

**K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE – 637 215.**  
(AUTONOMOUS)

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**COURSE / LESSON PLAN SCHEDULE (2019-2020)**

**16EC765 - HIGH PERFORMANCE NETWORKS (ELECTIVE)**

**NAME: Mr. P. MAHENDRAN**

**CLASS: B.E/ IV- ECE-A, B**

**A). TEXT BOOKS:**

1. Jean Warland, PravinVaraiya, "High Performance Communication Networks", Morgan Kaufmann Publishers, 2nd Edition, 2008.
2. Nader F. Mir, "Computer and Communication Networks", Dorling Kindersley, 3rd Edition, 2009.

**B). REFERENCES:**

1. Lenon Garcia Widjaya, "Communication Networks", Tata McGraw-Hill, 2nd Edition, 2007.
2. Ranier Handel Manfred N Huber, Stefan Schroder, "ATM Networks - Concepts, Protocols Applications", Addison Wesley, 3rdEdition, 2006.
3. IrvanPepelnjk, Jim Guichard& Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume1 and 2, 2007.

**C). LEGEND:**

L	- Lecture	PPT	- Power Point
Tx	- Text	BB	- Black Board
OHP	- Over Head Projector	pp	- Pages
Rx	- Reference		

S.No.	Lecture Hour	Topics to be covered	Teaching Aid Required	Book No. / Page No.
<b>UNIT – I NETWORK CONCEPTS</b>				
1.	L 1	Principles	BB	Tx1/pp21-27
2.	L 2	Applications	BB	Tx1/pp 41-44, Rx1/pp 34
3.	L 3	Services: Connection oriented and connection less	BB	Tx1/pp 44-47, Rx1/pp 50
4.	L 4	High performance networks	BB+PPT	Tx1/pp49-51
5.	L 5	Network elements	BB	Tx1/pp 51-56, Rx1/pp 21-22
6.	L6	Basic network mechanisms: Multiplexing, Switching	BB+PPT	Tx1/pp56-68, Rx1/pp 51,223-224
7.	L 7	Error control, Flow control	BB	Tx1/pp68-78, Rx1/pp 167,315
8.	L 8	Congestion control, Resource allocation	BB	Tx1/pp78-80, Rx1/pp 549
9.	L9	Layered architecture	BB	Tx1/pp86, Rx1/pp 35-62
<b>UNIT – II ATM</b>				
10.	L 10	Features of ATM: Connection oriented services, Fixed cell size	BB+PPT	Tx1/pp258-262
11.	L 11	Statistical multiplexing, Allocating resources	BB	Tx1/pp 262-269,Rx2/pp 150-154
12.	L 12	Addressing	BB	Tx1/pp 269-270, Rx1/pp 688-690, Rx2/pp 174-175
13.	L 13	Signaling	BB	Tx1/pp 270-272,Rx1/pp690-694, Rx2/pp159-171
14.	L14	Routing	BB	Tx1/pp 272-277,Rx1/pp 694-697,Rx2/pp 171-173
15.	L 15	ATM header structure	BB	Tx1/pp 277-282,Rx2/pp 102-107
16.	L 16	ATM adaptation layer	BB	Tx1/pp 282-285,Rx1/pp674-688,Rx2/pp 109-122
17.	L17, L18	BISDN	BB	Tx1/pp 293-294, Rx1/pp 662-665,Rx2/pp 31-38

<b>UNIT – III WIRELESS NETWORKS</b>				
18.	L19	Wireless channel	BB	Tx1/pp315-324
19.	L20	Link level design: Modulation techniques, Channel coding and Link layer retransmission	BB	Tx1/pp324-326
20.	L21	Flat-fading countermeasures, ISI countermeasures	BB+PPT	Tx1/pp326-331
21.	L22	Network design: Architecture, Mobility management	BB+PPT	Tx1/pp337-340
22.	L23	Network reliability, Internetworking	BB+PPT	Tx1/pp340-343
23.	L24	Applications: Cellular telephone systems, Cordless phones	BB	Tx1/pp343-349
24.	L25	Wireless LANs, Wide area wireless data services,	BB	Tx1/pp349-351
25.	L26	Paging systems,	BB	Tx1/pp352
26.	L27	Satellite networks		Rx2/pp352-353
<b>UNIT – IV MULTICASTING TECHNIQUES AND PROTOCOLS</b>				
27.	L 28	Definitions and techniques: IP multicast address	BB+PPT	Tx2/pp402-404
28.	L 29	Multicast tree algorithms	BB	Tx2/pp404-406
29.	L 30	Classification of multicast protocols	BB	Tx2/pp406,
30.	L 31	Intradomain multicast protocols: Distance vector multicast routing protocol	BB+OHP	Tx2/pp406-407,Rx1/pp 646
31.	L 32	Internet group management protocol	BB	Tx2/pp407-409,Rx1/pp643-644
32.	L 33	Multicast OSPF protocol, Protocol independent multicast	BB	Tx2/pp409-410, Rx1/pp 6232-631
33.	L 34	Core-based trees protocol, Multicast backbone	BB	Tx2/pp413-414
34.	L 35	Interdomain multicast protocols	BB	Tx2/pp414-417
35.	L 36	Node-level multicast algorithms	BB	Tx2/pp417-426
<b>UNIT – V ADVANCED NETWORK CONCEPTS</b>				
36.	L 37	VPN: Remote access, Site-to-site	BB	Tx2/pp431-434,Rx3/pp 421
37.	L 38	Tunneling and point to point protocol	BB	Tx2/pp434-436,Rx3/pp 408
38.	L39, L40	Security in VPNs	BB+OHP	Tx2/pp436-437
39.	L 41	MPLS: Operation, Routing, Tunneling and use of FEC	BB+OHP	Tx2/pp437-442
40.	L 42	Traffic engineering	BB	Tx2/pp 442-443
41.	L 43	MPLS based VPNs	BB	Tx2/pp443-444
42.	L 44	Overlay networks: Peer to peer connection	BB	Tx2/pp444-446, Rx1/pp 722-727, Rx3/pp 135-143
43.	L 45	Network Performance analyzer: NetFPGA	BB+OHP	<a href="http://yuba.stanford.edu/~casado/watson-stanford.pdf">http://yuba.stanford.edu/~casado/watson-stanford.pdf</a>

## Unit I - NETWORK CONCEPTS (CO1)

### PART –A( 2 MARKS)

#### 1.What are the basic elements of a network? (Remembering) (JAN 2017)

- Hubs
- Switches
- Bridges
- Routers
- Gateways.

#### 2.Define data communication.(Remembering)

It is the exchange of data between two devices via some form of Transmission medium ( such as copper cable,twisted pair cableetc).

#### 3. What are the elements of data communication?(Remembering)

The elements of data communication are

- Sender
- Receiver
- Transmission medium
- Message
- Protocol

#### 4.How we can check the effectiveness of data communication? (Understanding)

The effectiveness of data communication can be checked by

- a. Accuracy
- b. Delivery
- c. Timeliness

#### 5.What are the classes of transmission media? (Remembering)

The classes of transmission media are

- a. Guided transmission media
- b. Unguided transmission media

#### 6.What do you mean by OSI? (Remembering)

Open system interconnection model is a model for understanding and designing network architecture. It is not a protocol.

#### 7.Define Network. (Remembering)

A network is a set of devices connected by physical media links. A network is recursively a connection of two or more nodes by a physical link or two or more networks connected by one or more nodes

#### 8.What is a Link? (Remembering)

At the lowest level, a network can consist of two or more computers directly connected by some physical medium such as coaxial cable or optical fiber. Such a physical medium is called as Link.

#### 9. What is point-point link? (Remembering)

If the physical links are limited to a pair of nodes it is said to be point-point link.

#### 10. Summarize the available network services. (Understanding)

1. Connection oriented
- 2.Connection less services

#### 11. Define Constant Bit Rate(CBR).

**Constant bit rate (CBR)** is a term used in telecommunications, relating to the quality of service. Compare with variable **bit rate**. When referring to codecs, **constant bit rate** encoding means that the **rate** at which a codec's output data should be consumed is **constant**.

#### 12. Define Variable Bit Rate(VBR).

**Variable bit rate (VBR)** is a term used in telecommunications and computing that relates to the **bit rate** used in sound or video encoding. As opposed to constant **bit rate (CBR)**, **VBR** files vary the amount of output data per time segment.

#### 13. What is Multiple Access? (Remembering)

If the physical links are shared by more than two nodes, it is said to be Multiple Access.

#### 14. Define Switch. (Remembering)

Switches are hardware or software devices capable of creating temporary Connections between two or more devices

#### 15. Illustrate the types of switching? (Understanding)

The types of switching are

- Circuit switching

- Packet switching
- Message switching

**16. What do you mean by Crossbar switches? (Remembering)**

It connects  $m$  inputs to  $n$  outputs in a grid using electronic micro switches at each cross points.

**17. Define Blocking. (Remembering)**

The reduction in the number of cross points result in a phenomenon called Blocking

**18. Define packet switching. (Remembering)**

In packet switching data are transmitted in discrete units of potentially variable length blocks called Packets

**19. Illustrate the various approaches of packet switching. (Understanding)**

The approaches of packet switching are (i)Virtual circuit (ii)Datagram

**20. Analyze the meaning of Permanent Virtual circuit. (Analyzing)**

The same Virtual circuit is provided between two users on a continuous basis. The circuit is dedicated to the specific user.

**21. What do you mean by Automatic Repeat Request(ARQ)? (Remembering)**

ARQ means retransmission of data in three cases:

- Damaged Frame
- Lost Frame
- Lost Acknowledge

**22. Categorize three protocols used for noisy channels. (Analyzing)**

The three protocols used for noisy channels

- Stop – and – Wait ARQ
- Go – back – NARQ
- Selective Repeat ARQ

**23. What are the various types of connecting devices?(Remembering)**

There are five types of connecting devices

- Repeaters
- Hubs
- Bridges
- Routers
- Switches

**24. Define Flow control.(Remembering)**

It refers to a set of procedures used to restrict the amount of data the sender can sent before waiting for an acknowledgement.

**25. List out categories of Flow control.(Remembering)**

The categories of Flow control are

- Stop & wait
- Sliding Window

**26. Mention the disadvantages of stop & wait.(Remembering)**

- Inefficiency
- Slow process

**27. What are the functions of data link layer?(Remembering)**

The functions of data link layer are

- Flow control
- Error control

**28. What do you mean by polling?(Remembering)**

When the primary device is ready to receive data, it asks the secondary to send data. This is called polling.

**29. What are the various controlled access methods?(Understanding)**

The various controlled access methods are

- Reservation
- Token passing
- Polling

**30. What is the need of frame relay?(Remembering)**

It is a Virtual circuit wide area network that was designed to respond to demands for a new type of WAN.

**31. What is the maximum length of a datagram?(Understanding)**

The maximum length of a datagram is 65,535 bytes.

**32. What are the responsibilities of Network Layer?(Remembering)**

The Network Layer is responsible for the source-to-destination delivery of packet possibly across multiple networks (links).

- Logical Addressing
- Routing.

**33. What is DHCP?(Understanding)**

The Dynamic Host Configuration Protocol has been derived to provide dynamic configuration. DHCP is also needed when a host moves from network to network or is connected and disconnected from a network.

**34. Define Delivery of a packet.(Understanding)**

It refers to the way a packet is handled by the underlying network under the control of network layer

**35. What are the types of delivery?(Remembering)**

There are two types of delivery

1. Direct delivery
2. Indirect delivery

**36. What is class less addressing?(Understanding)**

Classless addressing requires hierarchical and geographical routing to prevent immense routing tables

**37. Define static mapping.(Remembering)**

It creating a table that associates an IP address with a MAC address

**38. Compare direct delivery & indirect delivery.(Analyzing)**

In **direct delivery** source and destination node belong to e same network

In **indirect delivery** source and destination node belong to different network

**39. What are the responsibilities of Transport Layer?(Remembering)**

The Transport Layer is responsible for source-to-destination delivery of the entire message.

- Service-point Addressing
- Segmentation and reassembly
- Connection Control
- Flow Control
- Error Control

**40. Define Congestion.(Understanding)**

It will occur if the number of packets sent to the network is greater than the Capacity of the network.

**41. What do you mean by Congestion control? (Understanding)**

It is a mechanism and technique to control the congestion

**42. What are the types of congestion control?(Remembering)**

There are two types of congestion control

- Open loop congestion control
- Closed loop congestion control

**43. What are the two factors that measure network performance?(Remembering)**

The two factors that measure network performance are

- Delay
- Throughput

**44. Compare Open loop Congestion Control & Closed loop congestion control. (Analyzing)**

In **Open loop congestion control**, policies are applied to prevent congestion before it happens. In **Closed loop congestion control**, policies are applied to reduce congestion after it happens.

**45. What is meant by quality of service?(Understanding)**

The quality of service defines a set of attributes related to the performance of the connection. For each connection, the user can request a particular attribute each service class associated with a set of attributes.

**46. What do you mean by TCP?(Understanding)**

TCP guarantees the reliable, in order delivery of a stream of bytes. It is a full-duplex protocol, meaning that each TCP connection supports a pair of byte streams, one flowing in each direction.

**47. What are the responsibilities of Application Layer?(Remembering)**

The Application Layer enables the user, whether human or software, to access the network. It provides user interfaces and support for services such as e-mail, shared database management and other types of distributed information services

- Network virtual Terminal
- File transfer, access and Management(FTAM)
- Mail services
- Directory Services

**48. What is Encapsulation and De-capsulation?(Understanding)**

To send a message from one application program to another, the TCP/UDP protocol encapsulates and de-capsulate messages.

**49. What is User Agent? (Remembering)**

A user Agent is defined in SMTP, but the implementation details are not. The UA is normally a program used to send and receive mail

**50. What do you mean by File transfer protocol?(Understanding)**

It is a standard mechanism provided by the internet for copying a file from one host to another

**51. What are the two types of connections in FTP? (Understanding)**

The two types of connections in FTP are

- Control connection
- Open connection

**52. Define HTTP.(Remembering)**

It is used mainly to access data on the World Wide Web. The protocol transfer data in the form of plaintext, hypertext, audio, and video and so on.

**53. How is topology related to line configuration?(Understanding)(Dec 2017)(Apr 2019)**

Line configuration refers to the way two or more communication devices attached to a link. Line configuration is also referred to as connection. A Link is the physical communication pathway that transfers data from one device to another. For communication to occur, two devices must be connected in same way to the same link at the same time.

There are two possible line configurations.

1. Point-to-Point.
2. Multipoint.

**54. List the advantage of star topology.(Remembering)(Dec 2017)**

- Less damage in case of a single computer failure as it does not affect the entire network.
- Easy to connect new nodes or devices. In star topology new nodes can be added easily without affecting rest of the network. Similarly components can also be removed easily.
- Centralized management. It helps in monitoring the network.
- Failure of one node or link doesn't affect the rest of network. At the same time it's easy to detect the failure and troubleshoot it.

**55. List the network services.(Remembering)(Apr 2018)**

- Connection oriented services
- Connection less services

**56. Define networking.(Remembering)(Apr 2018)**

Networking is the construction, design, and use of a network, including the physical

(cabling, hub, bridge, switch, router, and so forth), the selection and use of

telecommunication protocol and computer software for using and managing the network,

and the establishment of operation policies and procedures related to the network.

**57. Classify the topology of networks. (Remembering) (Dec 2018)**

Bus topology, Star topology, Ring topology, Mesh topology, Tree topology.

**58. Define the basic mechanism of High Performance network.(Remembering) (Dec 2018)**

Switching, Multiplexing, Error control, Flow control and Resource Allocation

**59. List any four High Performance Networks. (Remembering) (Apr 2019)**

- ATM
- X.25
- Optical Networks
- FDDI
- Frame relay

**PART B (16 Mark Questions)**

1. Compare and contrast connection oriented service and connectionless service. (Analyzing)(Jan 2017) (Dec 2018) (Apr 2019)
2. Write notes on traffic characterization and quality of service.(Remembering)
3. Explain briefly about the switching.(Understanding)
4. Explain briefly about the error control techniques.(Understanding)
5. Explain in detail about flow control and congestion control.(Analyzing)
6. Discuss in detail about the different layers of layered architecture with neat sketch.(Evaluating)(Jan 2017) (Dec 2018) (Apr 2019)
7. Explain in detail about high performance networks.(Understanding)
8. Compare and contrast connection oriented and connectionless services.(Analyzing)(Dec 2017)
9. List the applications of Networks.(Remembering)(Dec 2017)
10. Draw the layered architecture of high performance network and explain the function of each layer.(Understanding) )(Dec 2017)
11. Discuss in detail about the applications of Networks.(Understanding)(Apr 2018)
12. What are the services provided by connection oriented and connectionless protocols?(Analyzing)(Apr 2018)
13. Elaborate in detail the mechanism of networks with suitable diagram.(Understanding)(Apr 2018)

**Unit II - ATM (CO2)**

**PART –A ( 2 MARKS)**

**1.What is ATM?(Remembering)**

Asynchronous Transfer Mode (ATM) is a method for multiplexing and switching that supports a broad range of services. ATM is a connection-oriented packet switching technique that generalizes the notion of a virtual connection to one that provides quality-of-service guarantees.

**2.What are the main features of ATM?(Remembering)**

- The service is connection-oriented, with data transfer over a virtual circuit.
- The data is transferred in 53 byte packets called cells.
- Cells from different VCs that occupy the same channel or link are statistically multiplexed.
- ATM switches may treat the cell streams in different VC connections unequally over the same channel in order to provide different qualities of services (QOS).

**3.What are the traffic parameters of connection-oriented services?(Analyzing)**

- Peak Cell Rate(PCR)
- Sustained Cell Rate(SCR)
- Initial Cell Rate(ICR)
- Cell Delay Variation Tolerance(CDVT)
- Burst Tolerance(BT)
- Minimum Cell Rate(MCR)

**4. What are the quality service (QoS) parameters of connection-oriented services?(Analyzing)**

- Cell Loss Ratio(CLR)
- Cell Delay Variation(CDV)
- Peak-to-Peak Cell Delay Variation (Peak-to-PeakCDV)
- Maximum Cell Transfer Delay (MaxCTD)
- Mean Cell Transfer Delay (MeanCTD)

**5. Illustrate the types of delays encountered by cells. (Understanding)**

- Packetization delay (PD) at the source
- transmission and propagation delay(TD)
- queuing delay (QD) at each switch
- affixed processing delay (FD) at each switch
- a jitter compression or de packetization delay (DD) at the destination.

**6. What do you mean by ATM addressing?(Understanding)**

An ATM address indicates the location of an ATM interface in the network topology. This means that ATM address is not portable. The prefix of an address is associated with a group of interfaces with the same prefix.

**7. Illustrate the types of ATM network interface.(Understanding)**

Two most important interfaces are:

1. user-network interface(UNI)
2. network-network interface or network-node interface(NNI).

**8. What do you mean by user-network interface (UNI) and network-network interface or network-node interface(NNI)?(Understanding)**

UNI is the interface between an ATM end system and an ATM switch, NNI is the interface between two ATM switches.

**9. What are the two sublayers of AAL?(Remembering)**

1. Convergence Sublayer(CS)
2. Segmentation and Reassembly Sublayer(SAR).

**10. What is the function of CS?(Understanding)**

The Convergence Sublayer (CS) converts the information stream into four types of packets streams, called AAL Type1, Type2, Type3/4, and Type5. The packet formats match the requirements of the information stream.

**11. What are the subdivisions of CS?(Understanding)**

1. upper, service-specific or SSCS sublayer
2. Lower, common part or CPCS sublayer.

**12. What do you mean by Type1 traffic?(Understanding)**

Type1 traffic is a traffic generated at constant bit rate, and it is required to be delivered at the same rate (with a fixed delay).

**13. What is meant by traffic policing?(Remembering)**

In management and control the network must monitor the data transfer to make sure that the source also conforms to the QoS specification and to drop its cells as appropriate, is said to be a traffic policing.

**14. What are the functions of management and control?(Remembering)**

1. Fault management
2. traffic and congestion control
3. network status monitoring and configuration
4. user/network signaling.

**15. What are the layers of BISDN reference model?(Remembering)**

User plane, Control plane, Layer management plane, Plane management plane.

**16. What are the basic tasks required for internetworking over ATM?(Analyzing)**

Two basic tasks are:

1. Encapsulation of the protocol data unit
2. Routing of bridging of PDU.



**17. What are the functions of user plane?(Remembering)**

It comprises the functions required for the transmission of user information for instance, for an internet protocol over ATM, these layers could be HTTP/TCP/IP/AAL5.

**18. What are the three strategies of IP over ATM?(Remembering)**

The three strategies are

1. The classical IP model
2. The short cut models
3. The integrated models.

**19. What are the basic signaling function between the network and user?(Applying)**

The basic signaling function between the network and user are as follows:

1. The user requests a switched virtual connection
2. The network indicates whether the request is accepted or not
3. The network indicates error conditions with a connection.

**20. What are the two basic tasks required for internetworking over ATM?(Analyzing)**

The first is encapsulation of the protocol data units, and the second is routing or bridging of these PDUs.

**21. What are the two types of sub layer used in ATM adaptation layer? (Understanding)**

1. Convergence sub layer
2. Segmentation and Reassembly sub layer

**22. What are the benefits of ATM?(Remembering)**

- The benefits of ATM are the following:
- high performance via hardware switching
  - dynamic bandwidth for bursty traffic
  - class-of-service support for multimedia
  - scalability in speed and network size
  - common LAN/WAN architecture
  - opportunities for simplification via VC architecture
  - international standards compliance

**23. What is called a cell in ATM?(Remembering)**

In ATM, the information flow on each logical connection is organized into fixed size packets called cells

**24. What are the services of ATM? (Understanding)**

The ATM services are:

- i. Real time services:
  - i. Constant Bit Rate (CBR)
  - ii. Real Time Variable Bit Rate (rt-VBR)
- ii. Non Real time services:
  - i. Non Real Time Variable Bit Rate (nrt-VBR)
  - ii. Available Bit Rate (ABR)
  - iii. Unspecified Bit Rate (UBR)
  - iv. Guaranteed Frame Rate (GFR)

**25. What are the benefits of 10 Gbps Ethernet over ATM?(Analyzing)**

- No expensive, bandwidth consuming conversion between Ethernet packets and ATM cells
- Network is Ethernet end to end
- IP plus Ethernet offers QoS and traffic policing capabilities approach that of ATM
- Wide variety of standard optical interfaces for 10Gbps Ethernet

**26. What are the IEEE 802.11 services? (Remembering)**

- Association
- Re association
- Disassociation
- Authentication
- Privacy

**27. Define: Cell loss ratio. (Remembering)**

It defines the fraction of cells lost during the transmission

**28. Define: Cell transfer delay. (Remembering)**

It is the average time needed for a cell to travel from source to destination.

**29. Define: Cell delay variation tolerance.(Remembering)**

It is a measure of the variation in cell transmission time.

**30. Define: Sustainable cell rate. (Remembering)**

The SCR is the average cell rate over a long time interval. The actual cell rate may be lower or higher than this value, but the average should be equal to or less than SCR.

**31. Define: peak cell rate (Remembering)**

The Peak cell rate (PCR) defines the sender's maximum cell rate. The user's cell rate can sometime reach this peak as long as the cell delivered in error.

**32. What is the purpose of pay load type field in ATM cell format?(Analyzing)**

It is 3 bit information. It indicates type of data in the information field. The first bit indicates whether it is user data or network management data, second bit indicate whether it experience congestion or not, third bit indicate SDU type.

**33. What is the purpose of cell loss priority bit in ATM cell format?(Analyzing)**

It provides guidance to the network in the event of congestion. A value of 0 indicates a cell of relatively higher priority which should not be discarded unless no other alternatives is available. A value of 1 indicates that this cell is subject to discard with in the network.

**34. Define: cell sequence integrity (Remembering)**

It is the characteristic of virtual channel that can be used for call control (i.e.signalling channel)

**35. What are the two types of sub layer used in ATM adaptation layer? (Remembering)**

Convergence layer and Segmentation layer.

**36. Why do ATM networks use cell switching? (Understanding)(Dec 2017)**

**Cell switching** is associated with Asynchronous Transmission Mode (ATM) which is considered to be a high speed switching technology that attempted to overcome the speed problems faced by the shared media like Ethernet and FDDI. Cell switching uses a connection-oriented packet-switched network.

When a connection is established it is known as signaling. It is called cell switching because this methodology uses a fixed length of packets of 53 bytes out of which 5 bytes are reserved for header. Unlike cell technology, packet switching technology uses variable length packets. Even though cell switching closely resembles packet switching because cell switching also breaks the information into smaller packets of fixed length and thereby ensuring guaranteed delays.

**37. Which type of AAL is used for CBR and VBR applications?(Analyzing)(Dec 2017)**

AAL 5

**38. Recall the attributes of traffic and congestion control in ATM.(Remembering)(Apr 2018)**

- Peak cell rate(PCR)
- Sustained cell rate(SCR)
- Initial cell rate(ICR)
- Cell delay variance tolerance(CDVT)
- Burst tolerance(BT)
- Minimum cell rate(MCR)

**39. Mention the layers of BISDN reference model.(Remembering)(Apr 2018)**

- Physical layer
- ATM layer
- Signaling AAL
- Q.2931

**40. What is meant by cell switching? (Remembering)(Dec 2018)**

Cell switching operates in a similar way to packet switching but uses small fixed length cells for data transport. This technology is found within cell based integrated networks such as Asynchronous Transfer Mode (ATM) networks. Cell switching can handle multiple data types, i.e. voice, video and data.

Cell switching is typically a high bandwidth and high speed (up to 155 Mbps) technology.

**41. Mention any four channel coding techniques used in wireless channel. (Remembering)(Dec 2018)**

- Forward error correction code
- Trellis code
- Turbo code
- ARQ protocol

**42. What is the relationship between VPs and VCs? (Remembering) (Apr 2019)**

A TP (transmission path) is the physical connection between a user and a switch or between two switches. It is divided into several VPs (virtual paths), which provide a connection or a set of connections between two switches. VPs in turn consist of several VCs (virtual circuits) that logically connect two points together."

**43. List the applications of B-ISDN. (Remembering) (Apr 2019)**

- Image Communication
- Video Surveillance
- Video telephony and video conferencing
- Multimedia Mail
- Video Mail

**PART B (16 Mark Questions)**

1. Draw and explain ATM Header.(Understanding)(Jan 2017)
2. Explain the types of AAL with necessary formats.(Understanding) (Jan 2017)
3. Explain management and control in ATM.(Remembering)
4. Write in detail the congestion control.(Understanding)
5. Explain in detail internetworking with ATM. (Remembering)
6. Discuss the important features of ATM protocol. Also discuss the design goals of ATM.(Remembering)(Jan 2017)
7. Explain frame relay via ATM?(Understanding)
8. Explain in detail about Frame relay architecture and Frame Call Control? (Understanding)
9. Explain in detail about the ATM architecture. (Understanding)
10. What is a ATM cell? Explain about the ATM cell format? (Understanding)
11. Write in detail about Generic Flow control. (Analyzing)
12. What are the ATM service categories? Explain?(Evaluating)
13. Explain about the different AAL protocols.(Understanding)
14. What are the various IEEE 802.11 requirements? (Analyzing)
15. Explain in detail about IEEE 802.11 architecture and services. (Understanding)
16. Explain about the IEEE 802.11 protocol architecture. (Remembering)
17. Explain the Frame relay architecture & compare it with x.25. (Understanding)
18. Explain the ATM cell with a suitable diagram and explain Generic Flow Control and Header error control.(Applying)
19. Give ATM cell format. Explain how ATM cells are transmitted. (Analyzing)
20. Describe the ATM architecture. (AU June 2014)(Remembering)
21. Explain the working of an ATM error control algorithm.(Understanding)
22. Explain the various ATM service categories in detail. (Understanding)
23. What is statistical multiplexing? Explain.(Remembering)(Dec 2017)
24. Draw the UNI and NNI header diagram of ATM network and explain.(Remembering)(Dec 2017) (Apr 2019)
25. Draw the architecture of AAL layers and explain the function of each layer. (Remembering)(Dec 2017)
26. What are the different layers of ATM? Explain the function of each layer and compare it with OSI model.(Remembering)(Apr 2018)
27. Explain the Quality of Service (QoS) parameters of ATM.(Remembering)(Apr 2018)
28. Explain the broadband ISDN services in detail.(Remembering)(Apr 2018)
29. Draw the BISDN protocol architecture reference model and explain.(Remembering)(Apr 2018) (Apr 2019)

**Unit III- WIRELESS NETWORKS (CO3)****PART –A ( 2 MARKS)****1. Define wireless channel.(Understanding)**

The wireless radio channel is a difficult medium, susceptible to noise, interference, blockage and multipath, and these channel impediments change over time because of user movement. These characteristics impose fundamental limits on the range, data rate and reliability of communication over wireless links.

**2. What are the factors that determine the limits of wireless networks. (Analyzing)**

Propagation environment and user mobility

**3. List out the considerations in the design of wireless modems.(Analyzing)**

Bandwidth Efficiency, power Efficiency, out-of-band radiation, Resistance to multipath, constant envelope modulation.

**4. What is fading?(Remembering)**

Fading refers to the fluctuations in signal strength when received at the receiver.

**5. What are the types of fading?(Remembering)**

Fast fading/small-scale fading and slow fading /large- scale fading.

**6. State the effects of multipath Propagation ( April/May 2008)(Analyzing)**

1. Rapid change in signal strength over a small travel distance or time interval.
2. Random frequency modulation due to varying Doppler shifts on different multipath signals.
3. Time dispersion (echoes) caused by multipath propagation delays.

**7. What is meant by Doppler Shift?(Remembering)**

The Phase change in received signal due to the difference in path length hence the apparent change in frequency is called Doppler shift.

$$F_d = v/\lambda \cos\theta = 1/2\pi (\Delta\Phi/\Delta t).$$

**8.List out the consideration in the design of wireless modems.(Remembering)**

Bandwidth Efficiency, power Efficiency, out-of -band radiation, Resistance to multipath, constant envelope modulation.

**9. What are the digital wireless transmission techniques?(Understanding)**

Pulse transmission techniques, Basic modulation techniques and Spread spectrum systems.

**10. What is a frequency hopping?(Understanding)**

The shifts in frequency, or frequency hops, occur according to a random pattern that is known only to the transmitter and the receiver.

**11. Define equalization techniques.(Remembering)**

In-band time diversity and exploiting time diversity these two approaches serve the same purpose of equalizing the effects of the channel, and for that reason they are referred to as equalization techniques

**12. What are the diversity techniques?(Understanding)**

1. Time diversity techniques
2. Frequency diversity techniques
- 3.Space diversity techniques.

**13. What are the coding techniques used in wireless communication?(Remembering)**

1. Error control coding
- 2.speech coding
- 3.coding for spread spectrum systems.

**14. What is multicarrier modulation? (April/ May 2008).(Remembering)**

MCM takes the advantage of orthogonality of the channel and develops efficient implementation using FFT algorithm. In this system, the received signal power is measured in different sub channels and the modulation or coding of the subcarrier is changed to improve the performance.

**15. What do you understand about Ultra Wide Band (UWB) technology (April/ May 2008).(Remembering)**

It is used in short range communication. In this technique, a very narrow width and low power pulses (less than 1 ns) are used for transmission. The spectrum of this pulse occupies wideband (in GHz).

**16. How is a wireless network different from a wired network? State at least two differences.(Nov/Dec 2008)(Analyzing)**

A wired medium can provide reliable, guided link which conducts an electric signal associated with the transmission of information of from one fixed terminal to another. The wireless medium is unreliable. It has a low bandwidth. It supports mobility. Wireless transmission share the same medium which is nothing but air.

**17. What is the primary goal of IEE 802.11? (May/June 2009).(Analyzing)**

The primary goal of the standard was the specification of a simple, robust, WLAN

This offers time bounded and asynchronous services also it should be able to operate with multiple physical layers.

**18. What are Advantages of wireless LAN?(Analyzing)**

Flexibility, Planning, Design, Robustness, Quality Service, Cost, Proprietary Solution, Restriction, Safety and Security

**19. What are Design Goals of Wireless LAN?(Analyzing)**

Global Operation, Low Power, License-free Operation, Robust transmission technology, simplified spontaneous co-operation, Easy to use, protection of investment, Safety and Security, Transparency for application

**20. Define a LAN.(Remembering)**

A Local Area Network (LAN) is a privately owned network within a single office, Buildings or campus, covering a distance of a few kilometers.

**21. What is HIPERLAN?(Remembering)**

The HIPERLAN stands for High Performance Radio LAN and was initiated by the RES-10 group of the ETSI as a pan-European standard for high-speed wireless local Network.

**22. What are the functional requirements for the HIPERLAN-1?(Understanding)**

Data rates of 23.529 Mbps, Coverage of up to 100M, Multi-hop ad hoc networking capability, Support of time-bounded services, Support of power saving

**23. What are two periods of contention phase of the HIPERLAN-1?(Understanding)**

- i) Elimination
- ii) yield

**24. What are two features required for the to WLAN and cellular systems?(Understanding)**

i) Support for vertical roaming between local area and wide areas as well as

Between corporate and public environments.

ii) Support for QoS control for integration into multiservice voice-oriented back bone PSTN which include ATM switches and other facilities.

**25. Define HIPERLAN-2 (May/June 2009).(Understanding)**

HIPERLAN-2 aims at IP and ATM type services at high data for indoor and possibly outdoor applications. It expects to support both connectionless and connection-oriented services which will make its MAC layer far more complicated than 802.11 and HIPERLAN-1 that support only connectionless services.

**26. Name the five major challenges for implementation of wireless LANs that existed the beginning of this industry. (April/ May 2008).(Analyzing)**

Complexity and cost, Bandwidth, Coverage, Interference, Frequency Administration.

**27. What is a HAN? (Nov/Dec 2008).(Remembering)**

HAN means Home Area Network.

**28. What is flat fading?(Remembering)(Dec 2017)(\*Apr 2018)**

Flat fading describes the rapid fluctuations of the received signal power over short time periods or over short distances.

**29. Mention the applications of paging services.(Remembering)(Dec 2017)**

- It can control products such as alphanumeric LED displays for public areas
- Wireless speakers for PA voice messaging.
- Wireless strobe lights for special visual notifications.

**30. Justify paging.(Analyzing)(Apr 2018)**

Paging Systems are wireless communication systems that are designed to send brief messages to a subscriber. It's a one-way messaging system in which Base Station send messages to all subscribers. The Paging System transmits the message also known as Page, along with Paging System access number, throughout the service area using Base Station, which broadcast the page on a radio link.

**31. Define Flat Fading(Remembering)(Apr 2019)**

Flat fading describes the rapid fluctuations of the received signal power over short time periods or over short distances.

**32. What are the advantages of satellite networks? (Remembering)(Apr 2019)**

It is used for mobile and wireless communication applications independent of location.

It is used for voice, data, video and any other information transmission. Satellite system can be interfaced with internet infrastructure to obtain internet service. It is also used for GPS applications in various mobile devices for location determination.

It is used in wide variety of applications which include weather forecasting, radio/TV signal broadcasting, gathering intelligence in military, navigation of ships and aircrafts, global mobile communication, connecting remote areas etc.

**33. Mention any four channel coding techniques used in wireless channel.(Analyzing)(Dec 2018)**

- Forward error correction code
- Trellis code
- Turbo code
- ARQ protocol

**34. What is meant by frequency reuse? Give an example. (Remembering)(Dec 2019)**

Frequency reuse is the process of using the same radio frequencies on radio transmitter sites within a geographic area that are separated by sufficient distance to cause minimal interference with each other. Frequency reuse allows for a dramatic increase in the number of customers that can be served (capacity) within a geographic area on a limited amount of radio spectrum (limited number of radio channels).

**PART B (16 Mark Questions)**

1. Explain briefly about the link level design.(Understanding)
2. Discuss in detail about the Channel access.(Remembering)
3. Describe about the networks architecture and mobility management in detail.(Remembering)
4. Explain briefly about the flat fading and intersymbol interference counter measures.(Analyzing) (Dec 2018)
5. Explain in detail about wireless LAN architecture. Outline any four advantages and disadvantages. (Remembering)(Jan 2017) (Apr 2019)
6. Briefly explain about satellite networks.(Understanding)
7. Elaborate the communication in a cellular telephone systems.(Understanding)(Jan 2017)
8. Write notes on cordless phones.(Understanding) (Dec 2018)
9. Describe in detail about the wide area wireless networks.(Analyzing)
10. What are the technical challenges of a wireless network? Elaborate.(Remembering) (Apr 2018) (Dec 2017)
11. How is mobility management achieved in wireless networks?(Analyzing)(Dec 2017) (Dec 2018) (Apr 2019)
12. Explain the architecture and protocol stack of WLAN.(Remembering)(Dec 2017)(Apr 2018)

**Unit IV - MULTICASTING TECHNIQUES AND PROTOCOLS (CO4)****PART –A ( 2 MARKS)****1. What is Multicast technique?(Remembering)**

Multicast (point-to-multipoint) is a communication pattern in which a source host sends a message to a group of destination hosts. Although, this can be done by sending different unicast (point-to-point) messages to each of the destination hosts, there are many reasons which make having the multicasting capability desirable.

**2. What are the three types of IPv4 addresses?(Understanding)****Unicast**

Unicast addresses are used for transmitting a message to a single destination node.

**Broadcast**

Broadcast addresses are used when a message is supposed to be transmitted to all nodes in a subnetwork

**Multicast**

For delivering a message to a group of destination nodes which are not necessarily in the same subnetwork, multicast addresses are used.

**3. Define scalability.**

The large networks that lack mechanisms for extending or adding equipment can experience substantial scalability problems, especially in constructing multicast trees.

**4. Define Managability.(Remembering)**

As a data network becomes larger, constructing a central management system for distributed multicast tasks can become increasingly challenging

**5. What is Internet Group Management Protocol (IGMP)?(Remembering)**

Hosts willing to receive multicast messages (packets) need to inform their immediately-neighbor routers that they are interested in receiving multicast messages sent to certain multicast groups. This way, each node can become a member of one or more multicast groups and receive the multicast packets sent to those groups. The protocol through which hosts communicate this information with their local routers is called Internet Group Management Protocol (IGMP).

**6. List Multicast Tree Algorithm.(Understanding)**

- Dense mode algorithm
- Sparse mode algorithm

**7. List out the challenges in multicast routing.(Analyzing)**

- Dynamic change in the group membership
- Minimizing network load and avoiding routing loops
- Finding concentration points of traffic

**8. List out the intra domain multicast protocols.(Analyzing)**

- Distance Vector Multicast Routing Protocol (DVMRP)
- Internet Group Management Protocol (IGMP)
- Multicast OSPF(MOSPF) Protocol
- Protocol Independent Multicast (PIM)
- Core – Based trees (CBT) Protocol
- Multicast Backbone(MBone)

**9. List out the inter domain multicast protocols.(Analyzing)**

- Multiprotocol BGP
- Multicast Source Discovery Protocol(MSDP)
- Border Gateway Multicast protocol(BGMP)

**10. Define flooding.(Remembering)**

Flooding is a simple routing technique in computer networks where a source or node sends packets through every outgoing link.

Flooding, which is similar to broadcasting, occurs when source packets (without routing data) are transmitted to all attached network nodes. Because flooding uses every path in the network, the shortest path is also used. The flooding algorithm is easy to implement

**11. What does Spanning Tree Protocol (STP) mean? (Remembering)**

Spanning Tree Protocol (STP) is a link management protocol preventing media access control (MAC) bridge loops and broadcast delays on any Ethernet local area network (LAN). Bridge loops are network loops created by multiple active station paths. STP is a data link layer protocol standardized by the Institute of Electrical and Electronics Engineers (IEEE) 802.1D.

**12. What does Distance Vector Multicast Routing Protocol (DVMRP) mean? (Remembering)**

Distance Vector Multicast Routing Protocol (DVMRP) is an efficient Interior Gateway Protocol routing mechanism that combines Routing Information Protocol features with a truncated reverse path broadcasting algorithm for IP multitask data sharing between connectionless autonomous systems.

DVMRP is defined by the Internet Engineering Task Force as RFC 1075.

**13. What are the DVMRP header components?(Remembering)**

- Version
- Type
- Subtype: Response, request, non-membership report or non-membership cancellations
- Checksum: Complete message sum of 16-bit ones, not including IP headers. Requires 16-bit alignment. Checksum computation field is zero.

**14. List some tasks of DVMRP.(Analyzing)**

- Tracks multicast datagram source paths
- Encapsulates packets as Internet Protocol (IP) datagrams
- Supports multicast IP datagram tunneling via unsupported encapsulated and addressed unicast packet routers
- Generates dynamic multicast IP delivery trees via reverse path multicasting and a distributed routing algorithm

- Exchanges routing datagrams made up of small, fixed-length headers and tagged data streams via Internet Group Management Protocol
- Handles tunnel and physical interfacing according to broadcast routing exchange source trees produced during truncated tree branch removal
- Manages reverse path forwarding for multicast traffic forwarding to downstream interfaces

### **15. What is Reverse Path Broadcasting (RPB)?(Remembering)**

The RPB algorithm which is currently being used in the Mbone (Multicast Backbone), is a modification of the Spanning Tree algorithm. In this algorithm, instead of building a network-wide spanning tree, an implicit spanning tree is constructed for each source. Based on this algorithm whenever a router receives a multicast packet on link "L" and from source "S", the router will check and see if the link L belongs to the shortest path toward S. If this is the case the packet is forwarded on all links except L. Otherwise, the packet is discarded.

### **16. What is Truncated Reverse Path Broadcasting (TRPB)?(Remembering)**

Truncated Reverse Path Broadcasting (TRPB) was developed to overcome the limitations of Reverse Path Broadcasting. With the help of IGMP, multicast routers determine the group memberships on each leaf subnetwork and avoid forwarding datagrams onto a leaf subnetwork if it does not have a member of the destination group present. The spanning delivery tree is "truncated" by the router if a leaf subnetwork does not have group members

### **17. What is Reverse Path Multicasting (RPM)?(Remembering)**

Reverse Path Multicasting (RPM) is an enhancement to Reverse Path Broadcasting and Truncated Reverse Path Broadcasting. RPM creates a delivery tree that spans only:

- Subnetworks with group members, and
- Routers and subnetworks along the shortest path to subnetworks with group members

RPM allows the source-rooted spanning tree to be pruned so that datagrams are only forwarded along branches that lead to members of the destination group.

### **18. What is Core-Based Trees (CBT)? (Understanding)**

The CBT algorithm is quite similar to the spanning tree algorithm except it allows a different core-based tree for each group. Multicast traffic for each group is sent and received over the same delivery tree, regardless of the source. Unlike existing algorithms which build a source-rooted, shortest-path tree for each (source, group) pair, CBT constructs a single delivery tree that is shared by all members of a group.

### **19. What is Multicast Extensions to OSPF (MOSPF)?(Remembering)**

The Multicast extensions to OSPF (MOSPF) are defined in RFC-1584. MOSPF routers maintain a current image of the network topology through the unicast OSPF link-state routing protocol. MOSPF enhances the OSPF protocol by providing the ability to route multicast IP traffic

### **20. List some properties of MOSPF algorithm. (Applying)**

- For a given multicast datagram, all routers within an OSPF area calculate the same source-rooted shortest path delivery tree. Tie-breakers have been defined to guarantee that if several equal-cost paths exist, all routers agree on a single path through the area. Unlike unicast OSPF, MOSPF does not support the concept of equal-cost multipath routing.
- Synchronized link state databases containing Group-Membership LSAs allow an MOSPF router to effectively perform the Reverse Path Multicasting (RPM) computation "in memory". Unlike DVMRP, this means that the first datagram of a group transmission does not have to be forwarded to all routers in the area.
- The "on demand" construction of the shortest-path delivery tree has the benefit of spreading calculations over time, resulting in a lesser impact for participating routers.

### **21. What is Protocol-Independent Multicast (PIM)?(Remembering)**

The Protocol-Independent Multicast (PIM) routing protocol is currently under development by the Inter-Domain Multicast Routing (IDMR) working group of the IETF. The objective of the IDMR working group is to develop a standard multicast routing protocol that can provide scalable inter-domain multicast routing across the Internet.

### **22. What is Node-Level Multicast Algorithms?(Remembering)**

Multicasting techniques can also be used at the router level. To implement a multicast connection, a binary tree is normally constructed with the source switch port at the root and the destination switch ports at the leaves. Internal nodes act as relay points that receive packets and make



copies. A number of such multicast methods are used. One is a tree-based multicast algorithm using a separate copy network. The Boolean splitting multicast algorithm is used for multistage switches. The third technique the packet recirculation multicast algorithm. The fourth is multicasting in three-dimensional switches.

### 23. Define multicasting.(Remembering)(Dec 2017)

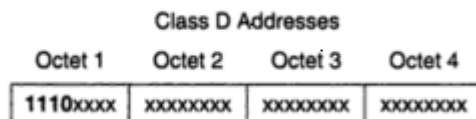
Transmission method in which one device communicates with several devices with a single transmission. In contrast to broadcasting( in which a message or signal is sent to all connected devices) a multicast message is transmitted only to the selected device(s)

### 24. Classify the multicast protocols(Understandin)(Dec 2017)(Apr 2018)

Intradomain – DVMRP, IGMP, MOSPF, PIM, CBT, Mbone

Interdomain – MBGP, MSDP, BGMP

#### Multicast Address Format



### 25. Construct the multicast address format.(Apr 2018)

### 26. Write the applications of Protocol independent protocol.(Remembering)(Dec 2018)

PIM, a multicasting routing protocol that runs over an existing unicast infrastructure. There are two variations of PIM:

PIM-SM -- Short for PIM-Sparse Mode, which is used when recipients are scattered over a large area.

PIM-DM -- Short for PIM-Dense Mode, which is used when the targeted recipients are in a concentrated area.

### 27. List the difference between multi-cast and broadcast address(Understanding)(Apr 2018)

BASIS FOR COMPARISON	BROADCAST	MULTICAST
Basic	The packet is transmitted to all the hosts connected to the network.	The packet is transmitted only to intended recipients in the network.
Transmission	One to all	One to many
Bandwidth	Bandwidth is wasted	Bandwidth is utilized efficiently
Process	Slow	Fast

#### PART B (16 Mark Questions)

1. Explain briefly about the intra domain multicast protocols.(Understanding)
2. Explain briefly about the inter domain multicast protocols.(Understanding)(Apr 2018) (Apr 2019)
3. Discuss in detail about the node level multicast algorithms.(Remembering)
4. Write notes on protocol independent multicast (PIM).(Remembering)
5. Explain briefly about multicasting in three dimensional switches.(Understanding)
6. Explain any one type of multicast tree algorithm.(Remembering)(Dec 2017)(Apr 2018)
7. Describe the principle of distance vector multicast routing protocol.(Remembering)(Dec 2017) (Dec 2018) (Apr 2019)
8. Discuss the principle of multicast OSPF protocol.(Analyzing)(Dec 2017)
9. What are intra domain routing protocols? Explain any one type.(Remembering)(Dec 2017)(Apr 2018)
10. Discuss the performance of multicast backbone.(Analyzing)(Apr 2018)

#### UNIT V - ADVANCED NETWORK CONCEPTS (CO5)

#### PART –A ( 2 MARKS)

##### 1.What do you mean by overlay model?(Understanding)

An overlay network is a virtual network of nodes and logical links that is built on top of an existing network with the purpose to implement a network service that is not available in the existing network.

**2. State the disadvantages of overlay model? (Understanding)**

- Deterministic searches
- Bounded search time
- Content-addressable data
- Load balancing
- Scalability

**3. What is VPN?(Remembering)(JAN 2017)**

A VPN is a networking infrastructure whereby a private network makes use of the public networks. A VPN maintain privacy by using tunneling protocols and security procedures.

**4. List out the types of VPN.(Remembering)**

1. Remote access
2. Site to site

**5. List the benefits of VPN.(Remembering)**

- Improved security for data exchanges
- Improve productivity of freelance employees that work via virtual workplaces
- Functionality and resources shared from a corporate office to all employees
- The VPN can grow as quickly as a businessdoes, which allows the purchase of extended VPN service packages to facilitate sizing as needed
- If data is intercepted, it will be encrypted and will not be readable to outside hackers

**6. List out the limitations of a VPN.(Remembering)**

Despite their popularity, VPNs are not perfect and limitations exist as is true for any technology. Organizations should consider issues like the below when deploying and using virtual private networks in their operations:

1. VPNs require detailed understanding of network security issues and careful installation / configuration to ensure sufficient protection on a public network like the Internet.
2. The reliability and performance of an Internet-based VPN is not under an organization's direct control. Instead, the solution relies on an ISP and their quality of service.
3. Historically, VPN products and solutions from different vendors have not always been compatible due to issues with VPN technology standards. Attempting to mix and match equipment may cause technical problems, and using equipment from one provider may not give as great a cost savings.

**7. What do you mean by peer model?(Understanding)**

Peer-to-peer (P2P) is a decentralized communications model in which each party has the same capabilities and either party can initiate a communication session. Unlike the client/server model, in which the client makes a service request and the server fulfills the request, the P2P network model allows each node to function as both a client and server.

**8. Define MPLS?(Remembering)**

Multiprotocol Label Switching (MPLS) is a type of data-carrying technique for high-performance telecommunications networks that directs data from one network node to the next based on short path labels rather than long network addresses, avoiding complex lookups in a routing table.

**9. What is tunneling? (Remembering)(Dec 2018)(Apr 2019)**

Tunneling is a process of encapsulating packets and sending them over public network.

**10. List the applications of Network performance analyzer. (Remembering)(Dec 2018)**

- Provide detailed statistics for current and recent activity on the network.
- Detect unusual levels of network traffic.
- Detect unusual packet characteristics.
- Identify packet sources or destinations.

**11. Mention the main features of label switching? (Applying)**

Label switching allows devices in the network core to switch packets according to these labels with minimal lookup activity.

Besides the obvious advantage of faster network transit,

MPLS also provides the privacy and quality of service (QoS) advantages of connection-oriented services such as ATM without the complexity of manually creating fully-meshed PVCs. MPLS

integrates the performance and traffic-management capabilities of the data link layer (Layer 2) with the scalability and flexibility of network layer (Layer 3) routing. MPLS is applicable to networks using any Layer 2 switching, but it has particular advantages when applied to ATM networks. It integrates IP routing with ATM switching to offer scalable IP-over-ATM networks.

**9. What are the advantages of label switching?(Understanding)**

- Determines how much resources to commit to the path
- What queuing and discarding policy to establish at each LSR for packets in FEC.

**10. Define traffic engineering.(Remembering)**

Traffic engineering is a method of optimizing the performance of a telecommunications network by dynamically analyzing, predicting and regulating the behavior of data transmitted over that network. Traffic engineering is also known as teletraffic engineering and traffic management.

**11. Define LIS.(Remembering)**

The **Location Information Server** or LIS is a network node originally defined in the National Emergency Number Association i2 network architecture that addresses the intermediate solution for providing e911 service for users of VoIP telephony. The LIS is the node that determines the location of the VoIP terminal.

**12. What are the components of ELAN?(Remembering)**

- LECS – LAN emulation configuration server
- LES - LAN emulation server
- BUS - Broadcast and Unknown server
- Multiple LEC's – LAN emulation clients.

**13. Demonstrate the principle of Label Switched Path (LSP). (Applying)**

Multi-Protocol Label Switching (MPLS) converts your routed network to something closer to a switched network and offers transport efficiencies that simply aren't available in a traditional IP-routed network. Instead of forwarding packets on a hop-by-hop basis, paths are established for particular source-destination pairs. The predetermined paths that make MPLS work are called label-switched paths (LSPs).

**14. Analyze about the guaranteed service. (Analyzing)**

Flows that are reserving resources are provided with guaranteed service. The service provides assured capacity levels.

**15. Define label swapping in MPLS.(Remembering)**

The basic operation of looking up an incoming label to determine the outgoing label and forwarding is called label swapping.

**16. Define soft state.(Remembering)**

A set of information at a router that expires unless regularly refreshed from the entity that requested the state.

**17. Illustrate the meaning of ingress edge and egress edge in MPLS domain. (Understanding)**

**Ingress edge:** Label switched router through which packets from internet router enters into MPLS domain is called ingress edge.

**Egress Edge LSR:** LSR through which packets leaves the MPLS domain is called egress edge.

**18. Define Label switched router in MPLS.(Remembering)**

An MPLS network consists of a set of nodes called label switched router (LSR) capable of switching and routing packets on the basis of which a label has been added to each packets.

**19. What is the need for resource reservation?(Nov/Dec 2014) (Remembering)**

To deliver data from source to destination with desired QOS (throughput, delay, delay variance). It enables routers to decide that it can meet requirements to deliver multicast transmission.

**20. Draw the format of MPLS Label(Nov/Dec 2014) (Creating)**

<b>21. Label value</b>	<b>22. EXP</b>	<b>23. S</b>	<b>24. TTL</b>
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Label value: 20-bit label; EXP: 3-bit reserved for experimental use; S- (bottom of stack) -1 – oldest entry in stack; 0 – all other entries. TTL – Time to Live – 8 bits used to encode hop count value.

**25. Develop the need for peer-peer process. (Creating)**

In its simplest form, a **peer-to-peer** (P2P) network is created when two or more PCs are connected and share resources without going through a separate server computer. A P2P network

can be an ad hoc connection—a couple of computers connected via a Universal Serial Bus to transfer files.

**26. When a switch is said to be congested? (Remembering)**

Sometimes a switch receives the packets faster than they can be accommodated in the shared link. These packets are stored in the memory for some time. However, after sometime the buffer space will exhaust and some packets will start getting dropped off. The switch is called as congested in this state.

**27. How does MPLS support scalability?(Analyzing)(Dec 2017)**

MPLS with million labels (which can be reused) makes the networking practically scalable with no growth limitation.

**28. Mention the main features of label switching?(Remembering)(Apr 2018)**

- It uses a small label or stack of labels appended to packets and typically makes efficient routing decisions.
- It is flexibility in merging IP based networks with fast switching capabilities.

**29. When a switch is said to be congested?(Analyzing)(Apr 2018)**

Whenever the input rate is more than available link capacity. Sometimes a switch receives the packets faster than they can be accommodated in the shared link. These packets are stored in the memory for some time. However, after sometime the buffer space will exhaust and some packets will start getting dropped off. The switch is called as congested in this state.

**PART B (16 Mark Questions)**

1. Illustrate VPN architecture and its features.(Applying)(Dec 2018)
2. What is authentication? Discuss about merits and demerits of different authentication protocols.(Understanding)
3. Write a note on (i) Packet filtering and (ii) Application Gateway.(Remembering)
4. Explain about Network Layer Security. (Analyzing)
5. a) What are tunneling and point to point protocol? Explain. (8)(Evaluating)  
b) Explain multiprotocol label switching in detail. (8) (Evaluating)
6. a) Explain in detail about the working of overlay networks. (8)(Understanding)  
b) Explain in detail about P2P protocol. (8)(Analyzing) (Applying)(Dec 2018)
7. a) Explain about virtual private networks and their advantages. (8)(Understanding)  
b) What is VPN? Explain Remote-Access VPN (8)(Understanding)
8. Explain how traffic engineering helps in designing an efficient network (Analyzing)
9. Discuss the MPLS architecture and the routing process in MPLS based VPN. (Applying) (Apr 2019)
10. Describe the addressing of VPN and the IP Sec for VPN in the tunnel mode. (Understanding)
11. Explain the concept of point to point protocol. Mention its applications.(Remembering)(Dec 2017)
12. How is security achieved in VPN? Explain.(Analyzing)(Dec 2017)
13. What is MPLS? With necessary sketch explain the label format and operation of MPLS protocol. (Remembering)(Dec 2017)(Apr 2018) (Dec 2018)
14. Discuss about virtual private networks and their advantages.(Analyzing) (Apr 2018)
15. Explain Remote – Access VPN.(Remembering)(Apr 2018) (Apr 2019)