



**Department of Electronics and Communication Engineering**

**EC8551 – COMMUNICATION NETWORKs**

**UNIT I**

**Fundamentals and Link layer**

**1. Write down the requirements to build a computer network. (April 2018)**

The requirements to build a computer network are Connectivity, Resource sharing and Support for common services

**2. List the metrics that influence the performance of the network. (May 16, April 2018)**

Metrics that influence the performance of the network are Throughput, Delay and Bandwidth

**3. Which layer implements the node to node channel connection in OSI layered architecture?(NOV 2018)**

Data link layer implements the node to node channel connection in OSI layered architecture

**4. Define the terms : Bandwidth and Latency (Nov 2017)**

Bandwidth, typically measured in bits, kilobits, or megabits per second, is the rate at which data flows over the network.

Latency, usually measured in milliseconds, is the time that elapses between a request for information and its arrival.

**5. Compare byte oriented verses bit oriented protocols. (Nov 2017)**

In a byte-oriented protocol, data to be carried are 8-bit characters from a coding system.

In a bit-oriented protocol, the data section of a frame is a sequence of bits. Bit-oriented protocols are more popular today because we need to send text, graphic, audio, and video which can be better represented by a bit pattern than a sequence of characters.

**6. .What is a protocol? What are the key elements of a protocol? (Nov 2015/ Nov 2021)**

Protocol is the set of rules governing the exchange of data between two entities. Key elements are Syntax: It refers to the structure or format of data meaning the order in which they are presented.

Semantics: It refers to the meaning of each section of bit. How to do interpretation.

Timing: When data should be sent and how fast they can be sent

**7. Write the mechanism of stop and wait protocol.(Nov 2016)**

In this method of flow control, the sender sends a single frame to receiver & waits for an acknowledgment. The next frame is sent by sender only when acknowledgment of previous frame is received. This process of sending a frame & waiting for an acknowledgment continues as long as the sender has data to send. To end up the transmission sender transmits end of transmission (EOT).

**8. Define bit stuffing. (May 2011, May 2017)**

HDLC denotes both the beginning and the end of a frame with the distinguished bit sequence 01111110. This sequence might appear anywhere in the body of the frame, it can be avoided by bit stuffing. On the sending side, any time five consecutive 1's have been transmitted from the body of the message, the sender inserts a 0 before transmitting the next bit.



**9. What is meant by Flow Control? (Nov 2011, May 2015, May 2016)**

Flow control is a technique for assuring that a transmitting entity does not overwhelm a receiving entity with data. It is a feedback mechanism by which the receiver is able to regulate the sender. Such a mechanism is used to keep the sender from overrunning the receiver, i.e., from transmitting more data than the receiver is able to process

**10. What is a URL?(Apr '19)**

A Uniform Resource identifier, termed as a Web Address, is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it

**11. What is mean by error control?**

Error control is a method that can be used to recover the corrupted data whenever possible.

These are two basic types of error control which are backward error control and forward error control.

**12. What is OSI? (Nov Dec 2019)**

A standard that specifies a conceptual model called Open systems Interconnection network interface model, which breaks networked communications into seven layers: Application, Presentation, Session, Transport, Network, Data link, Physical.

**13. State the major functions performed by the presentation layer of the ISO OSI model. (Nov Dec 2006)**

Presentation layer is concerned with the format of data exchanged between peers, for example, whether an integer is 16, 32, or 64 bits long and whether the most significant bit is transmitted first or last, or how a video stream is formatted.

**14. State the purpose of layering in networks? (May Jun 2007)**

A layer is a collection of related functions that provides services to the layer above it and receives services from the layer below it.

To execute the functions by each layer is independent.

**15. What are the two fundamental ways by which network performance is measured?**

1. Bandwidth
2. Latency



## **UNIT- II**

### **Media Access and Internetworking**

#### **1. What is a bridge? (Nov 2011, May 2017)**

Bridge is a hardware networking device used to connect two LANs. A bridge operates at data link layer of the OSI layer. A bridge observes and forwards all frames that it receives. It does forwarding & filtering frames using LAN destination address. Bridges are used to connect LAN or WAN and works at data link layer level. It should follow congestion control mechanisms to overcome congestion.

#### **2. Give the format of Ethernet format. (Dec 2017, Apr 19)**

Preamble	Dest addr	Src addr	Type	Body	CRC
64	48	48	16	(variable length)	32

#### **3. . What details are provided by DHCP other than IP address? (NOV 2018)**

The DHCP server manages a pool of IP addresses and information about client configuration parameters such as default gateway, domain name, the name servers, and time servers

#### **4. List the difference between Packet Switching and Circuit Switching. (May14, May 17)**

Issue	Packet switching	Circuit Switching
Circuit setup	Not Required	Required
Transmission path	No Transmission path	Dedicated path
Addressing	Each packet contains the full source and destination address	Only data is sent
Bandwidth	Dynamic Bandwidth	Fixed Bandwidth
Routing	Each packet is routed independently	Entire data is sent through the same path
Congestion control	Difficult	Easy if enough buffers can be located in advance for each VC set up

#### **5. What is meant by ICMP? (May 2016)**

ICMP stands for Internet Control Message Protocol . It is a supporting protocol in the Internet protocol suite. It is used by network devices, including routers, to send error messages and operational information indicating, for example, that a requested service is not available or that a host or router could not be reached.

#### **6. What is Bluetooth? (May 2016, Nov 2021)**

Bluetooth is a standard for the short-range wireless interconnection of mobile phones, computers, and other electronic devices. Bluetooth is a wireless technology standard for exchanging data over short distances in the range of 10 m with a rate of 2Mbps.

#### **7. What is scatternet? (Nov 2016)**



A scatternet is a type of network that is formed between two or more Bluetooth-enabled devices, such as smartphones and newer home appliances. A scatternet is made up of at least two piconets.

**8. When is ICMP redirect message used?(May 2017)**

An ICMP redirect is an error message sent by a router to the sender of an IP packet. Redirects are used when a router believes a packet is being routed sub optimally and it would like to inform the sending host that it should forward subsequent packets to that same destination through a different gateway.

**9. Highlights the characteristics of Datagram network. (Dec 2017)**

A datagram is a unit of transfer associated with networking. A datagram has the following characteristics: Data is transmitted from source to destination without guarantee of delivery. Data is frequently divided into smaller pieces and transmitted without a defined route or guaranteed order of delivery.

**10. Define 802.11 (May 2018)**

IEEE 802.11 is a set of media access control (MAC) and physical layer (PHY) specifications for implementing wireless local area network (WLAN) computer communication.

**11. What are the limitations of bridges?**

1. Scale
2. Heterogeneity

**12. Define Bluetooth.**

Bluetooth is a wireless technology standard for exchanging data over short distance (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices and building personal area networks (PANs).

**13. What are the 3 levels of hierarchy in IP Addressing?**

1. Netid
2. Subnetid
3. Hostid

**14. What are the functions of bridge?**

1. Connecting networks
2. Filtering information so that network traffic for one portion of the network does not congest the rest of the network.

**15. Define sub-netting**

Sub-netting is a technique that allows a network administrator to divide one physical network into smaller logical networks and thus control the flow of traffic for security or efficiency reasons.

### **UNIT – III**

#### **Routing**

#### **1. What does Border Gateway Protocol (BGP) mean? (Dec 2017)**

Border Gateway Protocol (BGP) is a routing protocol used to transfer data and information between different host gateways, the Internet or autonomous systems. BGP is a Path Vector Protocol (PVP), which maintains paths to different hosts, networks and gateway routers and determines the routing decision based on that. It does not use Interior Gateway Protocol (IGP) metrics for routing decisions, but only decides the route based on path, network policies and rule sets. Sometimes, BGP is described as a reach ability protocol rather than a routing protocol

#### **2. Explain about OSPF. (May 2018)**

OSPF (Open Shortest Path First) is a router protocol used within larger autonomous system networks in preference to the Routing Information Protocol (RIP), an older routing protocol that is installed in many of today's corporate networks. Using OSPF, a host that obtains a change to a routing table or detects a change in the network immediately multicasts the information to all other hosts in the network so that all will have the same routing table information.

#### **3. Explain Multicast routing? (May 2018, Nov 2021)**

Multicast IP Routing protocols are used to distribute data (for example, audio/video streaming broadcasts) to multiple recipients. Using multicast, a source can send a single copy of data to a single multicast address, which is then distributed to an entire group of recipients.

#### **4. Give the comparison of unicast, multicast and broadcast routing. (Nov16,May17)**

S.No	Unicast	Multicast	Broadcast
1.	One source and one destination	One source and group of destinations	One source and all destinations
2.	Relation ship is one to one	Relation ship is one to many	Relationship is one to all

#### **5. What is fragmentation and reassembly. (Nov 2016, Apr 19)**

Fragmentation is the process of converting the larger packet size into smaller sizes so that they will fit into the frames of the underlying network. The receiving system reassembles the smaller size packets into the original packets.

#### **6. Why is IPv4 to IPv6 transition required? (May 2017)**

The migration from IPv4 to IPv6 must be implemented node by node by using autoconfiguration procedures to eliminate the need to configure IPv6 hosts manually. This way, users can immediately benefit from the many advantages of IPv6 while maintaining the possibility of communicating with IPv4 users. The advantages are **More Efficient Routing, More Efficient Packet Processing, Directed Data Flows, security.**



**7. Differentiate between forwarding table and routing table (Dec 2017)**

A routing table is a representation of the Layer 3 forwarding table, based on IP. A "forwarding table" is a more generic term that could include Layer 2 forwarding.

**8. List the two factors that affect the performance of a network switch.(NOV 2018)**

Factors that affect the performance of a network switch are- Bandwidth. Throughput. Latency, Jitter and Error rate

**9. How does a router differ from a bridge? (May 2015)**

Routers relay packets among multiple interconnected networks. They route packets from one network to any of a number of potential destination networks on internet. A router operates as the physical, data link and network layer of the OSI model. A router is termed as an intelligent device. Therefore, its capabilities are much more than those of a repeater or a bridge

**10. What are the two major mechanism defined to help transition from IPV4 to IPv6 (Apr 19).**

- a. Dual Stack: Running both IPv4 and IPv6 on the same device
- b. Tunneling: Transporting IPv6 traffic through an IPv4 network transparently
- c. Translation: Converting IPv6 traffic to Ipv4 traffic for transport and vice versa

**11. What are the 3 types of routing performed by BGP?**

- Inter-autonomous system routing
- Intra-autonomous system routing
- Pass through autonomous system routing

**12. What are the different kinds of multicast routing?**

- DVMRP
- PIM
- MSDP
- MOSPF
- MBGP

**13. Write the types of PIM.**

- PIM Sparse mode
- PIM Dense mode
- Bidirectional PIM
- Source Specific Multicast (SSM)

**14. How can the routing be classified?**

The routing can be classified as,

- Adaptive routing
- Non-adaptive routing.

**15. What are the salient features of IPv6?( Nov 2021)**





Salient features are:

- Efficient and hierarchical addressing and routing infrastructures.
- IPv6 networks provide auto configuration capabilities.
- Better support for QOS.
- Large Address space.
- Stateless and stateful address configuration.

## **UNIT – IV Transport Layer**

### **PART A**

#### **1. What is the main difference between TCP & UDP? (Nov 2014, Nov 2016, Nov 2021)**

<b>TCP</b>	<b>UDP</b>
It provides Connection oriented service	Provides connectionless service.
Connection Establishment delay will be there	No connection establishment delay
Provides reliable service	Provides unreliable, but fast service
It is used by FTP, SMTP	It is used by DNS, SNMP, audio, video and multimedia applications.

#### **2. Define congestion control. (May 2018, Nov 2021)**

Congestion control is the process of preventing the source from sending data that will end up getting dropped by a router because its queue is full

#### **3. What is meant by slow start in TCP congestion? (May 2016)**

*TCP Slow Start* is part of the **congestion control** algorithms to help control the amount of data flowing through to a network. It balances the speed of a network connection. Slow start gradually increases the amount of data transmitted until it finds the network's maximum carrying capacity.

#### **4. List the different phases used in TCP Connection. (May 2016)**

Three phases used in TCP Connection are 1. Connection establishment 2. Data transfer 3. Connection termination

#### **5. What are the approaches used to provide Quality of Service(QoS)? (Dec 2017)**

- Integrated services ("IntServ") implements the parameterized approach. In this model, applications use the Resource Reservation Protocol (RSVP) to request and reserve resources through a network.
- Differentiated services ("DiffServ") implements the prioritized model. DiffServ marks packets according to the type of service they desire. In response to these markings, routers and switches use various queueing strategies to tailor performance to expectations.



**6. Compare flow control versus congestion control. ( Nov 2015, Dec 17)**

<b>Congestion Control</b>	<b>Flow Control</b>
Congestion control means preventing the source from sending data that will end up getting dropped by a router because its queue is full.	Flow control means preventing the source from sending data that the receiver will end up dropping because it runs out of buffer space.
congestion control is concerned with how hosts and networks interact.	It is an end to an end issue
This is more complicated, because packets from different sources travelling different paths can converge on the same queue.	This is fairly easy with a sliding window protocol
Techniques <ul style="list-style-type: none"><li>• AIMD (Additive Increase Multiplicative Decrease)</li><li>• Slow start</li><li>• Fast retransmit/Recovery.</li></ul>	Techniques <ul style="list-style-type: none"><li>• Stop and wait</li><li>• Sliding window</li></ul>

**7. What are the services provided by Transport layer protocol. (May 2018)**

**Transport layer protocol** provides

- Connection oriented services
- Reliable service by using Error Control and Flow Control.

Multiplexing: Transport layer performs multiplexing/demultiplexing function. Multiple applications employ same transport protocol, but use different port number. According to lower layer n/w protocol, it does upward multiplexing or downward multiplexing

**8. Define QoS. (May 2012,Nov 2014, May 2015, Nov 2015 ,NOV 2018)**

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 is associated with a set of attributes. The attributes are-Bandwidth, Latency or Delay, Jitter, Packet loss ratio.

**9. How do fast retransmit mechanism of TCP works.(May 2017)**

In TCP/IP, fast retransmit and recovery (FRR) is a congestion control algorithm that makes it possible to quickly recover lost data packets. With FRR, if a receiver receives a data segment that is out of order, it immediately sends a duplicate acknowledgement to the sender. If the sender receives three duplicate acknowledgements, it assumes that the data segment indicated by the acknowledgements is lost and immediately retransmits the lost segment.

**10. How does UDP address flow control mechanism? (Apr 19)**

UDP does not provide any mechanism for reassembling the data in its original sequence. The data is simply delivered to the application in the order that it arrives. **No Flow control**- There are no





mechanism within UDP to control the amount of data transmitted by the source to avoid over whelming the destination device

**11. What are the types of port numbers used in transport layer?**

- Well-known port
- Registered port
- Dynamic port

**12. Why TCP services are called Stream delivery services?**

TCP allows the sending process to deliver data as a stream of bytes and the receiving process to deliver data as a stream of bytes. So it is called as stream of bytes.

**13. Define jitter**

Jitter is defined as a variation in the delay of received packets. The sending side transmits packets in a continuous stream and spaces them evenly apart. Because of network congestion, improper queuing, or configuration errors, the delay between packets can vary instead of remaining constant.

**14. Compare connectionless service & connection oriented service**

In connection less service there is no connection between transmitter & receiver Ex: UDP

In connection oriented service there is a connection between transmitter & receiver Ex: TCP

**15. What is Unicast & Multicast communication?**

- Unicast communication is one source sending a packet to one destination.
- Multicast communication is one source sending a packet to multiple destinations.

**UNIT – V**

**Application Layer**

**1. What is DNS ? (May 2018)**

Domain Name System converts domain names into IP addresses so browsers can load Internet resources. It is mainly used for a memorable way of identifying hosts because IP numbers uniquely identify hosts on the Internet but are difficult to remember.. A DNS Resolver is responsible for making requests of the local DNS server on behalf of clients. A DNS Resolver must know the IP address of at least one DNS server.

**2. What do you mean by Web Services Description Language (WSDL) ? (Dec2017)**

The **Web Services Description Language (WSDL)** is an XML-based **language** used to describe the **services** a business offers and to provide a way for individuals and other businesses to access those **services** electronically.

**3. What is POP3?(Nov 2016)**

POP3 (Post Office Protocol 3) is the most recent version of a standard protocol for receiving e-mail. POP3 is a client/server protocol in which e-mail is received and held for you by your Internet server

#### 4. What is a URL, web browser and rlogin? (May 2016)

- Uniform Resource Locator is a string identifier that identifies a page on World Wide Web.
- Web browser is a software program that interprets and displays the contents of HTML web pages.
- Remote login or rlogin is used to login into remote system and access its contents.

#### 5. Mention the different levels in domain name space. (May 2012,16)

Domain name space is divided into three different sections: generic domains, country domains & inverse domain.

- Generic domain: Define registered hosts according to their generic behavior, uses generic suffixes.
- Country domain: Uses two characters to identify a country as the last suffix.
- Inverse domain: Finds the domain name given the IP address.

#### 6 . What is WWW and SMTP? (Nov 2010,May 2014, May 2015)

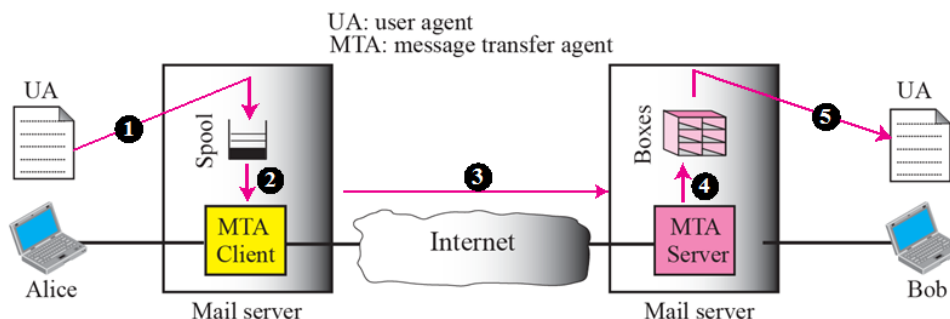
World Wide Web is an internet application that allows user to view pages and move from one web page to another. It helps to store and share data across varied distances. The TCP/IP protocol that supports electronic mail on the Internet is called Simple Mail Transfer (SMTP). It is a system for sending messages to other computer users based on e-mail addresses. SMTP provides mail exchange between users on the same or different computers.

#### 7. What is the use of SNMP protocol in a network? (NOV 2018)

**Simple Network Management Protocol (SNMP)** is an "Internet-standard protocol for managing devices on IP networks and for modifying that information to change device behavior.. Devices that typically support SNMP include routers, switches, servers, workstations, printers, & modem. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.

#### 8. Draw the scenario of Electronic Mail. (Apr 19)

E-mail (electronic mail) is the exchange of computer-stored messages by telecommunication. Email messages are usually encoded in ASCII text. The architecture of the email system consists of two kinds of subsystems: the user agents, which allow people to read and send email, and the message transfer agents, which move the messages from the source to the destination.





### 9. What is persistent HTTP. (Nov 2016)

HTTP persistent connection, also called HTTP keep-alive, or HTTP connection reuse, is the idea of using a single [TCP](#) connection to send and receive multiple [HTTP requests](#)/responses, as opposed to opening a new connection for every single request/response pair. The newer [HTTP/2](#) protocol uses the same idea and takes it further to allow multiple concurrent requests/responses to be multiplexed over a single connection.

### 10. Write the use of Hyper Text Transfer Protocol (HTTP). (Dec 2017, May 2018)

The browser **uses HTTP**, which is carried over TCP/IP to communicate to the server and retrieve Web content for the user. **HTTP** is a widely used **protocol** and has been rapidly adopted over the Internet because of its simplicity. It is a stateless and connectionless **protocol**.

#### 11. Name the four aspects of security.

- Privacy
- Authentication
- Integrity
- Non-repudiation

### 12. What is POP?

Post Office Protocol, version 3 (POP3) and Internet Mail Access Protocol version 4 (IMAP4) are protocols used by a mail server in conjunction with SMTP to receive and hold mail for hosts.

### 13. What is the function of SMTP?

The TCP/IP protocol that supports electronic mail on the Internet is called Simple Mail Transfer Protocol (SMTP). It is a system for sending messages to other computer users based on email addresses. SMTP provides mail exchange between users on the same or different computers.

### 14. How does MIME enhance SMTP?

MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP.

MIME transforms non-ASCII data at the sender site to NVT ASCII data and delivers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original data.

### 15. Why is an application such as POP needed for electronic messaging?

Workstations interact with the SMTP host, which receives the mail on behalf of every host in the organization, to retrieve messages by using a client-server protocol such as Post Office Protocol, version 3 (POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.



## **UNIT I**

### **Fundamentals and Link layer**

1. Explain in detail method of error detection and error correction. (**May 15, Nov 17, April 18, Nov 2021**)
2. Discuss in detail about the layers in OSI model. (**Nov16, Nov 2017, Apr 18, Nov 2021**)
3. Outline the steps involved in building a computer network. Give the detailed description for each step. (**May 2017, Nov 2017**)
4. Explain the layers of TCP/IP (or) Internet architecture in detail. (**April/May 15, April/May 17**)
5. Explain Link Layer Addressing and ARP Packet format (**ND 17, AM 18**)
6. Explain and Present the evolution and the types of Networks (**ND 21**)

## **UNIT- II**

### **Media Access and Internetworking**

1. Discuss in detail about the Ethernet. (**May 2012, Nov 2015, May 2017, May 2018, ND 21**)
2. With a neat sketch explain about IP service model, packet format, fragmentation and reassembly. (**Nov 2016, ND 21**)
3. Explain the error reporting using ICMP protocol. How does Traceroute program makes use of ICMP to determine the name and addresses of the routers between source and destination? (**NOV 2018**)
4. Outline the working principle of Bluetooth technology (**Apr 19**)
5. Give the comparison between different wireless technologies? Enumerate 802.11 protocol stack in detail (**May 2016**)
6. Analyze the various Phases in Mobile IP.

## **UNIT – III**

### **Routing**

1. Discuss about Link-state routing and routers. (**Dec 2017**)/ Explain in detail the operation of OSPF protocol by considering a suitable network. (**Nov 2016, May 2017, ND 21**)
2. Briefly explain the Border Gateway Protocol used for Inter domain routing in internetwork. (**NOV 2018**)



3. Explain about IPV6. Compare IPV4 and IPV6. **(May 2016) (May 2018) ND 21**
4. Explain the Routing Information protocol/Distance vector routing in detail. **(May 2018)**
5. Explain working of Protocol Independent Multicast (PIM) in detail.**(May17,May 18)**
6. Discuss the role of multicast routing and its relative merits. **ND 21**

#### **UNIT – IV**

##### **Transport Layer**

1. Elaborate on TCP Congestion control mechanisms. Differentiate these mechanisms **(May 2016, Nov 2016,May 2018)**
2. Explain three way of connection termination in TCP using state transition diagram. **(NOV 2018)**
3. .Write a detailed note on congestion avoidance mechanisms used in TCP. **(Dec 2017, ND 2021)**
4. Explain the differentiated services operation of QoS in detail **(May 2017)**
5. Summarize the following: (i) Stop-and-Wait Protocol (ii) Go-Back-N Protocol

#### **UNIT – V**

##### **Application Layer**

1. Discuss the working of E Mail in detail **(May 2015,May 2018 ,ND 2021)**
2. Briefly explain the Domain Name Service protocol with an example **(DEC17/NOV 2018)**
3. Explain in detail about SNMP messages **(Nov 2016,DEC 17)**
4. Explain in detail about HTTP operation **(Apr19,ND 2021)**
5. Discuss about Client Server Programming
6. Explain the basics of IMAP and POP3 mail access Protocols **(Apr 19)**