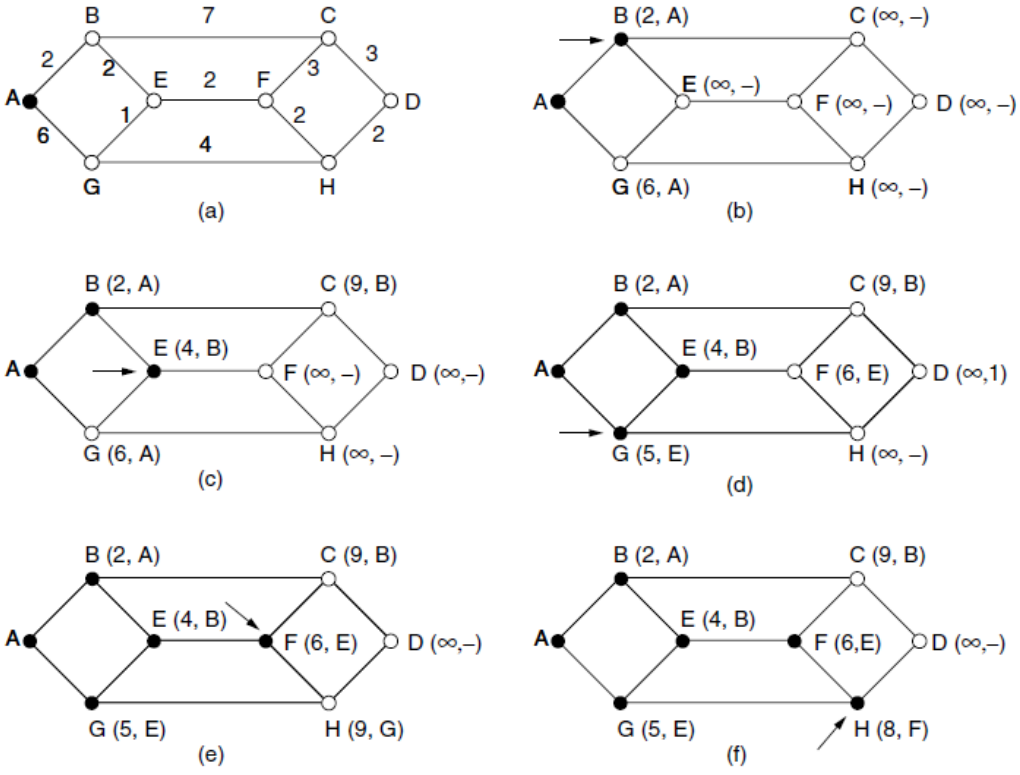
a. If the line is idle, it goes to step 1.

b. If the line is busy, it acts as though a collision has occurred and uses the backoff procedure.



Q.2 Explain Dijkastra Algorithm.

Ans. The concept of a **shortest path is** measuring path length is the number of hops.
The idea is to build a graph of the network, with each node of the graph representing a router and each edge of the graph representing a communication link. To choose a route between a given pair of routers, the algorithm just finds the shortest path between them on the graph.
Dijkastra Algorithm is used for find shortest path in any network. It finds the shortest paths between a source and all destinations in the network. Each node is labelled with its distance from the source node along the best known path. The distances must be non-negative. Initially all nodes are labelled with infinity. As the algorithm proceeds and paths are found, the labels may change, reflecting better paths. Initially, all labels are tentative. When it is discovered that a label represents the shortest possible path from the source to that node, it is made permanent and never changed.



To understand how its work we take an example weighted undirected graph which shown in above image part (a). We want to find the shortest path from *A* to *D.* Initially all node are label with infinity. We start out by marking node *A* as permanent, indicated by a filled-in circle. Then we examine each of the nodes adjacent to *A* (the working node), relabeling each one with the distance to *A* Having examined each of the nodes adjacent to *A*, we examine all the tentatively labelled nodes in the whole graph and make the one with the smallest label permanent, as shown in (b). We now start at *B* and examine all nodes adjacent to it. If the sum of the label on *B* and the distance from *B* to the node being considered is less than the label on that node, we have a shorter path, so the node is relabelled. Like this we examine all node of which having shortest distance. In last after travelling from each node with short distance we find shortest path from A to D is ABEFHD with distance 10.

Q.3 Write Short note on HDLC.
Ans. HDLC- High data Link Control

HDLC is a bit-oriented protocol. It was developed by the International Organization for Standardization (ISO). It has been so widely implemented because it supports both half-duplex and full-duplex communication lines, point-to-point (peer to peer) and multi-point networks, and switched or non-switched channels.
HDLC can be characterises by their station types, configurations and operation modes.
HDLC specifies the following three types of stations for data link control:

1. Primary Station
2. Secondary Station
3. Combined Station

Primary Station: It has the responsibility of controlling all other stations on the link (usually secondary stations). A primary issues *commands* and secondary issues *responses.* The primary station is also responsible for the organization of data flow on the link.

Secondary Station: The secondary station is under the control of the primary station. It is only activated when requested by the primary station. It only responds to the primary station. The secondary station's frames are called responses. It can only send response frames when requested by the primary station.

Combined Station: A combined station is a combination of a primary and secondary station. On the link, all combined stations are able to send and receive commands and responses without any permission from any other stations on the link. Each combined station is in full control of itself, and does not rely on any other stations on the link. No other stations can control any combined station.

Following are the three configurations defined by HDLC:

1. Unbalanced Configuration
2. Balanced Configuration
3. Symmetrical Configuration

Unbalanced Configuration: It consists of a primary station and one or more secondary stations. The unbalanced condition arises because one station controls the other stations. In an unbalanced configuration Full-Duplex or Half-Duplex operation and Point to Point or Multi-point networks are used. This method also called Master/ Slave Configuration.

Balanced Configuration: The balanced configuration in an HDLC link consists of two or more combined stations. Each of the stations has equal and complimentary responsibility compared to each other. Balanced configurations can use only Full - Duplex or Half - Duplex operation and Point to Point networks.

Symmetrical Configuration: This third type of configuration is not widely in use today. It consists of two independent point-to-points, unbalanced station configurations. In

this configuration, each station has a primary and secondary status. Each station is logically considered as two stations.

HDLC Operation Modes

There are three modes of operations:

1. Normal Response Mode (NRM)
2. Asynchronous Response Mode (ARM)
3. Asynchronous Balanced Mode (ABM)

Normal Response Mode (NRM): This is the mode in which the primary station initiates transfers to the secondary station. The secondary station can only transmit a response when, and only when, it is instructed to do so by the primary station. This transmission from the secondary station to the primary station may be much more than just an acknowledgment of a frame. Normal Response Mode is only used within an unbalanced configuration.

Asynchronous Response Mode (ARM): In this mode, the primary station doesn't initiate transfers to the secondary station. In fact, the secondary station does not have to wait to receive explicit permission from the primary station to transfer any frames. This mode is asynchronous, the secondary station must wait until it detects and idle channel before it can transfer any frames.

Asynchronous Balanced Mode (ABM): This mode is used in case of combined stations. There is no need for permission on the part of any station in this mode. This is because combined stations do not require any sort of instructions to perform any task on the link.

HDLC Frame Structure

There are three different types of frames in HDLC with different fields.

I-frame
S- Frame
U-Frame