BALASORE SCHOOL OF ENGINEERING, BALASORE

STUDY MATERIAL

BRANCH – COMPUTER SCIENCE & ENGG.
SUBJECT :- INTERNET & WEB TECHNOLOGY
SUBJECT CODE- CST-602
SEMESTER :– 6TH
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Short question - 2mrks

Q1-**HOW MANY BITS ARE THERE IN IP ADDRESS? 2016**

THERE ARE 32 BIT IN IP ADDRESS.

Q2-NAME TWO TYPE OF INTERNET CONNECTIVITY? 2018(s)-1(a),2019(s)-4-a

Dial-up connection

Leased connection

VSAT connection

Q3-WHAT IS ENDPOINT? 2018(s)3-a

- **TCP defines an end point to be a pair of integers, where host is the IP address for a host and port is a TCP port on that host 128.10.2.3,25.**

Q4-WRITE THE FUNCTION OF DEFAULT ROUTER? 2017(w)-4(a)

- **Another technique used to hide information and keep routing table sizes small consolidates multiple entries into a default case.**
- **The idea is to have the IP routing software first look in the routing table for the destination networks.**
- **Default routing is specially usefully when a site has a small set of local addresses and only one connection to the rest of the internet.**
- **Default routes work will in host computers that attach to a single physical network and reach only one router loading to the local net and default that points to the only router.**

Q-5 DEFINE ROUTER AND ROUTING? 2017(w)-5(a)

ROUTER IS A DEVICE WHICH TAKE THE ROUTING DECISION.THE TECNIQUE OF FIND A ROUTE OVER THE NETWORK IS CALLED A ROUTING.

Q6-WRITE THE FUNCTION OF TELNET? 2017(w)-6(a)

Typically, this protocol is used to establish a connection to Transmission Control Protocol (TCP) port number 23, where a Telnet server application (telnetd) is listening. Telnet, however, predates TCP/IP and was originally run over Network Control Program (NCP) protocols.

Q7-WHAT DO YOU MEAN BY PROTOCOL? 2017(w)-1(a)

- **Protocols**

  Protocol is a set of rules or conventions that, governs all aspects of data communication between a numbers of nodes. The elements of protocol are,

Q8-EXPLAIN DOTTED DECIMAL NOTATION?2017-2

Dot-decimal notation is a presentation format for numerical data expressed as a string of decimal numbers each separated by a full stop. ... In computer networking, the term is often used as a synonym of dotted quad notation, or quad-dotted notation, a specific use to represent IPv4 addresses.

Q9-IDENTIFY FOUR INTERNET SERVICE?2015-2,2016-2,2017(w)-2(b)

Information Retrieval Services. ...
Web Services. ...
World Wide Web (WWW) ...
Video Conferencing.

Q10-WHAT DO YOU MEAN BY CONJESION CONTROL?2017-2

- **TCP software designed by considering the interaction between two end point to a connection.**
- **TCP must also react to congestion in an internet.**
- **Congestion is a condition of delay caused by an overload of datagram at one or more switching point.**

Congestion simple means increase delay it is used for timeout and retransmission

Q11-WHAT IS E-MAIL?

E-mail is nothing but electronic mail by it user can send and receive message.

Q12-WHAT IS PROTOCOL NUMBER? 2018(s)-6-a,2019(s)-1-a

- **TCP uses protocol port numbers to identify the ultimate destination within a machine.**
- **Each port is assigned small integer used to identify it concept layering.**

Q13-WHAT IS HYPER TEXT?

Hypertext is text which is not constrained to be linear. Hypertext is text which contains links to other texts. The term was coined by Ted Nelson around 1965 (see History). HyperMedia is a term used for hypertext which is not constrained to be text: it can include graphics, video and sound ,

Q14-What is URL?(2019(s)-6-a)

- **URL stands for *Uniform Resource Locator (URL)* it is the global address of documents and other resources on the World Wide Web.**
- **The first part of the URL is called a *protocol identifier* and it indicates what protocol to use, and the second part is called a *resource name* and it specifies the IP address or the domain name where the resource is located.**

Q15-UDP? 2017(w)-7(iii)

- **It provides the primary mechanism that application program used to send datagram private mechanism to sent datagram to other application.**
- **UDP provide protocol port. UDP contain both a destination port and a source port.**

Q16-VB SCRIPT ?

VB Script stands for Visual Basic Script and it is a light version of Microsoft Visual Basic. The syntax ofVBScript is very similar to that of Visual Basic.VBScript was developed by Microsoft with the intention of developing dynamic web pages.

Q17-TELNET PROTOCOL?(2019(S)-7(ii))

- **Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.**
- **User data is interspersed in-band with Telnet control information in an 8-bit byte oriented data connection over the Transmission Control Protocol (TCP).**

Q18-DEFINE INTERNETWORKING?

Internetworking is the process or technique of connecting different networks by using intermediary devices such as routers or gateway devices. Internetworking ensures data communication among networks owned and operated by different entities using a common data communication and the Internet Routing Protocol.

Q19) STATE AND EXPLAIN IDEA BEHIND SLIDE WINDOWS PROTOCOL. 2017(w)-3(c)

- **It makes stream transmission efficient to achieve reliability.**
- **The sender transmits a packet and then waits for an ack, before transmitting media.**
- **A data only flow between the machines in one direction at any type of the network is capability of any both directions.**
- **A simple positive ack. Waste amount of network bandwidth, because it must delay. Sending a new packet, until receive an acknowledgment.**

Q20) Write the function of TCP checksum field. 2019(s)-2-a

- **The check sun field in the TCP header contains A 16 bit integer to verify the integrity of the data as well as TCP header.**
- **To compute the check sum TCP S/W on the sending machine follow a procedure.**
- **It depnds on pseudo header to the segment enough 'O' bit to make the segment the multiple of 16 bit and computer the 16 bit check sum.**
- **TCP doesnot count the pseudo header the exact same as an UDP.**
- **Whenever a data gram arrives a TCP segment must past to be TCP sources and destination IP address, form the datagram as well as segment.**

Q21) Define POP3,IMP4.

POP3 (Post Office Protocol 3)

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. Periodically, you (or your client e-mail receiver) check your mail-box on the server and download any mail, probably using POP3.

MP4 is a file format created by the Moving Picture Experts Group (MPEG) as a multimedia container format designed to store audiovisual data. The MP4 is largely replacing earlier multimedia file formats, and creating some changes in the way that vendors sell audiovisual files to the public.

MEDIUM TYPE QUESTION

Q1-WHAT DO YOU MEAN BY RELIABLE STREAM DELIVERY SYSTEM ?WRITE THE PROPERTIES OF RELIABLE DELIVERY SERVICES?2016-5, 2017(w)-3(b), 2019(s)-1(b)

3Properties of reliable delivery services

- **Stream orientation:-**
  - **When 2 application programme transfer large volume of data. Data is viewed as a stream of bit's divided in to 8 bit acted or bytes.**
  - **The stream delivery service passes to the receiver exactly the same sequence of acted or bytes the sender passes to it on the source machine.**
- **Virtual circuit connection:-**
  - **Making a stream transfer is analogues placing a telephone "call"**
  - **Before transfer construct, both the sending and receiving application programme interact with their respective operating system.**
  - **One application places a "call" which must be accepted by the other.**
  - **The two operating system communicate by sending messages across the interact verifying that the transfer is Authorized both sides are ready.**
  - **Once all detail having settle the protocol module inform the application programme that connection has establish the transfer can begin.**
- **During transfer protocol software on the 2 machine continues communicate to verify that the data is received correctly.**

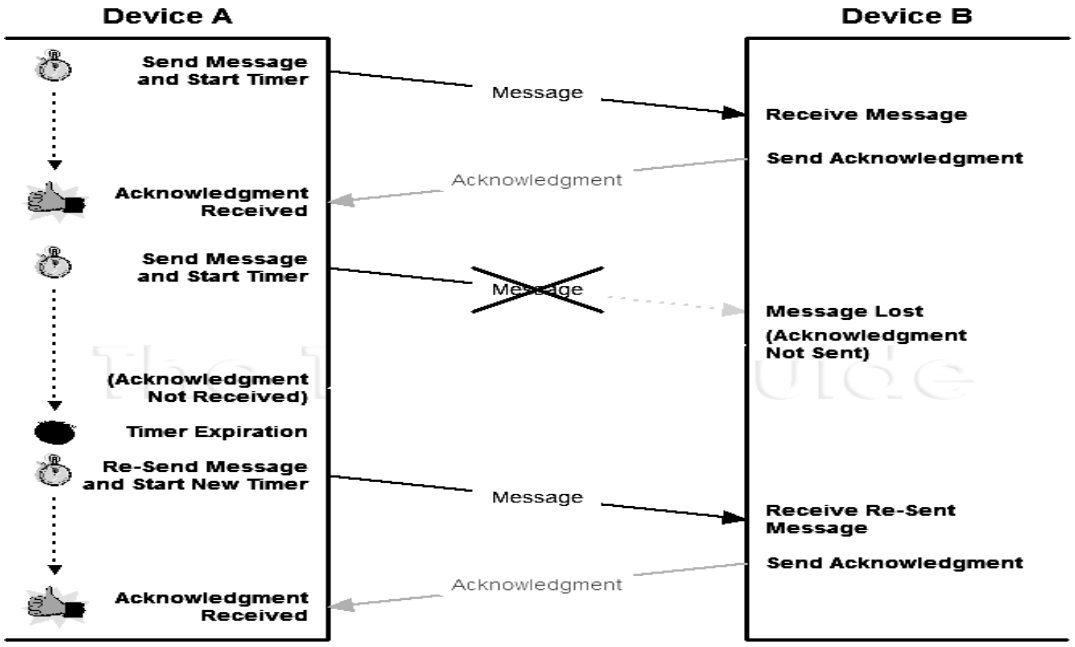
- **Buffer transfer:-**
  - **Application programme send a data stream across the virtual circuit by repeatedly passing data octets to the protocol software.**
  - **At the receiving end the protocol software delivery the octet from the data streams exactly some at the sender side.**
  - **Protocol software, it's free to divide the stream into packet independent of the piece.**
  - **If the application program chooses to generate extremely large block to data the protocol software divide each block into smaller place for transmission.**
  - **The stream service provides a push mechanism that application used to force to immediate transfer.**
  - **At the sender side push force protocol software to transfer data that has been generated without waiting to feet a buffer.**
- **Unstructured stream:-**
  - **It is important to understand that, the TCP/IP stream service does not honour, structure data streams. For example, there is no way for a payroll application to have the stream service, mark boundaries between employee- records.**

- **Application programme, using the stream service must understand and agree on stream format, before incite a connection.**

❖ **Full duplex connection:-**

- **TCP/IP stream service allows con- current transfer in both directions, such, connection are called, full duplex.**
- **Full duplex connection consists of two independent stream, following in opposite direction.**

Q2-HOW TCP PROVIDE A RELIABLE DELIVERY SERVICE?-2016-5



Time out and re transmission occur, when a packet is lost.

- **The dotted lines show the time that would be taken by the transmission of a packet and its acknowledgement.**
- **Reliable stream delivery service guaranty to deliver a stream of data sent from one machine to another machine without duplication and data loss.**
- **Most reliable protocol used a fundamental technique, known as, possible ack, with re transmission.**
- **The sender keeps a record of each packet it sends and wait for a ack, before sending the next pocket.**
- **The sender retransmits the packet. The timer expired, before an acknowledgment arrives.**
- **The sender start a timer, often transmit a packet. When, the timer expires, the sender assumes that, the packet was lost. Then the sender retransmits the pocket again.**
- **Avoiding duplication, the reliable protocol service, assigning each packet, a sequence no.**

Q3) What do you mean by routing of an internet DIFFERENTIATE DIRECT AND INDIRECT DELIVERY SYSTEM?(2019(s)-4(B)

Direct and indirect delivery:-

- **we can divide forwarding into two forms direct delivery and indirect delivery. Direct delivery, the transmitting of a datagram from one machine areas a single physically new directly to another.**
- **Two machine can engage in direct delivery may in the both attach directly to the same underlying physical transmission.**
- **Indirect delivery occurs token the destination is of on a directly attaching network.**

<u>Datagram delivery over a source network</u>

- **Transmission of an IP datagram between two machines on a single physical network does not process routers.**
- **The sender is capsulate the datagram in a physical frame, binds the destination IP address to a physical H/W address and sends the resulting frame directly to the destination is efficient.**

<u>Indirect delivery:-</u>

- **Routers in a TCP/IP internet form a cooperative interconnected structure datagram pass from router to router until they reached router that can deliver the datagram directly.**

Q4-DEFINE IP ADDRESS?.STATE THE THREE TECHNIQUE OF MINIMIZING NETWORK NUMBER?2017(w)-1(b)

- **The protocol that defines the unreliable connectionless delivery mechanism is called the internet protocol.**
- **Current version protocol is version 4 i.e. called IPV4.**
- **IP protocol provides three definitions.**
  - ✓ **1st = The IP defines the base unit of data transfer used throughout a TCP/IP internet.**
  - ✓ **2nd = IP software performs the forwarding function choosing a path over which a packet will be sent.**
  - ✓ **3rd = IP includes a set of rules that embody the idea of unreliable delivery.**

Minimizing Network Numbers

- **The original classful IP addressing scheme to handle all possibilities, but it has a minor weakness.**
- **Growth has been most apparent in the connected internet, where the size has been doubling every nine to fifteen months.**
- **The large population of networks with trivial size stresses the entire Internet design because it means**
  - ✓ **immense administrative overhead is required merely to manage network addresses,**
  - ✓ **the routing tables in routers are extremely large, and**

- ✓ the address space will eventually be exhausted.
- To minimize the number of addresses used, we must avoid assigning network pre-fixes whenever possible, and the same IP network prefix must be shared by multiple physical networks.

Q5-DISCUSS DIFFERENT TYPE OF CONNECTIVITY IN COMPUTER NETWORK?2017-5/2015-5

Types of connectivity

There are 3 types of connectivity, i.e.

- ❖ Dial-up connection
- ❖ Leased connection
- ❖ VSAT connection

❖ **Dial-up connection**

- It is also known as, level-2 connection. This provides connection to internet, through a dial up terminal connection.
- The computer, which, provides, internet access is known as, 'host' and the computer that, receives, the access is 'client' or 'terminal'.
- The client uses, modem to access a host and acts as, directly connected terminal to the host. This type of connection is also known as, remote modem access.
- Host carries, all the command, that, are type or a client machine and the client computer acts as a 'dumb' terminal, connected to remote host.
- It is also divided into two types, i.e.

  I) Shell connection

  II)TCP/IP Connection
- Shell connection

  In shell connection, it doesn't support, graphics display.
- TCP/IP Connection

  The measure difference between shell and TCP/IP account is that, shell account only display, text and doesn't support graphics, whereas, TCP/IP displays both. ⇒ It is more popular internet connection.

Components for dial-up connection

- Computer.
- Modem
- Telephone line
- Sheller TCP/IP connection
- Internet client software.

❖ **Leased connection**

- It is also known as, direct internet access or level-3 connection.

- **It is secure, dedicated and most expensive with leased connection.**
- **Computer is dedicatedly or directly connected to the internet using high speed transmission line.**
- **Leased inter connection are limited to large corporation and universities, who, could effort these costs.**

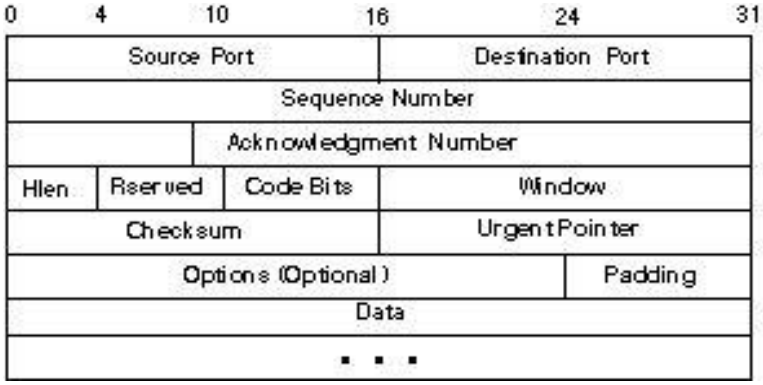
❖ **VSAT connection**

- **The full form of VAST is very small aperture terminal (VSAT).**
- **It is a two way satellite ground station.**
- **VSAT antenna with a dish antenna that, smaller than 3 meters.**
- **VSAT antennas range from 75 c.m. to 1.2 m.**
- **Data rates range from 4 kbit/s upto 4 mbit/s.**
- **VSAT are used to transmit narrow band data.**
- **Eg.- Transaction using credit cards.**

Q6-EXPLAIN THE TCP SEGMENT FORMAT WITH DIAGRAM?2017-5,2019(s)-2-c

TCP segment format

- **The unit of transfer between TCP software on two machine is called a segment.**
- **Segment are exchanged to establish connection, transfer data send acknowledgement, creating window size and close connection.**
- **Because TCP causes piggy backing, an acknowledgement travelling from machine. A to machine B may travelling the same segment from machine A to Machine B.**
- **Each segment is divided into two parts a header followed by data. The header, known as the TCP header, carries the excepted identification and control information.**
- **Source port and destination port contain the TCP port numbers that identify the application programs at the ends of the connection.**
- **The acknowledgement number filed identification is the number of the octet that the source expects to receive next.**
- **The HLEN field contains an integer that specifies the length of the segment header measured in**
  32-bit.
- **It is needed because the options field varies in length, depending on which options have been included.**



TCP checksum

- **The check sun field in the TCP header contains A 16 bit integer to verify the integrity of the data as well as TCP header.**
- **To compute the check sum TCP S/W on the sending machine follow a procedure.**
- **It depnds on pseudo header to the segment enough 'O' bit to make the segment the multiple of 16 bit and computer the 16 bit check sum.**
- **TCP doesnot count the pseudo header the exact same as an UDP.**
- **Whenever a data gram arrives a TCP segment must past to be TCP sources and destination IP address, form the datagram as well as segment.**

0	8	16	31
Source IP Address			
Destination IP Address			
Zero	Protocol	TCP Length	

TCP checksum format

- **The sending TCP assign a field protocol the value that the under line delivery system.**
- **IP datagram carrying TCP value = total length.**
- **At the receiving end the information is used pseudo header is extracted to verify the segment arrived at the correct destination intact.**

Acknowledgements

- **Acknowledgments cannot easily refer to datagram or segments.**
- **Because retransmitted segment include data more than originally.**
- **The receiver collects data from arriving segment and reconstructs an exact copy of the stream being sent.**
- **Because segment travel in IP datagram, they can be lost or delivered act of order.**
- **So the receiver uses the sequence numbers to recorder segment.**
- **The receiver always ack the longest, contiguous prefix of the stream that has been received correctly.**
- **A TCP ack specifies the sequence number of the next octek, that the next receiver obtech to receive.**
- **The TCP ack scheme is called cumulative because it reports how much of the stream is accumulated.**

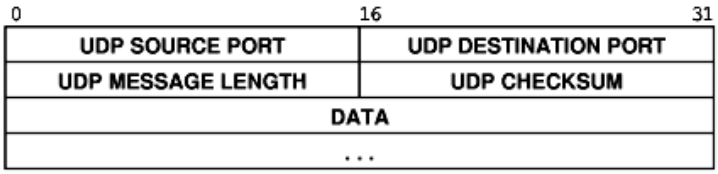
- **Lack of information about the successful transmission the makes cumulative ack. Ex. suppose that first segment is lost, but they arrive receiver send an the ack but each ack specifies.**
- **If the sender follow the accepted standard and retransmit only the first ack segment.**

Q7-EXPLAIN THE MECHANISM TO IDENTIFY THE ULTIMATE DESTINATION IN UDP?2017-5 2018(s)-3-c

What is UDP? (2019(w)-7(i))

- **It provides the primary mechanism that application program used to send datagram private mechanism to sent datagram to other application.**
- **UDP provide protocol port. UDP contain both a destination port and a source port.**
- **The UDP software at the destination to deliver message to correct recipient from 1 machine to another.**
- **UDP user underlines internet protocol to transform 1 machine to another.**
- **It is doesn't use ack to makes your message arrive.**
- **It doesn't provide feedback to control the rate at which information close between the machines.**
- **The UDP provide and unreliable connection less delivery service, using IP to transform message between machine.**

Format of UDP message



- **Each UDP message is called a user datagram.**
- **It consists of two parts: i) a UDP header and ii) a UDP data area.**
- **The UDP header is divided into four 16-bit fields that specify the port from which the message was sent.**
- **The source port and destination port contain the 16-bit UDP protocol.**
- **Port numbers used to demultiplex datagram process waiting to replies message.**
- **The source port is optional.**
- **The length field contains a count of octets in the UDP datagram, including the UDP header and the user datagram.**
- **The UDP checksum is optional and need not be used at all. Value of zero in the checksum field means that the checksum has not been completed.**

Q8-EXPLAIN THE ROUTING MECHANISM IN E-MAIL?2017-5

E-mail is nothing but electronic mail by it use can send and receive message.

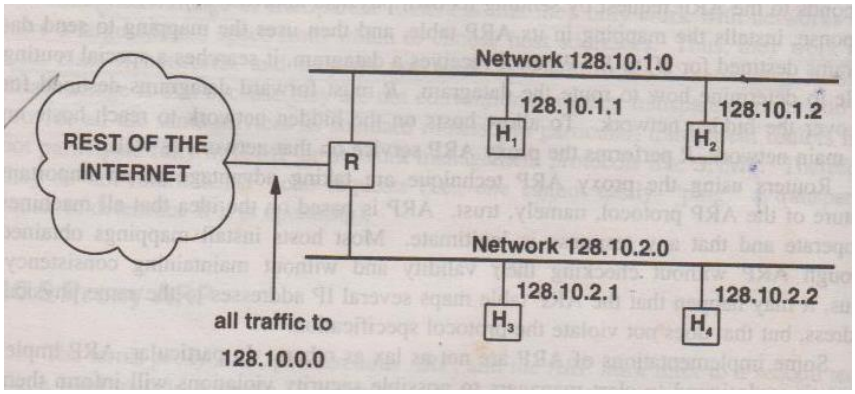
E-Mail Routing

- **Firstly, incoming emails go through spam filtering gateways, and all clean messages are then sent to the destination mail server.**
- **Mail routing goes a step beyond spam filtering to make a carbon copy of specified emails based on rules and send this copy to additional recipient(s).**
- **The rules for the carbon copy generation can be based on the sender or recipient.**
- **Messages are still delivered to the original recipient.**
- **Mail routing helps an organization keep track of important emails.**
- **For example, you may wish to have a copy of all emails addressed to sales@yourdomain.com delivered to an additional archiving email system in addition to your primary mail server. Used correctly, mail routing could give your business a competitive edge.**

Q9-EXPLAIN SUBNET ADDRESSING IN DETAIL?2017-5, 2019(s)-3-b

Subnet addressing

- **Subnetting is the most widely used techniques because it is the most general and because it has been standardized. In fact, subnetting is a required part of IP addressing.**
- **A site has a single glass class B IP network address assigned to it, but it has to or more physical networks**
- **Only local routers know that there are multiple physical nets and how to route traffic among them ; routers in other autonomous system route all traffic as if there were a single physical network.**



- **The site is using the single class B network address 128.10.0.0 for two networks.**
- **Except for router R, all routers in the internet route as if there were a single physical net.**

- **Once a packet reaches R, it must be sent across the correct physical network to its destination.**
- **To make the choice of physical network efficient, the local site has chosen to use the third octet of the address to distinguish between the two networks.**
- **The manager assigns machines on one physical net addresses of the form 128.10.1.X, and machines on the other physical net addresses of the form 128.10.2.X, where X, the final octet of the address, contain a small integer used to identify a specific host.**
- **To choose a physical network, R examines the third octet of the destination address and routes datagram's with value I to the network labelled 128.10.1.0 and those with value 2 to the network labelled 128.10.2.0**
- **Conceptually, adding subnets only changes the interpretation of IP addresses slightly.**
- **Instead of dividing the 32-bit IP address into a network prefix and a host suffix, subnetting divides the address into a network portion and a local portion.**
- **A 32-bit IP address as having an internet portion and a local portion, where the internet portion identifies a site, possibly with multiple physical networks, and the local portion identifies a physical network and host at that site.**
- **Subnet addressing with a class B address that had a 2-octet internet portion and a 2-octet local portion.**
- **To make routing among the physical network efficient , the site administrator in our example chose to use one octet of local portion to identify a physical network, and the other octet of the local portion to identify a host on that network.**

Internet part	Local part	
Internet part	Physical network	Host

- **The result is a form of hierarchical addressing that leads to corresponding hierarchical routing.**
- **The top level of the routing hierarchy (i.e., other autonomous systems in the internet) uses the first two octets when routing, and the next level (i.e., the local site) uses an additional octet.**
- **Finally, the lowest level (i.e., delivery across one physical network) uses the entire address.**
- **For ex: U.S. telephone system, where a 10-bit phone number is divided into a 3-disit area code, 3-disit exchange, and 4-disit connection.**

Advantage

- **It accommodates large growth because it means a given router does not need to know as much detail about distant destinations as it does about local ones.**

Disadvantage

- **Choosing a hierarchical structure is difficult, and it often becomes difficult to change a hierarchy once it has been established.**

Q-10EXPLAIN THE SEVERAL PART OF XML DOUMENT?2017-5 , 2017(w)-7(ii),2018(s)-2-c

XML APPLICATION:-

- **This is used to create customized tags for publishing documents online.**
- **XML is based on mathematical formula is document and chem. Ml (Chemistry work up language).**
- **It is a standard used XML based language for making of mathematical formula.**
- **XML is widely used to exchange data between two homogeneous or heterogeneous applications.**

Advantage of XML as a Technology:-

- **Modularity:-HTML appears to have DTD (document type definition) .HTML has a limit less no of DTD on the other hand there is only on for each type of document.**
- **Extensibility:-XML will powerful linking mechanism allow to link to Material without requiring the link target.**
- **Distribution:- In addition to linking introduce a for more sophisticated method of including links target.**
- **Internationality:- both HTML and SGML relay heavily on ASCII. XML is based on UNICODE and require all html software to support UNICODE.**
- **Data orientation:- XML operate on data orientation rather than read ability by human.**

Design goal of XML

- **The user must be able to view XML document as quickly and easily as html document.**
- **XML should be beneficial to wide variety of application such as authoring browsing and contain analysis.**
- **XML design should be prepare quickly XML was needed immediately and was develop as quickly as possible.**
- **The design should be formed and concise. XML document shall be easy to create.**

Rules for XML

The name can contain letter no and other character. Name must not start with a number and other character.

- **Names must start with XML letter names can not contain space .XML document after have a parallel database where filed names parallel database where field names parallel width elements name.**

  Examples<author name><published name>

Empty tag:-

It is the tag which don't have closing tag.

Comments in XML file:-

<text> welcome to XML tutorial

</text>

<this is a comment>

<subject>

Processing instruction

- **An XML file can contain processing instruction that give command or information to an application that is processing the XML data.**
- **Where target is the name of application that is expected to do expressing.**

Structure of XML

Hello. XML

<? XML version ="1.0">

<P.00>

Hello XML

<\F00>

Here the sharing of file is done by using .XML

XML prolog:-

- **XML file always start with a prolog an attribute is a name value separate by an equal sign.**
- **Every XML document should begin with an XML declaration that specify the version XML. <? XML version = "1.0">**
- **The declaration may also contain an additional information.**

<? XML version = "1.0" encoding = "ISO-8895.1" standard alone = "yes"?>

Elements and attribute:-

Each tag in a XML file can have element and attribute.

<Email to = "admin @ may domain.com">

From = "user @ my site.com>

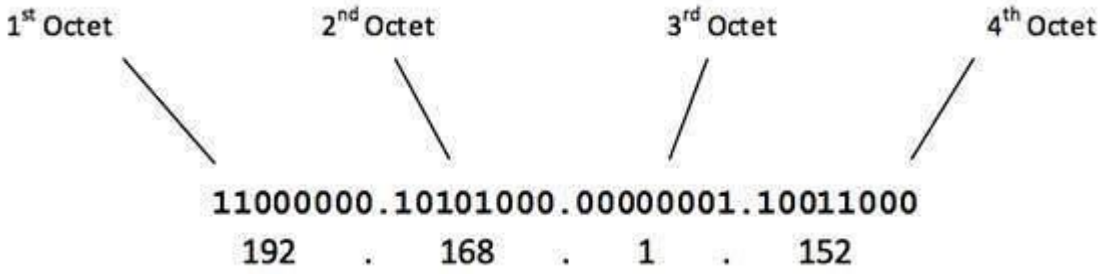
Subject = "introducing XML

<\email>

Q-11- Define original class-full addressing scheme state the different forms of IP address? 2017(w)-2(b)

Class-full IP Addresses to be used efficiently in various situations as per the requirement of hosts per network. Broadly, the IPv4 Addressing system is divided into five classes of IP Addresses. All the five classes are identified by the first octet of IP Address.

The first octet referred here is the left most of all. The octets numbered as follows depicting dotted decimal notation of IP Address −



The number of networks and the number of hosts per class can be derived by this formula −

Number of networks = 2^network_bits

Number of Hosts/Network = 2^host_bits − 2

Class A Address

The first bit of the first octet is always set to 0 (zero). Thus the first octet ranges from 1 – 127, i.e.

00000001 – 01111111
1 – 127

Class B Address

An IP address which belongs to class B has the first two bits in the first octet set to 10, i.e.

10000000 – 10111111
128 – 191

Class C Address

The first octet of Class C IP address has its first 3 bits set to 110, that is −

11000000 – 11011111
192 – 223

Class D Address

Very first four bits of the first octet in Class D IP addresses are set to 1110, giving a range of −

11100000 – 11101111
224 – 239

Class E Address

This IP Class is reserved for experimental purposes only for R&D or Study. IP addresses in this class ranges from 240.0.0.0 to 255.255.255.254. Like Class D, this class too is not equipped with any subnet mask.

Q12- What is IRC? Explain the function channel. 2018(s)1-b

Stands for "Internet Relay Chat." IRC is a service that allows people to chat with each other online. It operates on a client/server model where individuals use a client program to

connect to an IRC server. Popular IRC clients include mIRC for Windows and Textual for OS X. Several web-based clients are also available, including KiwiIRC and Mibbit.

In order to join an IRC conversation, you must choose a username and a channel. Your username, also called a handle, can be whatever you want. It may include letters and numbers, but not spaces.

A channel is a specific chat group within an IRC network where users can talk to each other. Some networks publish lists of available channels, while others require you to manually enter channel names in order to join them. Channels always begin with a hashtag followed by a name that represents their intended chat topic, such as "#teenchat," "#politics," or "#sports". Some IRC channels require a password while others are open to the public.

When you join a channel, the chat window will begin displayig messages people are typing. You can join the conversation by typing your own messages. While channel members can type whatever they want, popular channels are often moderated. That means human operators or automated bots may kick people out of the channel and even ban users who post offensive remarks or spam the channel with repeated messages.

Q13- State and Explain JAVA SCRIPT? 2018(s)2-b

The programs in this language are called *scripts*. They can be written right in a web page's HTML and run automatically as the page loads.

Scripts are provided and executed as plain text. They don't need special preparation or compilation to run.

In this aspect, JavaScript is very different from another language called Java.

Today, JavaScript can execute not only in the browser, but also on the server, or actually on any device that has a special program called the JavaScript engine.

The browser has an embedded engine sometimes called a "JavaScript virtual machine".

Different engines have different "codenames". For example:

- **V8 – in Chrome and Opera.**
- **SpiderMonkey – in Firefox.**
- **...There are other codenames like "Trident" and "Chakra" for different versions of IE, "ChakraCore" for Microsoft Edge, "Nitro" and "SquirrelFish" for Safari, etc.**

The terms above are good to remember because they are used in developer articles on the internet. We'll use them too. For instance, if "a feature X is supported by V8", then it probably works in Chrome and Opera.

Q14- What is classful addressing scheme?(2019(S)-7(iv))

Classful Addressing

The 32 bit IP address is divided into five sub-classes. These are:

- Class A
- Class B

- Class C
- Class D
- Class E

Each of these classes has a valid range of IP addresses. Classes D and E are reserved for multicast and experimental purposes respectively. The order of bits in the first octet determine the classes of IP address.

IPv4 address is divided into two parts:

- Network ID
- Host ID

Q-15) Define www. What is browser? Write important components of a WWW. (2019(s)-6(B))

The World Wide Web (WWW) is combination of all resources and users on the Internet that are using the Hypertext Transfer Protocol (HTTP).

A web browser is a software program that allows a user to locate, access, and display web pages. In common usage, a web browser is usually shortened to "browser." Browsers are used primarily for displaying and accessing websites on the internet, as well as other content created using languages such as Hypertext Markup Language (HTML) and Extensible Markup Language (XML).

These components include:

- content - the information in a web page or web application, including:
    - natural information such as text, images, and sounds
    - code or markup that defines structure, presentation, etc.
- web browsers, media players, and other “user agents”
- assistive technology, in some cases - screen readers, alternative keyboards, switches, scanning software, etc.
- users’ knowledge, experiences, and in some cases, adaptive strategies using the web
- developers - designers, coders, authors, etc., including developers with disabilities and users who contribute content
- authoring tools - software that creates websites

- **evaluation tools - web accessibility evaluation tools, HTML validators, CSS validators, etc.**

LONG TYPE QUESTION

Q1-WHO IS ISP? IDENTIFY THE FACTER FOR CHOOSING AN ISP? (2019(s)-5(b))

ISP

- **ISP stands for Internet Service Provider. An ISP is an organization that provides service for accessing, using or participating in the internet.**
- **ISP may be organized in various forms, such as commercial community owned, privately owned, etc.**
- **It refers to a company that provide, internet service including personal and business access to the internet for a monthly fee.**
- **An ISP is a company, that, supplies, internet connectivity to home and business customer. It support, one or more forms of internet access, ranging from traditional modem dial-up to DSL and cable modem broad band service to dedicated T1/T3 lines.**
- **More recently, wireless ISP that, offer internet access, through wireless LAN or wireless broad band network.**

❖ **Factors for choosing an ISP**
  - **Size**
  - **Reliability**
  - **Performance**
  - **Price**

❖ **Quality of service**
  - **Working hours**
  - **Technical support.**

Internet service providers in India

- **BSNL**
- **Aircel**
- **Airtel**
- **Docomo**
- **Vodafone**
- **Idea, etc.**

Q2-DEFINE TCP/IP 5- LAYERING MODEL WITH SUITABLE EXAMPLE?2016-7/2017-7 2017(w)-2(c),2018(s)-7-c,2019(s)-1-c

- **TCP/IP**
  - **TCP/IP is the combination of 2 different types of protocol**
    - ✓ **TCP-Transmission control protocol**
    - ✓ **IP-Internet protocol**
  - **TCP/IP protocol is used to communicate across any set of interconnected network. Ex.-TCP-IP connect a set of network within a single building, with in physical campus or among a set of compose etc.**
  - **TCP/IP provides end to end connectivity specifying how data should be address packetize address, transmitted, routers and receive at the destination.**

TCP/IP model has 5 layers. These are:- 2017(w)-2(c)

- ✓ **Application layer**
- ✓ **Transport layer**
- ✓ **Internet layer**
- ✓ **Network interface/ link sub network layer/ network access layer**
- ✓ **Physical layer**

<u>Application layer:-</u>

- **Application layer is the top most layer of TCP/IP model.**
- **Application layer is present on top of transport layer.**
- **Application layer include all the higher level protocol like DNS (Domain name system), HTTP, FTP, SNMP (Simple Network Management Protocol), SMTP (Simple Mail Transport Protocol) DHCP (Dynamic host Configuration Protocol).**
- **Application layer defines TCP/IP application protocol and how host program interface with transport layer service to use the network.**

<u>Transport layer:-</u>

- **Transport layer is the 3rd layer of the TCP/IP model.**
- **The purpose of transport layer is to permit device on the source and destination host to carry on a conversation.**
- **The position of the transport layer in between the application layer or internet layer. Ex. - TCP & UDP are used UDP –(User datagram protocol)**
- **The transport layer defines the level of service and status of the connection used when transporting data.**

<u>Internet layer:-</u>

- **It is the 2nd layer of the TCP/IP model.**
- **The position of the layer in between transport layer and network interface layer.**

- **Internet layer is also responsible for routing datagram layer.**
- **Internet layer job is to allow host to insert packet into any network and have them to deliver independently to the destination.**
- **At the destination side the data packet may appear in a different order than they were sending.**
- **It is the jobs of the higher layer to rearrange them in order to delivery them to proper n/w application operating at the application layer. Ex. IP, ICMP (Inter control message protocol) ARP (Address resolution protocol) RARP (Reverse address resolution protocol).**

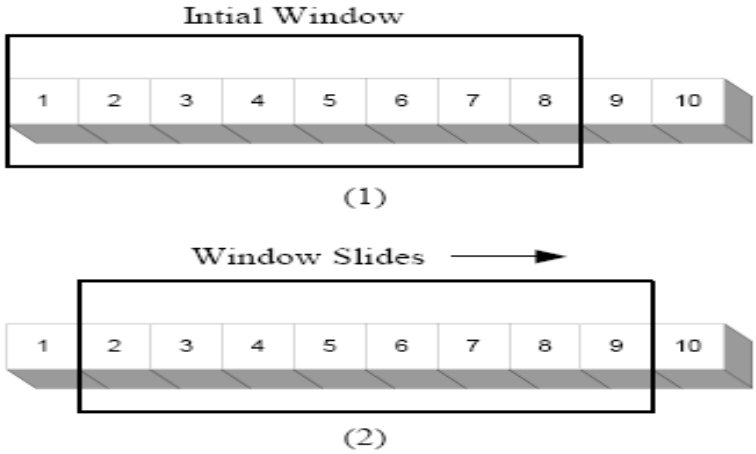
Network access layer:-

- **It is the 1st layer of the TCP/IP model.**
- **It defines how data is physically sent through the network.**
- **How bits are electrically signal by hardware device the interface directly with a network medium such as co axial cable, optical fibber.**
- **The protocol use in this layer Ethernet frame relay.**

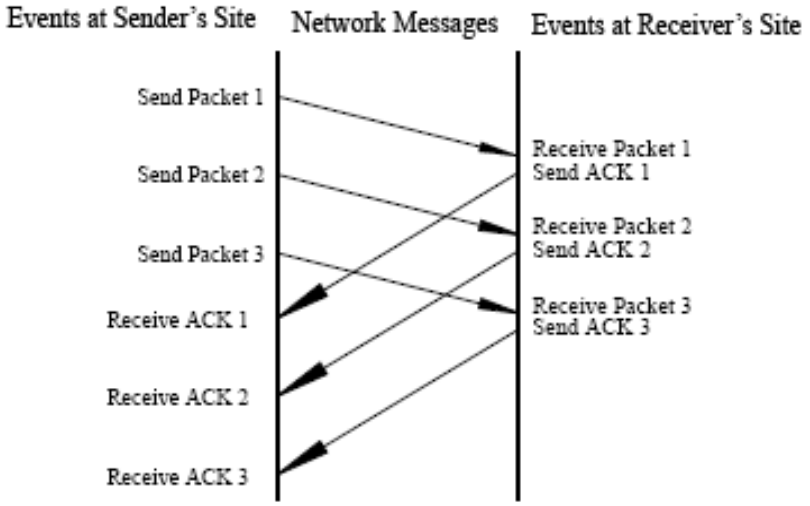
Q3-STATE EXPLAIN IDEA BEHIND SLIDING WINDOW PROTOCOL? ALSO EXPLAIN TIME OUT AND RETRANSMISSION?2016-7/2017-7,2017(w)-3(C).

Idea behind slide windows

- **It makes stream transmission efficient to achieve reliability.**
- **The sender transmits a packet and then waits for an ack, before transmitting media.**
- **A data only flow between the machines in one direction at any type of the network is capability of any both directions.**
- **A simple positive ack. Waste amount of network bandwidth, because it must delay. Sending a new packet, until receive an acknowledgment.**
- **The sliding window protocol uses network bandwidth because they allows to sender to transmit to multiple pocket before waiting for an ack.**



- **The protocol places a small fixed size window on the sequence and transmits all packets.**
- **A packet is an ack if it has been transmitted, but no ack has been received.**
- **The no of packet that can be ack at any given time with the window size is limited small fixed number.**
- **In sliding window protocol window sizes, the sender is permit to transmit 8 packets.**
- **Once the sender receives and ack for the 1st packet inside the window then send the next packet.**
- **If a packet is los the timer expires the sender transmits the packet again.**
- **The window partition the sequence of packet in to 3 set.**
    - ✓ **Those packets to the write have not been transmitted.**
    - ✓ **Those packet lie in the window and being transmitted.**
    - ✓ **And those packet to the left of the window has been transmitted, receive and ack.**

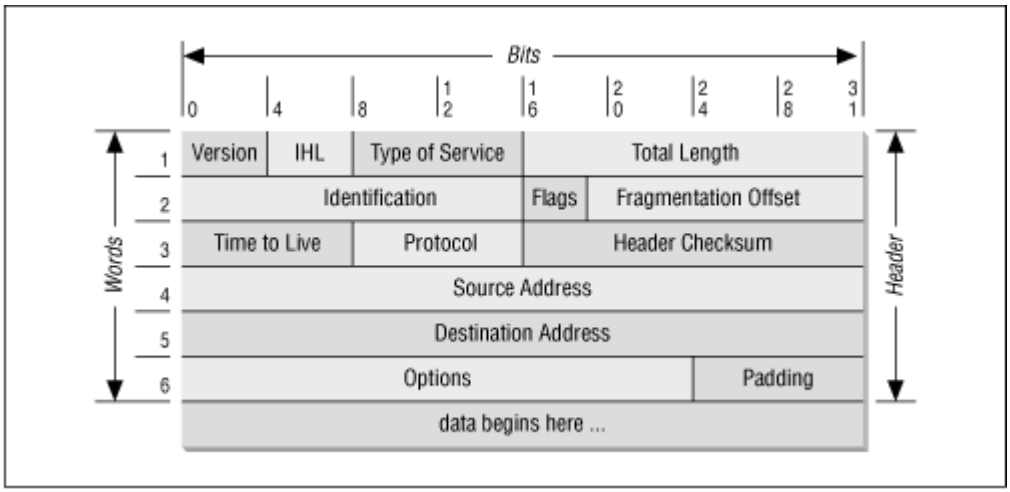


Q4-DEFINE INTERNET DATAGRAM?WRITE THE FIELD OF DATAGRAM FORMAT?2016-7 2017(w)-4(c)

IP Datagram

- **The TCP/IP protocols were built to transmit data over the ARPANET, which was a *packet switching network*.**
- **A *packet* is a block of data that carries with it the information necessary to deliver it - in a manner similar to a postal letter, which has an address written on its envelope.**
- **A packet switching network uses the addressing information in the packets to switch packets from one physical network to another, moving them toward their final destination.**
- **Each packet travels the network independently of any other packet.**
- **The *datagram* is the packet format defined by IP. Pictorial representation of an IP datagram is displayed in the figure.**

- **The first five or six 32-bit words of the datagram are control information called the *header*. By default, the header is five words long; the sixth word is optional. Because the header's length is variable, it includes a field called Internet Header Length (IHL) that indicates the header's length in words. The header contains all the information**



necessary to deliver the packet.

- **IP delivers the datagram by checking the *Destination Address* in word 5 of the header. The Destination Address is a standard 32-bit IP address that identifies the destination network and the specific host on that network.**
- **If the Destination Address is the address of a host on the directly attached network, the packet is delivered directly to the destination.**
- **If the Destination Address is not on the local network, the packet is passed to a gateway for delivery.**
- ***Gateways* are devices that switch packets between the different physical networks. Deciding which gateway to use is called *routing*. IP makes the routing decision for each individual packet.**

Q5-WHAT IS DNS?EXPLAIN THE MAPPING OF DOMAIN NAME TO ADDRESS?2016-7/2017-7 2017(w)-5(c),2018(s)-4-c,2019(s)-4-c

DNS (Domain name System)

- **This is a hierarchical structure which represent for all (domain name server).**
- **It is used to convert IP address into the high level machine.**

<u>Internet Domain:-</u>

- **The domain name system (DNS) is the system that provides name to address mapping for the internet.**
- **DNS has two, conceptually independent aspects.**
- **The first is abstract:- It specifies the name syntax and rules for delegating authority over names.**
- **The second is concrete:- It specifies the implementation of a distributed computing system that efficiently maps names to address.**
- **The section consider the name syntax, and after sections examine the implementation.**

- **The domain name system uses a hierarchical naming scheme known as domain name.**

  Cs Govt. Edu.

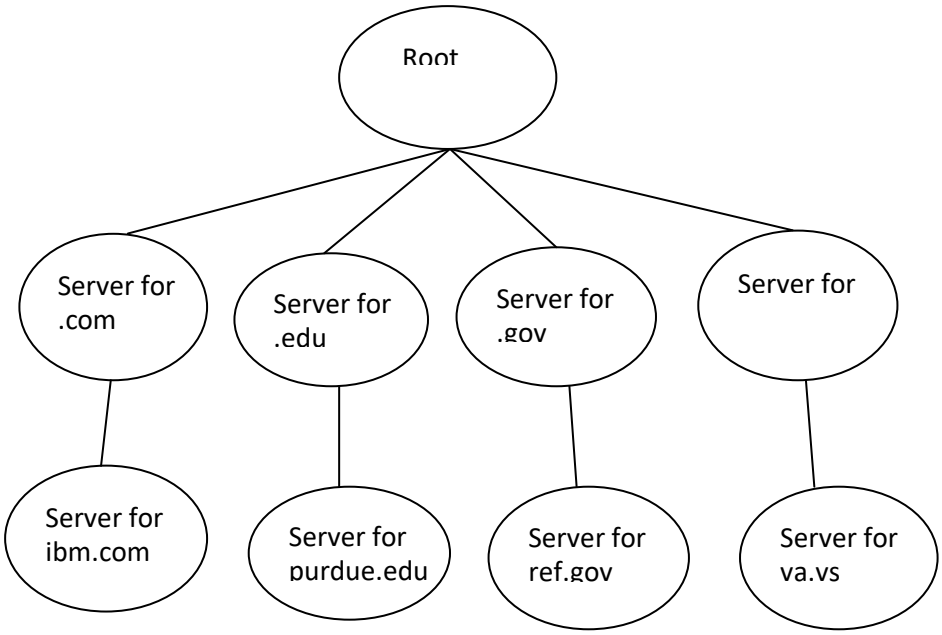
  Department education institute name

<u>Top level domain:-</u>

- **Conceptually, the top level names permit two completely different naming hierarchies: geographic and organization.**
- **The geographic scheme divides the universe of machines by country.**

Mapping domain name to address:-

- **The rules for name syntax and delegation of out hornet, the domain name scheme includes an efficient, reliable, general purpose, distributed system for mapping names to address.**
- **The system is distributed in the technical sense, meaning that a set of servers operating at multiple sites co-operatively solve the mapping problem.**
- **The domain mechanism for mapping names to addresses consists of independent cooperative systems called name servers.**
- **The client software called a name resolver, user one or more names servers when translating a name.**



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Q6-STATE AND EXPLAIN THE WORKING OF FTP PROCESS MODEL?2016-5,,2017(w)-6(b) 2019(s)-3-c

- File transfer protocol

- **This commonly used for exchanging file. It work on the principle of client server one is called server and the other is called client.**
- **Once connection has been established the client can do a no. of file manipulation such as uploading and downloading of files.**

- **The main objective of FTP- To promote computer program and data. To encourage indirect or implicate used of remote computer. To transfer data reliable or efficiently.**
- **FTP COMPONENT**
  - ✓ **FTP Command:- The commands that are used for FTP.**
  - ✓ **FTP Server:- This is used for upload or download of file.**
  - ✓ **FTP Site:- the collection of file and program on an FTP server.**
  - ✓ **Download:- To transfer a copy of file from a remote computer to a local computer.**
  - ✓ **FTP does not need a password through user**

⇒FTP server and authentication:- HT/IP also have the facilities of FTP server as handling the exchange of file.

FTP client

- **FTP clients are program that enable the user to upload and download file.**
- **FTP clients also work a windows 95, 98, XP, UNIX, MAC, and LINUX.**

Type of FTP Client:-

1) **Line mode FTP**
2) **GUI FTP**
3) **Browser base FTP**
4) **Using line made FTP**

1) **Line Made FTP:-Ex-are operating system are the windows, mac, linux are unix, these are capable of FTP client program.**
2) **GUI FTP:-Some FTP client provide Graphical user interface and their completely stand alone.**
   Ex.-IP Switch, Inc etc.
3) **Browser base FTP:-Must web browser like Microsoft internet explorer net cape navigator and fire for include FTP client and they provide used they easy way to download and upload file.**

Q8-DEFINE E-MAIL?EXPLAIN THE FORMAT OF EMAIL MESSAGE?2016-7,2017(w)-6(c) 2018(S)-1(c),2019(s)-5-c

Format of an e-mail message

- **Internet email messages consist of two major sections:**
  - ✓ ***Header* – Structured into fields such as From, To, CC, Subject, Date, and other information about the email.**
  - ✓ ***Body* – The basic content, as unstructured text; sometimes containing a signature block at the end. This is exactly the same as the body of a regular letter.**
- **The header is separated from the body by a blank line.**

Message header

- **Each message has exactly one header, which is structured into fields. Each field has a name and a value.**
- **Email header fields can be multi-line, and each line should be at most 78 characters long and in no event more than 998 characters long.**
- **The message header must include at least the following fields:**

  - ✓ ***From*: The email address, and optionally the name of the author(s). In many email clients not changeable except through changing account settings.**
  - ✓ ***Date*: The local time and date when the message was written. Like the *From:* field, many email clients fill this in automatically when sending. The recipient's client may then display the time in the format and time zone local to him/her.**
  - ✓ ***Message-ID*: Also an automatically generated field; used to prevent multiple delivery and for reference in In-Reply-To: (see below).**
  - ✓ ***In-Reply-To*: Message-ID of the message that this is a reply to. Used to link related messages together. This field only applies for reply messages.**

- **Common header fields for email include:[**

  - ✓ ***To*: The email address(es), and optionally name(s) of the message's recipient(s). Indicates primary recipients (multiple allowed), for secondary recipients see Cc: and Bcc: below.**
  - ✓ ***Subject*: A brief summary of the topic of the message.**
  - ✓ ***Bcc*: Blind carbon copy; addresses added to the SMTP delivery list but not (usually) listed in the message data, remaining invisible to other recipients.**
  - ✓ ***Cc*: Carbon copy; Many email clients will mark email in one's inbox differently depending on whether they are in the To: or Cc: list.**
  - ✓ **Content-Type: Information about how the message is to be displayed, usually a MIME type.**
  - ✓ ***Precedence*: commonly with values "bulk", "junk", or "list"; used to indicate that automated "vacation" or "out of office" responses should not be returned for this mail, e.g. to prevent vacation notices from being sent to all other subscribers of a mailing list.**
  - ✓ ***References*: Message-ID of the message that this is a reply to, and the message-id of the message the previous reply was a reply to, etc.**
  - ✓ ***Reply-To*: Address that should be used to reply to the message.**
  - ✓ ***Sender*: Address of the actual sender acting on behalf of the author listed in the From: field (secretary, list manager, etc.).**
  - ✓ ***Archived-At*: A direct link to the archived form of an individual email message.**

Q9-EXPLAIN THE ROUTING MECHANISM IN INTERNET PROTOCOL?2017-7

Routing with IP address

- **Except of determination the time to live and re computing the check sum, IP routing does not alter the original datagram.**

- **The datagram source and destination address remain unaltered, they always specify the IP address of the original source and the IP address of the ultimate destination.**
- **When IP executes the routing algorithm it selects a new IP address. The IP address of the machine to which the datagram should be sent next.**
- **After executing the routing algorithm IP passes the datagram and the next hop address to the network interface responsible for the physical network which the data gram must be sent.**
- **The network interface software birds the next hop address to a physical address places the datagram in the data portion of the frame and sends.**

Q10-WHAT IS DTD?EXPLAIN THE CONCEPT OF DTD WITH EXAMPLE?

What is DTD? (2019(s)-7(iii))

Concept of DTD

- **It stands for document type definition.**
- **A DTD define a structure of the XML document.**
- **DTD list the element attribute then entity and the notation that can be used in a document.**
- **The document type definition declaration must be first in the document after processing instruction.**
- **Creating DTD is just like creating table in database. DTD specify the structure of data by declaring the data.**
- **Modularity:-HTML appears to have DTD (document type definition) .HTML has a limit less no of DTD on the other hand there is only on for each type of document.**
- **Extensibility:-XML will powerful linking mechanism allow to link to Material without requiring the link target.**
- **Distribution:- In addition to linking introduce a for more sophisticated method of including links target.**
- **Internationality:- both HTML and SGML relay heavily on ASCII. XML is based on UNICODE and require all html software to support UNICODE.**
- **Data orientation:- XML operate on data orientation rather than read ability by human.**

Rules for XML

The name can contain letter no and other character. Name must not start with a number and other character.

- **Names must start with XML letter names can not contain space .XML document after have a parallel database where filed names parallel database where field names parallel width elements name.**

  Examples<author name><published name>

Empty tag:-

It is the tag which don't have closing tag.

Comments in XML file:-

<text> welcome to XML tutorial

</text>
<this is a comment>
<subject>
Hello. XML
<? XML version =”1.0”>
<P.00>
Hello XML
<\F00>
Here the sharing of file is done by using .XML

<u>XML prolog:-</u>

- **XML file always start with a prolog an attribute is a name value separate by an equal sign.**
- **Every XML document should begin with an XML declaration that specify the version XML. <? XML version = “1.0”>**
- **The declaration may also contain an additional information.**

<? XML version = “1.0” encoding = “ISO-8895.1” standard alone = “yes”?>

<u>Elements and attribute:-</u>

Each tag in a XML file can have element and attribute.

<Email to = “admin @ may domain.com”>
From = “user @ my site.com>
Subject = “introducing XML
<\email>

Q11-WHAT DO YOU MEAN BY REMOTE LOGIN?EXPLAIN E-MAIL ROUTING WRITE THE ADVANTAGE OF EMAIL?2015-8

What is TELNET.(2019(w)

- **Telnet is a network protocol used on the Internet or local area networks to provide a bidirectional interactive text-oriented communication facility using a virtual terminal connection.**
- **User data is interspersed in-band with Telnet control information in an 8-bit byte oriented data connection over the Transmission Control Protocol (TCP).**
- **Telnet, by default, does not encrypt any data sent over the connection (including passwords), and so it is often practical to eavesdrop on the communications and use the password later for malicious purposes; anybody who has access to a router, switch, hub or gateway located on the network between the two hosts where Telnet is being used can intercept the packets passing by and obtain login, password and whatever else is typed with a packet analyzer.**
- **Most implementations of Telnet have no authentication that would ensure communication is carried out between the two desired hosts and not intercepted in the middle.**

- **Several vulnerabilities have been discovered over the years in commonly used Telnet daemons.**
- **Firstly, incoming emails go through spam filtering gateways, and all clean messages are then sent to the destination mail server.**

- **Mail routing goes a step beyond spam filtering to make a carbon copy of specified emails based on rules and send this copy to additional recipient(s).**
- **The rules for the carbon copy generation can be based on the sender or recipient.**
- **Messages are still delivered to the original recipient.**
- **Mail routing helps an organization keep track of important emails.**
- **For example, you may wish to have a copy of all emails addressed to sales@yourdomain.com delivered to an additional archiving email system in addition to your primary mail server. Used correctly, mail routing could give your business a competitive edge.**

Q12-EXPLAIN DIFFERENT TYPES OF INTERNET CONNECTIVITY?(2019(S)-5(a))

Types of connectivity

There are 3 types of connectivity, i.e.

- **Dial-up connection**
- **Leased connection**
- **VSAT connection**

- **Dial-up connection**
  - **It is also known as, level-2 connection. This provides connection to internet, through a dial up terminal connection.**
  - **The computer, which, provides, internet access is known as, 'host' and the computer that, receives, the access is 'client' or 'terminal'.**
  - **The client uses, modem to access a host and acts as, directly connected terminal to the host. This type of connection is also known as, remote modem access.**
  - **Host carries, all the command, that, are type or a client machine and the client computer acts as a 'dumb' terminal, connected to remote host.**
  - **It is also divided into two types, i.e.**

    I) Shell connection

    II)TCP/IP Connection
  - **Shell connection**

    In shell connection, it doesn't support, graphics display.
  - **TCP/IP Connection**

    The measure difference between shell and TCP/IP account is that, shell account only display, text and doesn't support graphics, whereas, TCP/IP displays both. ⇒ It is more popular internet connection.

Components for dial-up connection

- **Computer.**

- **Modem**
- **Telephone line**
- **Sheller TCP/IP connection**
- **Internet client software.**

❖ **Leased connection**

- **It is also known as, direct internet access or level-3 connection.**
- **It is secure, dedicated and most expensive with leased connection.**
- **Computer is dedicatedly or directly connected to the internet using high speed transmission line.**
- **Leased inter connection are limited to large corporation and universities, who, could effort these costs.**

❖ **VSAT connection**

- **The full form of VAST is very small aperture terminal (VSAT).**
- **It is a two way satellite ground station.**
- **VSAT antenna with a dish antenna that, smaller than 3 meters.**
- **VSAT antennas range from 75 c.m. to 1.2 m.**
- **Data rates range from 4 kbit/s upto 4 mbit/s.**
- **VSAT are used to transmit narrow band data.**
- **Eg.- Transaction using credit cards.**

Q13-WHY HTML IS USED?EXPLAIN FEATURE AND COMPONENT OF HTML WITH SUITABLE EXAMPLE?2015-8,2019(s)-6-c

- **HTML stands for Hypertext Mark up language.**
- **HTML is the basic tool for designing the web page.**
- **It uses some standard tags to tell your web browser how to display the web page you have requested for this reason its called markup language.**
- **It uses tags as mark up codes in an HTML document. A tag is a symbol in HTML that has a special meaning.**
- **It is a documentation language to mark the heading, title, table and forms.**

<u>TAG ATTRIBUTES:-</u>

- **Tag attributes are the special words used inside the opening and closing tag to control the tags behavior.**
- **There could be more than one attributes for a tag separated by a space in between.**

  Ex: < BODY . BGCOLOR – "RED" TEXT = "GREEN">

  Tag name Attribute Attribute Value Attribute Attribute Value
- **All the attribute value should be enclosed with double quote marks ("") except letter (A-Z, a-Z), Number (0-9), by then (-).**

<u>Base HTML TAGS:-</u>

- **HTML documents is made up of various tags but there are some basic HTML tags used in all HTML document to identify document parts.**
  - ✓ **The HTML Tag**
  - ✓ **The Head Tag**
  - ✓ **The Title Tag**
  - ✓ **The Body Tag**

HTML TAG [<HTML> ------</HTML>]

- **This tag surround the whole document which marks the start and end of the HTML document.**
- **It helps the browser to understand that this is the HTML document.**

2. HEAD TAG [<HEAD>--------</HEAD>]

- **Head tag is used to define the document header.**
- **It is placed between the HTML tag and contains the information like title, style documents description etc.**

3. TITLE TAG [<TITLE>------</TITLE>]

- **Title tag appears within the head tags.**
- **The information enclosed by the title tag appears in the title bar.**

4. BODY TAG [<BODY>--------</BODY>]

- **Body tag appears after the head tag**
- **All the contents of the web page i.e. text, graphics, links etc. are enclosed in between the body tags.**

STRUCTURE OF HTML DOCUMENT

```
                    <HTML>
HEAD                <HEAD>
                    <TITLE>----------</TITLE>      -- TITLE BAR
                    </HEAD>
BODY                <BODY>
                    -
                    -
HTML                -
                    -
                    -
                    -
                    E
                    X
                    A
MPLE----- --------
----
</BODY>
</HTML>
<html>
```

```
<head><title></title></head>
<body>
<table bg color = “Red” Boarder = “6” width = “50”>
</table>
</body>
</html>
```

Q15-

Q14-Why sliding window concept is used ? Explain the working of sliding window with suitable diagram.(2019(w)-2(B))

Sliding window protocol is a flow control **protocol**. It allows the sender to send multiple frames before needing the acknowledgements. Sender **slides** its **window** on receiving the acknowledgements for the sent frames. This allows the sender to send more frames.

Sliding window protocols are data link layer protocols for reliable and sequential delivery of data frames. The sliding window is also used in Transmission Control Protocol.

In this protocol, multiple frames can be sent by a sender at a time before receiving an acknowledgment from the receiver. The term sliding window refers to the imaginary boxes to hold frames. Sliding window method is also known as windowing.

Working Principle

In these protocols, the sender has a buffer called the sending window and the receiver has buffer called the receiving window.

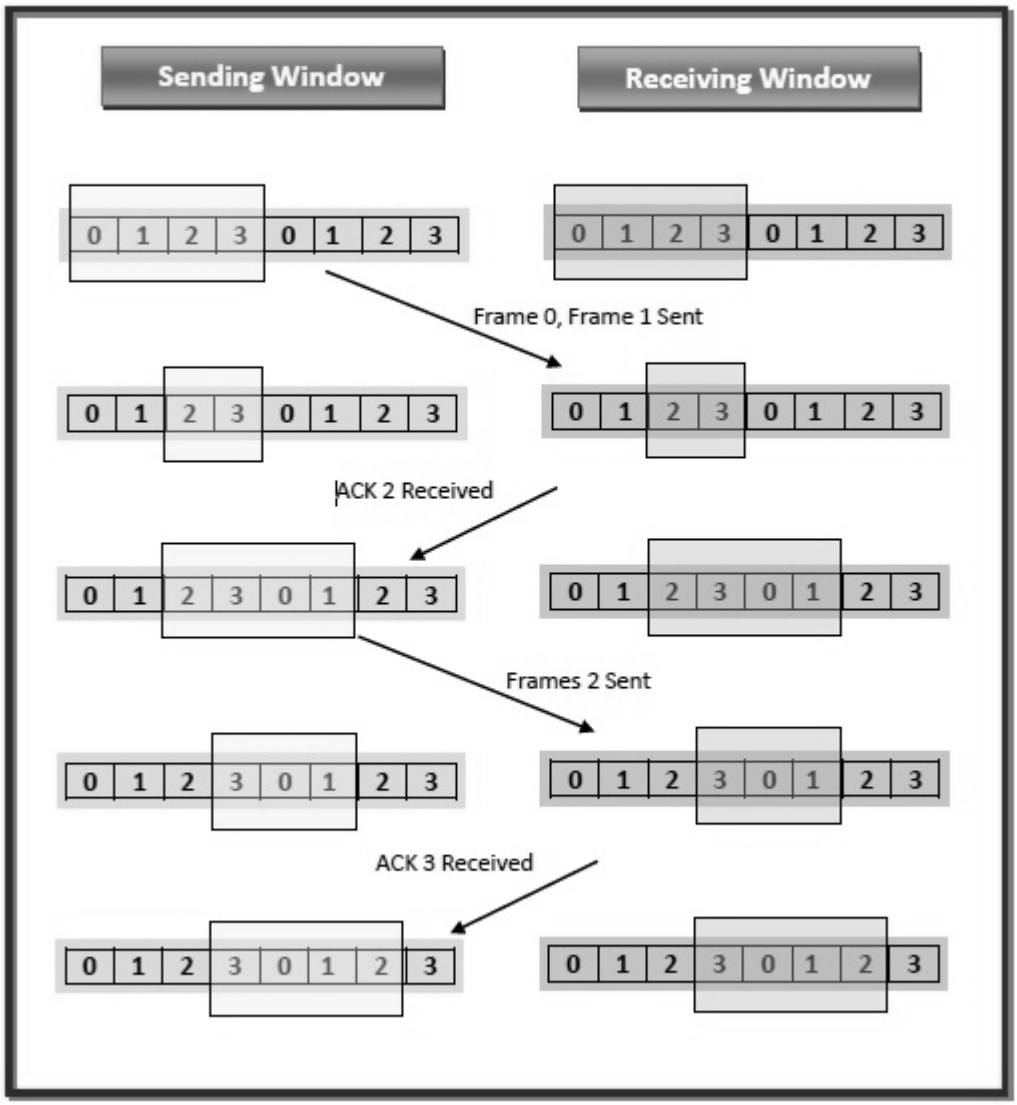
The size of the sending window determines the sequence number of the outbound frames. If the sequence number of the frames is an n-bit field, then the range of sequence numbers that can be assigned is 0 to 2□−1. Consequently, the size of the sending window is 2□−1. Thus in order to accommodate a sending window size of 2□−1, a n-bit sequence number is chosen.

The sequence numbers are numbered as modulo-n. For example, if the sending window size is 4, then the sequence numbers will be 0, 1, 2, 3, 0, 1, 2, 3, 0, 1, and so on. The number of bits in the sequence number is 2 to generate the binary sequence 00, 01, 10, 11.

The size of the receiving window is the maximum number of frames that the receiver can accept at a time. It determines the maximum number of frames that the sender can send before receiving acknowledgment.

Example

Suppose that we have sender window and receiver window each of size 4. So the sequence numbering of both the windows will be 0,1,2,3,0,1,2 and so on. The following diagram shows the positions of the windows after sending the frames and receiving acknowledgments.



Types of Sliding Window Protocols

The Sliding Window ARQ (Automatic Repeat reQuest) protocols are of two categories −

- **Go – Back – N ARQ**

  Go – Back – N ARQ provides for sending multiple frames before receiving the acknowledgment for the first frame. It uses the concept of sliding window, and so is also called sliding window protocol. The frames are sequentially numbered and a finite number of frames are sent. If the acknowledgment of a frame is not received within the time period, all frames starting from that frame are retransmitted.

- **Selective Repeat ARQ**

  This protocol also provides for sending multiple frames before receiving the acknowledgment for the first frame. However, here only the erroneous or lost frames are retransmitted, while the good frames are received and buffered