PAVENDAR BHARATHIDASAN COLLEGE OF ARTS AND SCIENCE

(AFFILIATED TO BHARATHIDASAN UNIVERSITY)

BACHELOR OF COMPUTER APPLICATION

SUBJECT: COMPUTER NETWORK

SUBJECT CODE :16SCCCA8

Text book: data communication and networking 5E Forouzan

PART-A

1.Define network:

Netwok is the communication of a set of device capable of communications.

2) What is topology?

The geometric representation of the relationship of all the links and linkingdevices.

3) what is data communication?

Data communications are exchange of data between two devices via some form of transmission medium.

4)Define protocol.

A protocol is set of rules that govern data communications.

5) Define Jitter .

Jitter refers to variation in the packet arrival time.

6) What is router?

Which connects the network to other network a switch which connects devices together, sometimes its called connecting devices such as router.

7) What is packet?

The communication betweenthe two ends is done in blocks of data called packets.

8) Define Multiplexing and Demultiplexing.

A protocol at a layer can encapsulates a packet from several next higher layer protocols it is called multiplexing.

A protocol at a layer can decapsulates and deliver a packet from several next higher layer protocols it is called demultiplexing.

9) What is optical fiber?

It is a cable that accepts and tansports signals in the form of light.

10) Define Error and types.

The bits flow from one point to another .there are two types of error.single bit, burst bit.

11)Define piggybacking.

        The simple,and stop and wait protocols are designed for uni directional communications, in which data is flowing only in one direction although the acknowledgement may travel in other directions.

12)Define channelization and its types.

        It is sometimes called channel partition, is a multiple access method in which the available bandwidth of a link in shared in a time among different protocols. There are three types of channelization , FDMA,TDMA,CDMA.

13) Define BLUETOOTH.

        Blue tooth is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, cameras, printers when they are at a short distance from each other.

14)Define hub:

        A hub is a device that operates only in the physical layer. A hub or repeater donot check the link layer address of the received frame.

15)Define Address space:

        An address space is the total no ofaddress used by the protocol.

<center>**PART-B**</center>

1) **Explain about topology and types?**

The geometric representation of the relationship of all the links and linkingdevices.

There are four types of topology.mesh, star,bus,ring.

MESH:

every device has a dedicated poni-to-point linkto every other device.

Advantages: if the data are over load thus eliminated, the mesh topology is robust, it is the topology is privacy or security.

Dis advantages:installation and reconnection is difficult.

STAR:

every device has a dedicated point-to-point link only to a central controller usually called hub.the device are not directly linked to one another.

BUS:

It is point-to-point connections. It one long cable acts as to links all the device in a network. Adv: its ease of installation. Bus uses less cabling than mesh and star topology.

Disadv: it include difficult reconnection and fault isolation.

RING:

Each device has a dedicated point-to-point connection with only the two devices on either side of it.

2) **Explain about network types ?**

Netwok is the communication of a set of device capable of communications. There are three types of networks; LAN,WAN,MAN.

LAN(Local Area Network) –it is usually privately ownedand connects some hosts in a single office ,building, or campus. Example, Wi-Fi.

WAN(Wide Area Network)- a WAN has a wider geographical span,spanning a town, a state,a country or even the world.

A WAN interconnects connecting devices such as switches,routers,or modems.

The WAN are two types, point-to-point WAN, switched WAN.

internet.

3) **Explain about multiplexing and demultiplexing**.

Multiplexing is set of techniques .multiplexer (MUX),which combines them into a singlestream(many-to-one)

Demultiplexer(DEMUX)- which separates the stream back into its component transmissions.(one-to-many).

There are three categories of multiplexing,

I) frequency division multiplexing(FDM)- It is an analog technique that can be applied when the band width of a link(in hertz). Channels can be separated by strips of unused bandwith- **guardbands** – to prevent signals from over laping.

II) Wavelength division multiplexing(WDM)-it is designed to use the high-data-rate capability of fibre optic cables. Multiplexing allows as to combine several lines into one.WDM, and FDM combining different signals of different frequency.

III) Time- division multiplexing(TDM) is a digital process that allows several connections to share the high bandwidth of a link, each connection occupies a portion of time in the link.

4) **Explain about BLUE TOOTH.**

Blue tooth is awireless LAN technology designed to connect devices of different functions such as telephones, notebooks, cameras,printerswhen they are at a short distance from each other.

Bluetooth technology has several applications.peripheral devices such as a wireless mouse or keyboard can communicate with the computer through this technology.

It defines two types of networks: piconet and scatternet.

Piconets:

A Bluetooth network is called a piconet or a small net.

A piconetcan have up to eight stations ,one of the which is called primary; the rest are called secondaries.

All the secondary stations synchronize their clocks and hopping sequence with the primary.

Scatternet:

Piconets can be combined to form what is called a scatternet. A secondary station in one piconet can be the primaryin another piconet.

This station can receive messages from the primaryin the first piconet and acting as a primary,deliver them to secondaries in the second piconet.

Bluetooth layers:

Application layer			
audio	profiles / data / L2CAP layer		control
Baseband layer			
Radio layer			
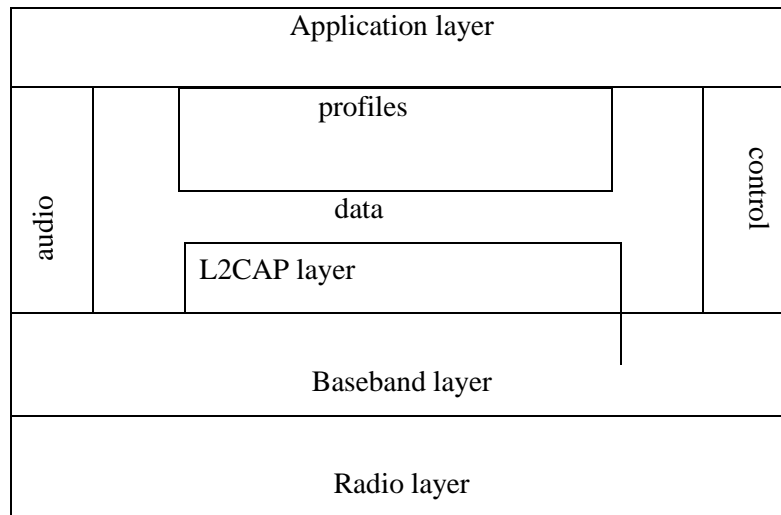
5)Explain about satellite networks.

A satellite network is a combination of nodes, some of which are satellites, that provides communication from one point on the Earth to another.

A node in the network can be satellite ,an Earth station or an end user terminal or telephone.

Satellite networks are like cellular networks in that they divide the planet into cells. It can provide transmission capability to and from any location on Earth.

Orbits:

An artificial satellite needs to have an orbit,the path in which in travels around the earth. The orbit can be equatorial, inclined or polar.

There are three categories of satellites:

I)Geostationary Earth Orbit(GEO)- Line-of sight propagation requires that the sending and receiving antennas be locked onto each other's location at all times(one antenna must have the other in sight).

The satellite must move at the same speed as the Earth so that it seems to remain fixed above a certain spot. Such satellite called geostationary.but one geostationary satellite cannot cover whole earth.

II) Low- Earth Orbit(LEO)- It have polar orbits. The altitude is between 500 and 2000 km, with a rotation period of 90 to 120 min. Satellites that are close to each other are connected through inter satellite links (ISLs).

A mobile system communicate with the satellite through a user mobile link (UML) it also communicate with an Earth station (GATEWAY) through a gateway link (GWL). Example global star- 48 satellites, 6 polar orbits, Iridium- 66 satellites, 6 orbits, **Teledesic** it is a first broadband LEO system, It provides fiberoptic like communication. It sometimes called "internet in the sky".

III)Medium-Earth Orbit(MEO)- A satellite at this orbit takes approximately 6 to 8 hours to circle the Earth.example of MEO satellite system is **Global Positioning System(GPS).**

Trilateration

GPS is based on a principle called trilateration. The terms trilateration and triangulation are normally used interchangeably. We use the word **trilateration**, which means using three distances,instead of **trilateration**, which may mean using three angles.

6) **Explain about IPV4 addresses**.

The identifier used in the IP layer of the TCP/ IP protocol suite to identify the connection of each device to the internet is called the internet address or IP address.
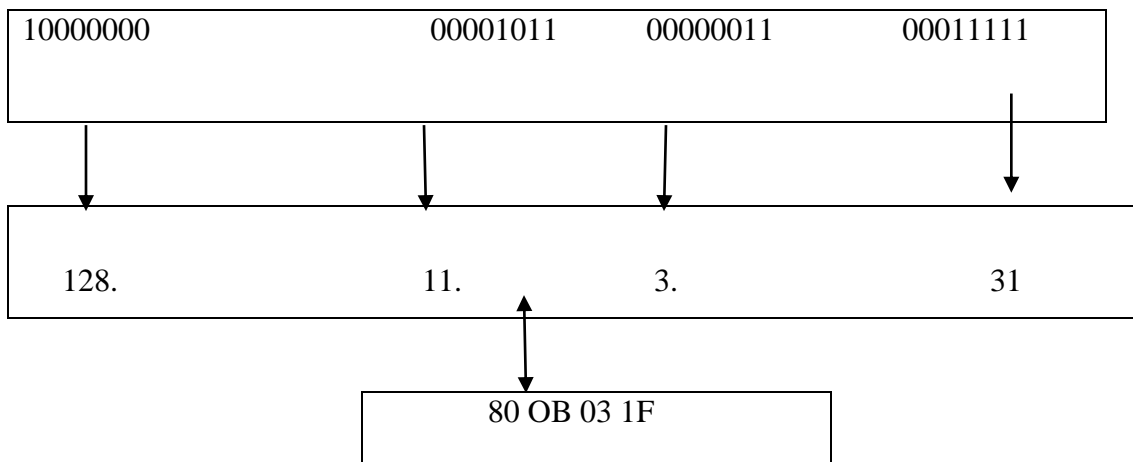An IPV4 address is a 32 bit address.

Address space:

An address space is the total no of addresses used by the protocol.

Notation :

There are three common notations to show an IPV4 address binary notation (base2),dotted-decimal notation (base 256) and hexa decimal notation (base 16).

1. In binary notation, an IPv4 address is displayed as 32 bits.
2.   Decimal form with a decimal point (dot) separating the bytes. This format is referred to as dotted –decimal notation.

10000000	00001011	00000011	00011111

128.	11.	3.	31

80 OB 03 1F

A 32-bit IPV4 address is also hierarchical ,but divided only two parts. The first part of the address ,called the prefix,defines the network ; the second part address called the suffix,defines node.

There are two types of addressing.

Classful addressing – the whole address space was devided into five classes (class A,B,C,D and E). This scheme is referred to classful addressing.

Classless addressing – Internet authorities announced a new architecture called classless addressing. Variable length blocks are used that belong to no classes.

Network address

The first address, the network address is particularly important because it is used in routing a pocket to its destination network.

7) **Explain about Transport layer protocols.**

The TCP/IP protocols uses a transport -layer protocol that is either a modification or a combination of some of this protocols.

Simple protocol:

First protocol is a simple connectionless protocol with neither flow nor error control .that the receiver can immediately handle any packet it receives.

FSMs

The sender site should not send a pocket until its application layer has a message to send. The receiver site cannot deliver a message to its application layer until a pocket arrives.

Stop- and-wait protocol

Our second protocol is a connection oriented protocol called the stop-and-wait protocol, which uses both flow and error control. The sender and the receiver use a sliding window of size one. the sender sends one packet at a time and waits for an acknowledgement before sending a next one.

Pipelineing in networking and in other areas, a task is often begun before the previous task has ended. This is known as pipelineing.

8) **Explain about user datagram protocol.**

The user datagram protocol (UDP) is a connectionless unreliable transport protocol.

UDP packets, called user datagram have a fixed-size header of 8 bytes made of four fields, each of 2 bytes (16 bits). The 16 bits can defined a total length of 0 to 65,535 bytes.

UDP services

Process-to-process communication

UDP provides process-to-process communication using socket addresses, a combination of IP address and port numbers.

Connectionless services – UDP provides connectionless services that each user datagram send by UDP is an independent datagram.

Flow control- The receiver may overflow with incoming messages. The lock of flow control means that the process using UDP should provide for this service.

Error control- There is no error control mechanism in UDP except for the checksum. The sender doesnot know if a message has been lost or duplicated. When the receiver detects an error through the check sum, the user datagram is silently discarded.

Checksum- UDP checksum calculation include three sections.

i)Pseudoheader   ii)UDP header   iii) data coming from application layer.

The pseudoheader is the part of the IP packet. If the checksum doesnot include the pseudoheader,a user datagram may arrive safe and sound. If the IP header is corrupted ,it may be delivered to the wrong host.

Typical applications(UDP)

⇨ It is simple request -response communication
⇨ Process with internal flow and error control mechanism.
⇨ Transport protocol for multicasting.
⇨ It is used for management processes such as SNMP.
⇨ It is used for route updating protocols such as Routing Information Protocol(RIP).

9) Explain about World Wide Web(WWW).

A repository of information in which the documents ,called web pages are distributed and linked .

Linking one web page to refer to another web page stored in another server somewhere else in the world. The linking webpage using this concept called **hypertext.**

The web implemented this idea electronically to allow the linked documents to be retrieved when the link was clicked by the user .

The term hypertext coined to mean linked text documents has been changed to **hypermedia,** to show that a web page can be a text document, an image, an audio file or a video file.

Web is used to provide electronic Shopping and gaming.

Architecture:

WWW is a distributed client server service ,in which a client using a browser can access a service using a server.

The service provided is distributed over many location called sites.

A simple webpage has no links to other webpage; a composite webpage has one or more links to other webpages.

Each webpage is a file with a name and address.

Web client (Browser) :

A variety of vendors offer commercial browsers that interpret and display a web page. Each browser usually consists of three parts.

=> Controller- receives the input from keyboard or the mouse.

=> Client protocols- such as HTTP (or) FTP.

=> interpreters- it can be HTML,Java, or javascript depending on the type of document.

Uniform Resource Locator(URL)

A webpage as a file needs to have a unique identifier to distinguish it from other webpages. Three identifier are needed.

Host-it is the IP address of the server or unique name given to the server.

Port- 16 bit integer, predefined for the client-server application.

Path – it identifies the location and the name of the file in the underlying operating system.

Protocol://host/path   used most of the time

Protocol://host:port/path   used when port number is needed.

10) Explain about TELNET.

It is one of the remote logging protocols is TELNET, which is an abbreviations for TErminal NETwork. It is requires a logging name and password , it is vulnerable to hacking because it sends all data including the password in plaintext .

A hacker can eavesdrop and obtain the logging name and password.

The uses of TELNET has diminished in favor of another protocol ,secure shell(SSH), TELNET is almost replaced by SSH ,for two reasons.

⇨   The simple plaintext architecture of TELNET allows us to explain the issues and challenges related to the concept of remote logging , SSH also used .

⇨   Network administrator often use TELNET for diagnostic and debugging purposes.

Local versus Remote Logging

When a user logs into a local system it is called **local logging**. As a user types at a terminal or at a workstation running a terminal emulator, the keystrokes are accepted by the terminal driver. The terminal driver passes the characters to the OS.

OS interprets the combination of characters and invokes the desired application program or utility.

When a user wants to access an application program or utility located on a remote machine –**remote logging.** The user sends the keystrokes to the terminal driver where the local OS accepts the characters but does not interpret them.

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PART-C

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1) **OSI MODEL:**

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Open System Interconnection (OSI).

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The purpose of the OSI model how to facilitate communication between different system without requiring changes to the logic of the underlying architecture. There are seven types of layers.

Layer 7	APPLICATION
Layer 6	PRESENTATION
Layer 5	SESSION
Layer 4	TRANSPORT
Layer 3	NETWORK
Layer 2	DATALINK
Layer 1	PHYSICAL

Addressing in the TCP/IP protocol suite

Packet names	Layers	Addresses
Message	Application layer	Names
Segment/user datagram	Transport	Port numbers
Datagram	Network layer	Logical addresses
Frame	Data link layer	Link layer addresses
Bits	Physical layer	

Physical layer:

Data consist of a stream of **bits** with out any interpretation.(line configuration , topologies, transmission mode are included)

Data link layer:

The data link layer takes a datagram and encapsulates it in a packet called **frames.**

Network layer:

It create a connection between the source computer and the destination computer. IP defines the format of the packet called a **datagram** at the network layer .

Transport layer:

The transport layer of the source host gets the message from the application layer, encapsulates it in a transport layer packet called a **segment or a user datagram** and sends it logical connection to the transport layer at the destination host.

Application layer:

The two application layers exchange messages between each other as though there were bridge between the two layers.

Ex:SMTP,HTTP,FTP,SNMP,TELNET.

2)   **GUIDED MEDIA**

That provide a conduit from one device to another , include twisted-pair cable ,coaxial cable ,and fiber –optic cable. Twisted pair-cable, coaxial cable use metallic (copper) conductors that accepts and transport signals in the form of electric current.   fiber is a cable that accepts and transport singnals in the form of light.
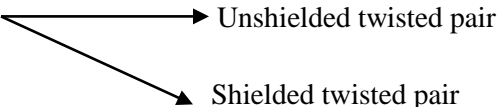
Twisted –pair cable:

It consist of two conductors(copper) each with its own plastic insulation ,twisted together.

One of the wires is used to carry signals to the receiver and the other is used only as a ground reference. The receiver uses the difference between the two.

If the two wires are parallel ,the effect of these unwanted signals is not the same in both wire because they are at different locations relative to the noise or crosstalk sources.

There are two types of twisted pair ⟶ Unshielded twisted pair

⟶ Shielded twisted pair

Coaxial cable

Coaxial cable (or coax) carries signals of higher frequency ranges than those in twisted pair cable , because the two media are constructed quite differently.

It having two wires coax has a central core conductor of solid or standed wire enclosed in an insulating sheath , encased in an outer conductor of metal foil ,braid or a combination of two.
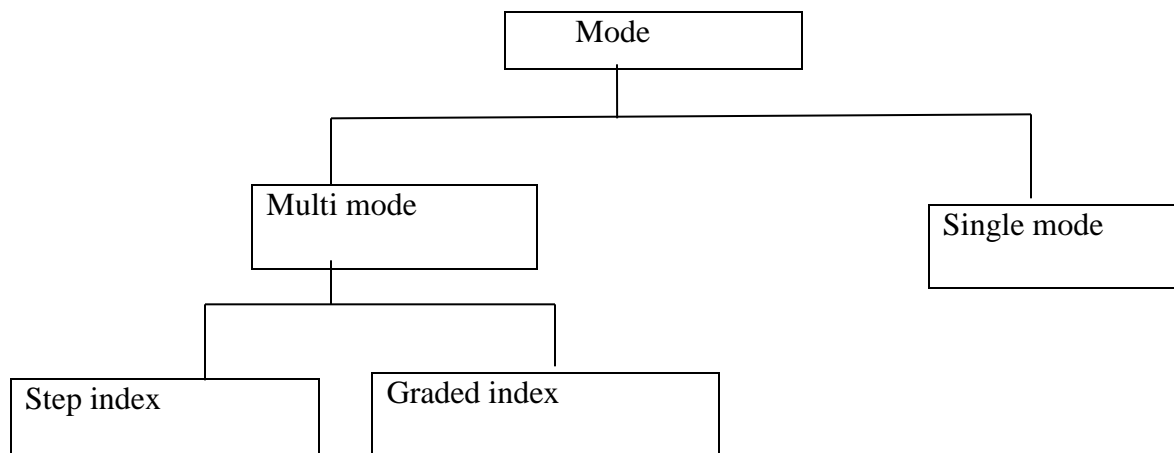
Coaxial cable standards

Coaxial cable are categorized by their Radio Government(RG) ratings. RG number denotes a unique set of physical specifications, including the wire gauge of the inner conductor. each cable defined by an RG rating is adapted for a specialized function.

Fibre –optic cable:

A fiber optic cable is made of glass or plastic and transpit signal in the form of lite. Light travels in a straight line as long as it is moving through a single uniform substance.

Optical fiber use reflection to guide light through a channel. A glass or plastic core is surrounded by a cladding of less dense glass or plastic. The difference in density of the two materials must be such that a beam of light moving through the core is reflected off the cladding instead of being refracted into it.

```
                    ┌──────────────┐
                    │     Mode     │
                    └──────┬───────┘
              ┌────────────┴────────────────┐
        ┌─────┴──────┐              ┌────────┴─────┐
        │ Multi mode │              │ Single mode  │
        └─────┬──────┘              └──────────────┘
      ┌───────┴───────┐
┌─────┴──────┐  ┌─────┴────────┐
│ Step index │  │ Graded index │
└────────────┘  └──────────────┘
```

3) CHECKSUM

Checksum is an error detecting technique that can be applied to a message of any length. In this technique is mostly used at the network and transport layer rather than the data link layer.

At the source, the message is first devided into m-bits units. The generator then creates an extra m-bits units called the check sum, which is sent with the message at the destination, the checker creates a new checksum from the combination of the message and sent checksum.

If the new checksum from the combination of the message is accepted; otherwise the message is discarded.

One's complement addition

$$(10_2)+(0100)_2= (0110)_2=>(6)_{10}$$

The job of the receiver easier if we send the complement of the sum, the checksum. In once complement's arithmetic, the complement of a number is found by completing all bits (changing all 1_s to 0_s and all 0_s to 1_s).

Procedure to calculate the traditional checksum

Sender	Receiver
The message is divided into 16-bit words	The message and the checksum are received.
The value of the checksum word is initially set to zero.	The message is divided into 16-bit words
All words including the checksum are added using one's complement addition.	All words are added using one's complement addition.
The sum is complemented and becomes the	The sum is complemented and becomes the

checksum.	new checksum.
The checksum is send with the data.	If the value of checksum is 0, the message is accepted; otherwise it is rejected.

4) DOMAIN NAME SPACE(DNS)

The central directory system cannot hold all the mapping. If the central computer fails the whole communication network will collapse distribute the information among the many in the world. the host that needs mapping can contact the closest computer holding the needed information. This method is used by the Domain Name System(DNS).

Name space

A name space that maps each address to a unique name can be organized in two ways. Flat or hierarchical.

Flat name space – a name is assigned to an address. A name in this space is a sequence of character without structure.

Disadvantage:

Flat name space is that it cannot be used in a large system such as the internet must be centrally controlled to avoid ambiguity and duplication.

Hierarchical name space each name is made of several parts.

1) Nature of organization
2) Define the name of organization
3) Define departments in the organization

Ex: two organizations call one of their computer Ceasar. The first organization is given a name by the central authority such as first.com, the second organization is given the name second.com .when each these organization add the name Ceasar to the name already been

in given   the end result is two distinguishable names: ceasar.first.com and ceasar.second.com. the name are unique.

Label:

Each node in the tree has a label, which is a string with a maximum of 63 characters.

Domain name:

Each node in the three has a domain name. A full domain name is a sequence of labels separated by dots(.) the domain names are always read from the node up to the root.

If a label is terminated by a null string ,it is called a fully qualified domain name(FQDN). If a label is not terminated by a null string ,it is called partially qualified domain name(PQDN).

Domain

A domain is a subtree of the domain name space. The name of the domain is the name of the node at the top of the subtree.

DNS servers

To distribute the information among many computers called DNS servers.