① Compare Packet switched Network, circuit Switched Network and Message Switching Techniques.

Parameter	Packet Switching	Circuit Switching	Message Switching
Message and Packets	The big message is divided into a small no. of packets	There is one big entire data stream called a message.	There is one big entire data stream called a message.
Routing	Packets follow the independent path to hold the destination.	one single dedicated path exists between the source and destination	Messages follow the independent route to reach destination.
Propagation delay	Yes	No	Yes
Transmission Capacity	Max	low	Max
Sequence codes	Packets do not appear in sequence at destination	Message arrives in sequence.	Message arrives in sequence.
Queuing	Queue is formed	No queue is formed	Queue is formed
Addressing and Sequencing	Packets are addressed and sequencing is done as all the packets follow the independent route.	Messages need not be addressed as there is one dedicated path	Messages are addressed as independent routes are established
Multiplexing scheme	packet multiplexing shared media access networks	circuit Multiplexing	Character message multiplexing
Delay	Call setup delay as well as packet transmission delay	Call setup delay	Packet Transmission delay, propagation delay, queuing delay, processing delay.

(2) Compare Bridge and Gateway:

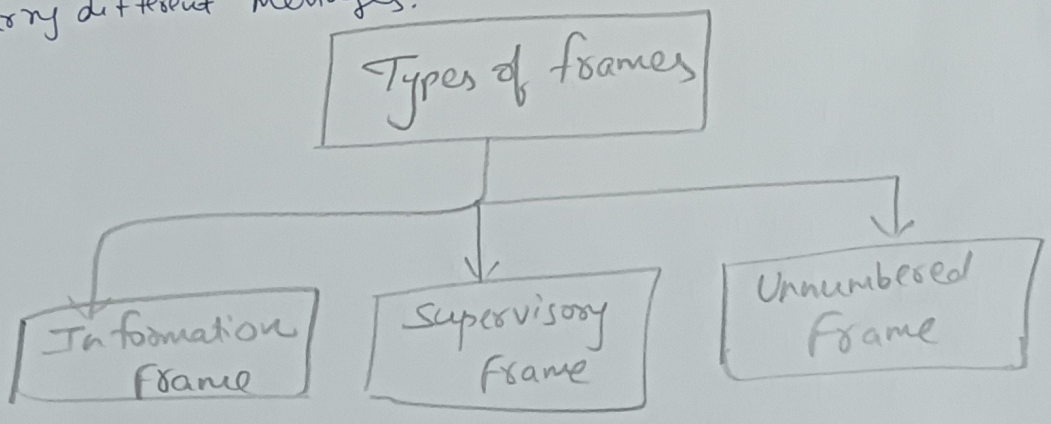
Bridge	Gateway
(1) Bridge works in datelink layer.	(1) It works in all layers
(2) Connects two different LANs	(2) It converts the protocol
(3) Connects two different LAN's working on same protocol	(3) Gateway will settle for and transfer the packet across networks employing a completely different protocol.
(4) In bridge, data or information is in the form of packet	(4) In gateway, data of info is also in the form of packet
(5) format of packet is not changed.	(5) Format of packet is changed.
(6) Bridge is not installed in router	(6) Gateay is installed in router
(7) The current passing through a circuit element is the primary cause of voltage drop.	(7) EMF (electromotive force) is the primary cause of the potential difference.

(3) Compare OSI and TCP/IP layers.

Parameters	OSI Model	TCP/IP Model
Full form	Open Systems Interconnection	Transmission control protocol (or) Internet protocol
Layers	It has 7 layers	It has 4 layers
Usage	Low in usage	Mostly used
Approach	Vertically approached	Horizontally approached
Delivery	Delivery of package is guaranteed in OSI model	Delivery of package is not guaranteed in TCP/IP model
Replacement	Replacement of tools and changes can be easily be done	Replacement of tools is not easy as it is in OSI model.
Reliability	Less reliable than TCP/IP.	More reliable than OSI.

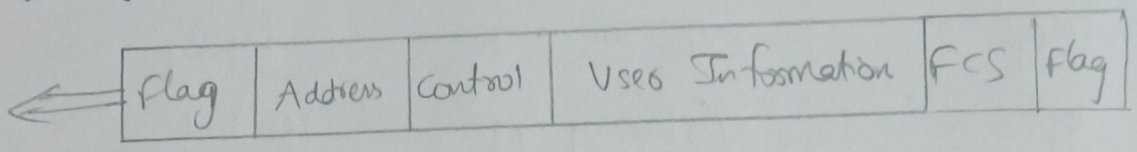
(4) Different types of HDLC frames.

High-level Data Link Control (HDL) generally provides flexibility to simply support all options that are possible in various data transfer modes and configurations. To provide flexibility, HDLC has three different types of frames. Frames are identified by the control field. The frames carry different messages.



(1) I-Frame:-

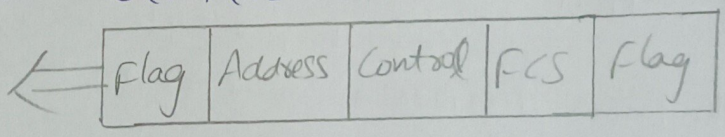
* I-Frame : Information frames
* Used for transporting user data from network layer.
* Carry data and control information.
* Have send sequence number and acknowledgement number.
* Can piggyback acknowledgement in ABM (Asynchronous Balanced Mode)
* First bit of control field is 0.



(2) S-Frame:-

* S-Frame : Supervisory Frames
* Needed for error and flow control
* provide control information.
* Have only acknowledgment number
* First two bits of control field are 10.
* No information fields
* Have send and receive sequence numbers.

Examples :- Receive Ready (RR)
Receive Not Ready (RNR)
Reject on Frame N(R) (REJ) etc..



(3) U-Frame:-

* U-Frame : Unnumbered Frames
* Used for link setup and disconnections.
* Support control purposes
* Not sequenced
* First two bits of control field are 11
* May have information field depending on type.
* Used for miscellaneous purposes and link management.
* No acknowledgment information.
* Reserved for system management

Examples :- Set Normal Response Mode (SNRM)
Set Asynchronous Response Mode (SARM)
Set Asynchronous Balanced Mode (SABM)
Unnumbered Polling (UP)
Unnumbered Acknowledge (UA) etc...