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WINTER – 2019 EXAMINATION
MODEL ANSWER

Subject: Computer Network   **Subject Code:**   22417

Important Instructions to examiners:
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills).
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1.	**(a) Ans.**	**Attempt any FIVE of the following:** **List advantages & disadvantages of Computer Network.** **Advantages of Computer Network:** 1. Resource sharing 2. Information Sharing 3. High reliability communication 3. Cost effective 4. Powerful communication medium 5. Centralised management 6. Data Backup 7. Increased Storage capacity **Disadvantages of Computer Network:** 1. Social issues regarding privacy of data, information etc.. 2. Broadcasting of anonymous messages 3. Security threats 4. Need for efficient handler 5. Lack of Robustness	**10** **2M** *Any two advantages & disadvantages ½M each*

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(b) **Ans.**	**State features of Nos.** **Features of NOS (Network Operating System).:** A network operating systems salient features are: • Basic support for operating systems like protocol and processor support, hardware detection and multiprocessing. • Printer and application sharing. • Common file system and database sharing. • Network security capabilities such as user authentication and access control. • Directory Services • Backup and web services. • Internetworking of various resources connected in the network • Providing access to remote printers, managing which users are using which printers when, managing how print jobs are queued, and recognizing when devices aren't available to the network. • Enabling and managing access to files on remote systems, and determining who can access what—and who can't. • Granting access to remote applications and resources, such as the Internet, and making those resources seem like local resources to the user (the network is ideally transparent to the user). • Providing routing services, including support for major networking protocols, so that the operating system knows what data to send where. • Monitoring the system and security, so as to provide proper security against viruses, hackers, and data corruption. • Providing basic network administration utilities (such as SNMP, or Simple Network Management Protocol), enabling an administrator to perform tasks involving managing network resources and users.		**2M** *Any two features 1M each*
(c) **Ans.**	**Define host and access point in computer network.** **Host:** Host is the end system of WAN which contains a collection of machines intended for running user (application) programs. **OR** Host is an end device such a computer which is connected for communication. **Access point:** Access point is the system in network which allows		**2M** *Each definition 1M*

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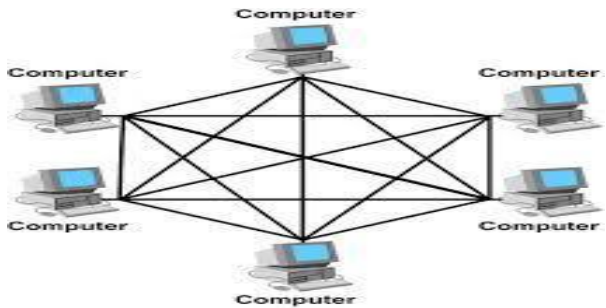|			
		user to use application programs stored at HOST machine. **OR** An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. **OR** An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area.	
(d) **Ans.**		**State Computer topology. Give its importance.** **Computer topology** is the network configuration. The term 'topology' refers to the way a network is laid out either physically or logically. **OR** The topology of network is the geometric representation of the relationship of all the links and linked devices usually called nodes to each other. **OR** Network Topology is the way in which the devices and connected to each other in a computer network. **Importance of Topology:** 1. Better Understanding of the network 2. Effective use of resources 3. Easier error detection 4. Effective management of cost of network 5. Easy to upgrade/change in the network	**2M** *Definition 1M* *Any one Importance 1M*
(e) **Ans.**		**Define protocol. State its significance.** **Protocols:** Protocols are the rules and conventions used in the exchange of information between two machines in various layers of a network. **Significance of protocol:** • Protocols control the sending and receiving of the information with in a network. • The peer entities communicate using these protocols. Each protocol belongs to one of the layers and is distributed among the network entities that implement this protocol.	**2M** *Definition 1M* *Any one Significance 1M*
(f) **Ans.**		**List any four application layer protocols.** *(Note: Any other application layer protocol shall be considered).*	**2M**

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		Protocols used at application layer are: 1.TELNET (Terminal Network) 2. FTP (File Transfer Protocol) 3. SMTP (Simple Mail Transfer Protocol) 4. DNS (Domain Name System) 5. HTTP (Hyper Text Transfer Protocol) 6. SNMP (Simple Network Management Protocol) 7. DHCP (Dynamic Host Configuration Protocol)		*Any four applicati on ½M each*
	(g)	**Explain the logical address and physical address in computer network.**		**2M**
	Ans.	**Logical Address:** Logical Address is network layer generated 32 bit address (for IPv4) interpreted by protocol handler. Logical addresses are used by networking software to allow packets to travel through WAN (Internet). It makes packets to travel independently.		*Logical Address 1M*
		Physical Address: Physical address is 48 bit MAC address of system. This is hardware level address used by "Ethernet" interface to communicate on LAN (Local Area Network) NIC card carries this address. This address is specified by the manufacturer of NIC.		*Physical Address 1M*
2.		**Attempt any THREE of the following:**		**12**
	(a)	**Describe working of Mesh topology. Give its advantages and disadvantages.**		**4M**
	Ans.	**Mesh topology:** In mesh topology there are multiple paths between / nodes. Mesh networks are most commonly employed for long distance transmission of data between nodes, which act as message switch, circuit switch or packet switch. A fully connected mesh, linking 'n' nodes requires n (n-1) / 2 links but it is unusual for all possible or connections to be provided. 		*Working 2M*

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		Advantages: 1. Avoids traffic problem 2. Robust topology since if one node fails, it does not affect the other nodes. 3. Point to point connection makes it easier to detect errors. 4. More security and Privacy in connections. **Disadvantages:** 1. More cables are required than other topologies. 2. Cost of the network is high since more number of cables are used. 3. Installation and re-configuration is difficult. 4. Setup and maintenance of the topology is difficult. 5. Through put and transmission quantity depends on media and capacity of switching nodes.	*Any two advantages and disadvantages ½M each*
	(b) **Ans.**	**Draw OSI model. State function of each layer.** **Fig. ISO-OSI reference model**	**4M** *Diagram 2M*

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OSI model has following 7 layers as **Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer, Application layer**.

Following are the functions performed by the above layer

1. **Physical layer:** it deals with the mechanical and electrical specification of the interface and transmission medium.
   ➢ Physical characteristics of interfaces and medium.
   ➢ Representation of bits or signals.
   ➢ Data rate
   ➢ Synchronization of bit
   ➢ Line configuration or connection type.
   ➢ Physical topology
   ➢ Transmission mode.

2. **Data link layer:** It performs node to node delivery of the data.
It is responsible for transmitting group of bits between the adjacent nodes. The group of bits is called as frame.
   ➢ Framing
   ➢ Physical addressing
   ➢ Flow control
   ➢ Error control
   ➢ Media access control
   ➢ Node to node delivery

3. **Network layer:** It is responsible for routing the packets within the subnet i.e. from source to destination. It is responsible for source to destination delivery of individual packets across multiple networks. It ensures that packet is delivered from point of origin to destination.
   ➢ Logical addressing
   ➢ Routing.
   ➢ Congestion control
   ➢ Accounting and billing
   ➢ Address transformation
   ➢ Source host to destination host error free delivery of packet.

4. **Transport layer:** Responsibility of process to process delivery of message ensures that whole message arrives in order.
   ➢ Service point addressing
   ➢ Segmentation and reassembly

Functions 2M

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		➢ Connection control
		➢ Flow control is performed end to end
		➢ Error control
		
		5. **Session layer:** Establishes, maintains, and synchronizes the interaction among communication systems It is responsible for dialog control and synchronization.
		    ➢ Dialog control
		    ➢ Synchronization
		    ➢ Token Management
		    ➢ Activity Management
		    ➢ Data Exchange
		
		6. **Presentation layer:** It is concerned with syntax, semantics of information exchanged between the two systems.
		    ➢ Translation: Presentation layer is responsible for converting various formats into required format of the recipient
		    ➢ Encryption: Data encryption and decryption is done by presentation layer for security.
		    ➢ Compression and Decompression: data is compressed while sending and decompress while receiving for reducing time of transmission.
		7. **Application layer:** It enables user to access the network. It provides user interfaces and support for services like email, remote file access.
		Functions of Application layer:
		    ➢ Network virtual terminal
		    ➢ File transfer access and management
		    ➢ Mail services and directory services.	

	(c) **Ans.**	**Describe design issue for layering in computer network.** **Design issue for layering in computer network:** **Reliability:** Network channels and components may be unreliable, resulting in loss of bits while data transfer. So, an important design issue is to make sure that the information transferred is not distorted. **Scalability:** Networks are continuously evolving. The sizes are continually increasing leading to congestion. Also, when new technologies are applied to the added components, it may lead to	**4M** *Any four design issues 1M each*

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incompatibility issues. Hence, the design should be done so that the networks are scalable and can accommodate such additions and alterations.

Addressing: At a particular time, innumerable messages are being transferred between large numbers of computers. So, a naming or addressing system should exist so that each layer can identify the sender and receivers of each message.

Error Control: Unreliable channels introduce a number of errors in the data streams that are communicated. So, the layers need to agree upon common error detection and error correction methods so as to protect data packets while they are transferred.

Flow Control: If the rate at which data is produced by the sender is higher than the rate at which data is received by the receiver, there are chances of overflowing the receiver. So, a proper flow control mechanism needs to be implemented.

Resource Allocation: Computer networks provide services in the form of network resources to the end users. The main design issue is to allocate and deallocate resources to processes. The allocation/ deallocation should occur so that minimal interference among the hosts occurs and there is optimal usage of the resources.

Statistical Multiplexing: It is not feasible to allocate a dedicated path for each message while it is being transferred from the source to the destination. So, the data channel needs to be multiplexed, so as to allocate a fraction of the bandwidth or time to each host.

Routing: There may be multiple paths from the source to the destination. Routing involves choosing an optimal path among all possible paths, in terms of cost and time. There are several routing algorithms that are used in network systems.

Security: A major factor of data communication is to defend it against threats like eavesdropping and surreptitious alteration of messages. So, there should be adequate mechanisms to prevent unauthorized access to data through authentication and cryptography.

	(d) **Ans.**	**Describe working of SLIP protocol and PPP protocol.** **SLIP (Serial Line Internet Protocol):** SLIP (Serial Line Internet Protocol) is designed to work over serial ports and routers with TCP/IP suit. It is a simple protocol which	**4M**

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		provides communication between machines which are previously configured for direct communication with each other. E.g Telephone lines to be use for computer networks SLIP transmission has a very simple format comprising of payload and a flag that act as an end delimiter. The flag in generally a special character equivalent to decimal 192. If the flag is present in data then an escape sequence precedes it, so that the receiver does not consider it as the end of frame.	*Description of SLIP & PPP 2M each*

Data	ENDFlag

PPP (Point to Point protocol):
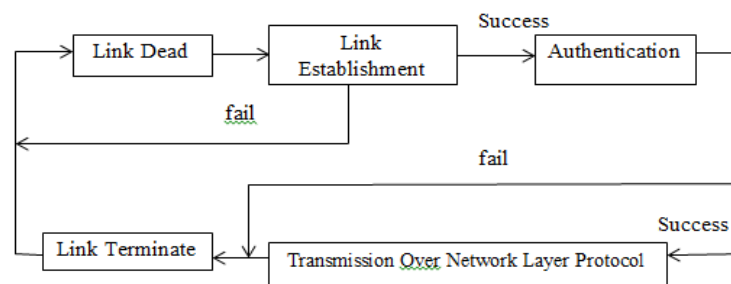
PPP (Point to Point protocol) is a layer 2 or data link layer protocol which is used to establish a direct communication between two nodes in network. This protocol is used to create a simple link between two peers in a network to transmit packets. It provides authentication, encryption and compression.

PPP links are full duplex and deliver packets in order. PPP works in 5 phases.
1) Link Dead Phase: PPP begin with Link Dead phase. At this phase link establishment initiates.
2) Link Establishment Phase: Configured packets with link control protocol are handed over to Network Layer.
3) Authentication Phase: PPP link needs authentication before exchange packets which network layer. Two types of authentication protocols used-
   a) Password Authentication Protocol
   b) Challenge Handshake Authentication Protocol.
4) Link Transmission Phase: PPP packets travels over network layer with IP, IPX and other Network Layer Protocol

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3.		**Attempt any THREE of the following:**	**12**
	(a)	**Describe the classification of networks based on transmission technology.**	**4M**
	Ans.	The Computer networks can be classified on the basis of transmission technology used by them. There are two types of Computer networks in this category: 1. **Broadcast Networks:** In broadcast networks, a single communication channel is shared among all the computers of the network. This means, all the data transportation occurs through this shared channel. The data is transmitted in the form of packets. The packets transmitted by one computer are received by all others in the network. The destination of packet is specified by coding the address of destination computer in the address field of packet header. On receiving a packet, every computer checks whether it is intended for it or not. If the packet is intended for it, it is processed otherwise, it is discarded. There is another form of broadcast networks in which the packets transmitted by a computer are received by a particular group of computers. This is called as "Multicasting". 2. **Point to Point or Store and Forward Networks:** The store and forward networks consist of several interconnected computers and networking devices. The data is transmitted in the form of packets. Each packet has its own source and destination address. To go from a source to a destination, a packet on this type of network may first have to visit one or more intermediate devices or computers that are generally called as "routers". The packets are stored on an intermediate router unless the output line is free. When the output line is free, it is forwarded to the next router. The routing algorithms are used to find a path from the source to destination. The routing algorithms play a very important role in this type of network.	*Description of two categories 2M each*
	(b)	**State NIC and Access Point. How it differs?**	**4M**
	Ans.	**NIC :** A network interface card (NIC) is a hardware component without which a computer cannot be connected over a network. It is a circuit	

5) Line Termination Phase: Closing the link is the task at this phase. PPP packet is configured to instruct network layer for proper termination.

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		board installed in a computer that provides a dedicated network connection to the computer. It is also called network interface controller, network adapter or LAN adapter. **Access Point :** An access point is a device that creates a wireless local area network, or WLAN, usually in an office or large building. An access point connects to a wired router, switch, or hub via an Ethernet cable, and projects a Wi-Fi signal to a designated area. For example, if you want to enable Wi-Fi access in your company's reception area but don't have a router within range, you can install an access point near the front desk and run an Ethernet cable through the ceiling back to the server room.	*Definition of NIC and AP 1M each*

NIC	Access Point
1. NIC is a computer hardware component that connects a computer to a computer network	1. AP is a networking hardware device that allows other Wi-Fi devices to connect to a wired network
2. A NIC connects one System to Computer Network	2. An Access Point used to connect many devices to form Computer Network.
3. Primary function of NIC is to provide interface between PC and Computer Network.	3. Primary function of AP is to bridge 802.11 WLAN traffic to 802.3 Ethernet traffic.
4. Example : Ethernet card	4. Example : Wifi (802.11) AP

Any Two difference 1M each

	(c) **Ans.**	**Describe working of TCP/IP model. How it differs from OSI.** **Working of TCP/IP Model :** TCP/IP uses the client/server model of communication in which a user or machine (a client) is provided a service (like sending a	**4M** *Description 2M*

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webpage) by another computer (a server) in the network.
Collectively, the TCP/IP suite of protocols is classified as stateless, which means each client request is considered new because it is unrelated to previous requests. Being stateless frees up network paths so they can be used continuously.

The transport layer itself, however, is stateful. It transmits a single message, and its connection remains in place until all the packets in a message have been received and reassembled at the destination.

TCP/IP model layers

TCP/IP functionality is divided into four layers, each of which include specific protocols.

The application layer provides applications with standardized data exchange. Its protocols include the Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Post Office Protocol 3 (POP3), Simple Mail Transfer Protocol (SMTP) and Simple Network Management Protocol (SNMP).

The transport layer is responsible for maintaining end-to-end communications across the network. TCP handles communications between hosts and provides flow control, multiplexing and reliability. The transport protocols include TCP and User Datagram Protocol (UDP), which is sometimes used instead of TCP for special purposes.

The Network layer, also called the Internet layer, deals with packets and connects independent networks to transport the packets across network boundaries. The network layer protocols are the IP and the Internet Control Message Protocol (ICMP), which is used for error reporting.

The physical layer consists of protocols that operate only on a link -- the network component that interconnects nodes or hosts in the network. The protocols in this layer include Ethernet for local area networks (LANs) and the Address Resolution Protocol (ARP).

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OSI (Open System Interconnection)	TCP/IP (Transmission Control Protocol / Internet Protocol)	
1. OSI is a generic, protocol independent standard, acting as a communication gateway between the network and end user.	1. TCP/IP model is based on standard protocols around which the Internet has developed. It is a communication protocol, which allows connection of hosts over a network.	
2. In OSI model the transport layer guarantees the delivery of packets.	2. In TCP/IP model the transport layer does not guarantees delivery of packets. Still the TCP/IP model is more reliable.	*Difference any two points 1M each*
3. Follows vertical approach.	3. Follows horizontal approach.	
4. OSI model has a separate Presentation layer and Session layer.	4. TCP/IP does not have a separate Presentation layer or Session layer.	
5. Transport Layer is Connection Oriented.	5. Transport Layer is both Connection Oriented and Connection less.	
6. Network Layer is both Connection Oriented and Connection less.	6. Network Layer is Connection less.	
7. OSI is a reference model around which the networks are built. Generally it is used as a guidance tool.	7. TCP/IP model is, in a way implementation of the OSI model.	
8. Network layer of OSI model provides both connection oriented and connectionless service.	8. The Network layer in TCP/IP model provides connectionless service.	
9. OSI model has a problem of fitting the protocols into the model.	9. TCP/IP model does not fit any protocol	
10. OSI model defines services, interfaces and protocols very clearly and makes clear	10. In TCP/IP, services, interfaces and protocols are not clearly separated. It is also	

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distinction between them. It is protocol independent.	protocol dependent.
11. It has 7 layers	11. It has 4 layers
12. OSI model has a separate Presentation layer and Session layer	12. TCP/IP does not have a separate Presentation layer or Session layer

Diagrammatic Comparison between OSI Reference Model and TCP/IP Reference Model

OSI Model

| Application Layer |
| Presentation Layer |
| Session Layer |
| Transport Layer |
| Network Layer |
| Data Link Layer |
| Physical Layer |

TCP/IP Model

| Application Layer |
| Transport Layer |
| Internet Layer |
| Network Access Layer |

(d) Ans. | **Explain working of ARP and RARP to assign IP addresses.**

ARP :

ARP (Address Resolution Protocol) is a network layer protocol. As ARP is a dynamic mapping protocol, each host in the network knows the Logical address of another host. Now, suppose a host needs to send the IP datagram to another host. But, the IP datagram must be encapsulated in a frame so that it can pass through the physical network between sender and receiver. Here, the sender needs the

4M

Working of ARP and RARP 2M each

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physical address of the receiver so that it is being identified that to which receiver the packet belong to when the packet travel in the physical network.
For retrieving the physical address of the receiver the sender performs the following action.

i.   The sender sends the ARP query packet on the network which is broadcasted to all the other host or router present in the network.
ii. The ARP query packet contains the logical and physical address of the sender and the logical address of the receiver.
iii. All the host and router receiving the ARP query packet process it but, only the intended receiver identifies its logical address present in the ARP query packet.
iv. The receiver then sends ARP response packet which contains the logical (IP) address and physical address of the receiver.
v.   The ARP response packet is unicast message sent directly to the sender whose physical address is present in the ARP query packet.
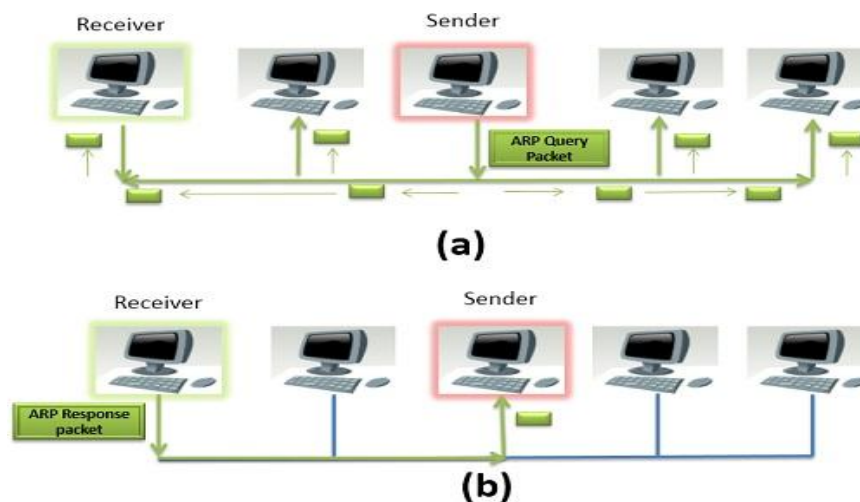
Address Resolution Protocol

RARP
RARP (Reverse Address Resolution Protocol) is also a network layer protocol. RARP is a TCP/IP protocol that allows any host to obtain its IP address from the server. RARP is adapted from the ARP protocol and it is just reverse of ARP.

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RARP perform following steps to obtain an IP address from the server.

  i.   The sender broadcast the RARP request to all the other host present in the network.

 ii.   The RARP request packet contains the physical address of the sender.

iii.   All the host receiving the RARP request packet process it but, the authorized host only which can serve RARP service, responds to the RARP request packet such host are known as RARP Server.

 iv.   The authorized RARP server replies directly to requesting host with the RARP response packet which contains IP address for the sender.

Reverse Address Resolution Protocol

4.		**Attempt any THREE of the following:**	**12**
	(a) **Ans.**	**List and describe any four benefits of Computer network.**	**4M**
		1. File sharing: -files can be centrally stored and used by multiple users. Shared directory or diskdrive is used. If many users access same file on network and make changes at same time andconflict occurs. Network operating system performs file sharing and provides security to sharefiles.	*Any four benefits 1M each*

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2. Printer sharing: Printer connected in a network can be shared in many ways. Use printerqueues on server. Here printer is connected to server. Each work station can access printerdirectly. Printer can be connected to server. Connect a printer to a computer in a network andrun special print server software. Use built in print server. Use dedicated print server. Byprinter sharing reduces no. of printers needed. Share costly and high quality printers.

3. Application services: Share application on a network. When applications are centralized,amount of memory required on disk of work station is reduced. It is easier to administer anapplication. It is more secure and reliable. It is faster and convenient.

4. E-mail services. Two types of email systems are available:

1) File based system: Files are stored in shared location on server. Server provides access tofile. Gate way server connects from file based email system to internet.

2) Client server e-mail system: E-mail server contains message and handles e-mailinterconnections. E-mail client functions (also consider other e-mail functions): read mail,send, compose, forward, delete.
E-mail protocols: SMTP, POP etc.

5. Remote access: Set up remote access service on network operating system. Setup VPN (virtualprivate network) on internet terminal services (TELNET). User can access files from remotelocation. User can access centralized application or share files on LAN.

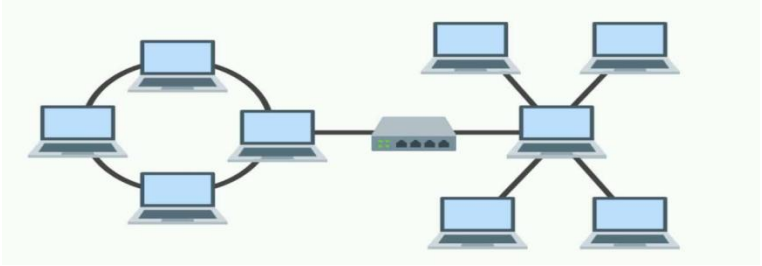|			
	(b)	**Draw and describe graphical representation of Hybrid topology. Give it significance.**	**4M**
	Ans.	Hybrid topology is an interconnection of two or more basic network topologies, each of which contains its own nodes. The resulting interconnection allows the nodes in a given basic topology to communicate with other nodes in the same basic topology as well as those in other basic topologies within the hybrid topology. Advantages of a hybrid network include increased flexibility as new basic topologies can easily be added or existing ones removed and increased fault tolerance.	*Description 2M*

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Hybrid Topology (Star-Ring)

Significance:

- There are many reasons why hybrid topologies are used but they all have one thing in common: flexibility.
- There are few constraints on the structure that a hybrid topology cannot accommodate, and you can incorporate ring, bus, mesh, and star topologies into one hybrid setup.
- Hybrid topologies are very scalable. Their scalability makes them well-suited to larger networks.

Diagram 1M

Significance 1M

(c) Ans.	**Define Interfaces, Services, Packets & Layer.**	**4M**

Interfaces :
In OSI Reference Model, the mechanism for communication between adjacent layers in the model is called an interface. Interface refers to the process by which data is passed between layer N of the model and layer N-1 or layer N+1.

Services: A service is a set of actions that a layer offers to another (higher) layer. A service is what the layer provides to the layer above it through an interface.
A service is a set of primitives (operations) that a layer provides to the layer above it.

Packet :
A packet is a small amount of data sent over a network, such as a LAN or the Internet. Similar to a real-life package, each packet includes a source and destination as well as the content (or data)

Definition 1M each

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		being transferred. When the packets reach their destination, they are reassembled into a single file or other contiguous block of data. A typical packet includes two sections — a header and payload. Information about the packet is stored in the header.	
		Layer : In layered architecture of Network Model, one whole network process is divided into small tasks. Each small task is then assigned to a particular layer which works dedicatedly to process the task only. Every layer does only specific work. In layered communication system, one layer of a host deals with the task done by or to be done by its peer layer at the same level on the remote host. The task is either initiated by layer at the lowest level or at the top most level.	
(d)		**Give class & subnet address for following IP address:** **(i) 191.168.0.1** **(ii) 221.45.14.68** **(iii) 245.32.14.24** **(iv) 10.145.14.68**	**4M**
	Ans.	 	*For each address ½M for correct Class and ½M for subnet address*
(e) **Ans.**		**Describe working of Nos. State its salient features.** **Working of NOS :** A network operating system (NOS) is a computer operating system (OS) that is designed primarily to support workstations, personal computers and, in some instances, older terminals that are connected on a local area network (LAN). The software behind a NOS allows multiple devices within a network to communicate and share resources with each other. The composition of hardware that typically uses a NOS includes a number of personal computers, a printer, a server and file server with a local network that connects them together. The role of the NOS is to	**4M** *Description 2M*

Sr. No.	IP Address	Class	Subnet address
1	191.168.0.1	Class B	191.168.0.0
2	221.45.14.68	Class C	221.45.14.0
3	245.32.14.24	Class E	Reserved
4	10.145.14.68	Class A	10.0.0.0

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| | | then provide basic network services and features that support multiple input requests simultaneously in a multiuser environment.

Types of network operating systems
There are two basic types of network operating systems, the peer-to-peer NOS and the client/server NOS:

Features of network operating systems
Features of network operating systems are typically associated with user administration, system maintenance and resource management functionality.
This includes:

• Basic support for operating systems like protocol and processor support, hardware detection and multiprocessing.
• Printer and application sharing.
• Common file system and database sharing.
• Network security capabilities such as user authentication and access control.
• Directory Services
• Backup and web services.
• Internetworking of various resources connected in the network
• Providing access to remote printers, managing which users are using which printers when, managing how print jobs are queued, and recognizing when devices aren't available to the network.
• Enabling and managing access to files on remote systems, and determining who can access what—and who can't.
• Granting access to remote applications and resources, such as the Internet, and making those resources seem like local resources to the user (the network is ideally transparent to the user).
• Providing routing services, including support for major networking protocols, so that the operating system knows what data to send where.
• Monitoring the system and security, so as to provide proper security against viruses, hackers, and data corruption.
• Providing basic network administration utilities (such as SNMP, or Simple Network Management Protocol), enabling an administrator to perform tasks involving managing network | *Any 2 features 1M each* |

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|			
		resources and users.	
5.	**(a)**	**Attempt any TWO of the following:**	**12**
		Describe working of DNS and SMTP protocols with suitable example.	**6M**
		(Note: Any other diagram showing the DNS concept shall also be considered).	
	Ans.		
		DNS:	
		• The Domain Name System (DNS) is a client/server application that identifies each host on the Internet with a unique user-friendly name.	
		• DNS organizes the name space in a hierarchical structure to decentralize the responsibilities involved in naming.	
		• Each node in the tree has a domain name.	*Working of DNS 2M*
		• A domain is defined as any subtree of the domain name space.	
		• Domain Name system has top level domains such as .edu, .org, .com etc	
		• The name space information is distributed among DNS servers.	*Example 1M*
		• A domain name server is simply a computer that contains the database and the software of mapping between domain names and IP addresses.	
		Functions of DNS:	
		• Accept request from programs for converting domain names into IP addresses.	
		• Accept request from other DNS servers to convert domain names into IP addresses.	

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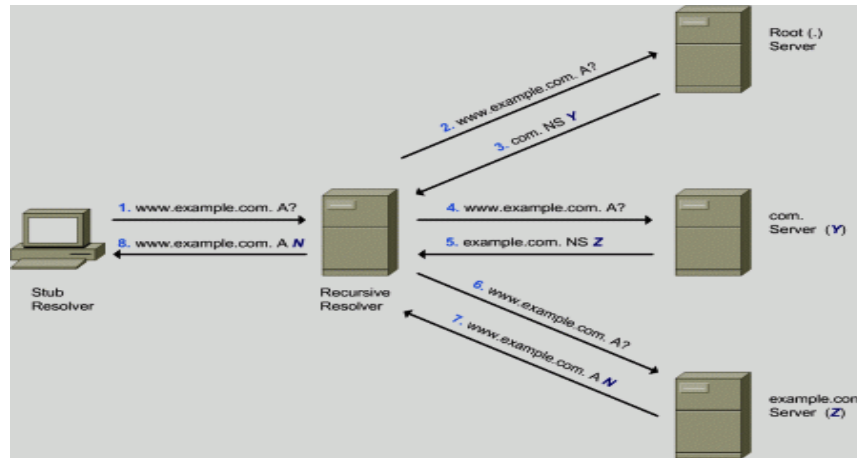
As shown in Diagram Stub receiver wants to access www.example.com; this request is forwarded to Recursive resolver. The Recursive resolver forwards the request to all connected machines with request via its IP address. Server which is connected to specified IP address will respond back with said request.

SMTP:
- SMTP is simple mail transfer protocol.
- It is connection-orientedtext-based protocol in which sender communicates with receiver using a command and supplying data over reliable TCP connection.
- SMTP is standard application layer protocol for delivery of email over TCP/IP network.
- SMTP establish a TCP connection between Sender And port number 25 of receiver.
- It is limited in its ability to queue messages at the receiving end, it is usually used with one of two other protocols, POP3 or IMAP, that let the user save messages in a server mailbox and download them periodically from the server.
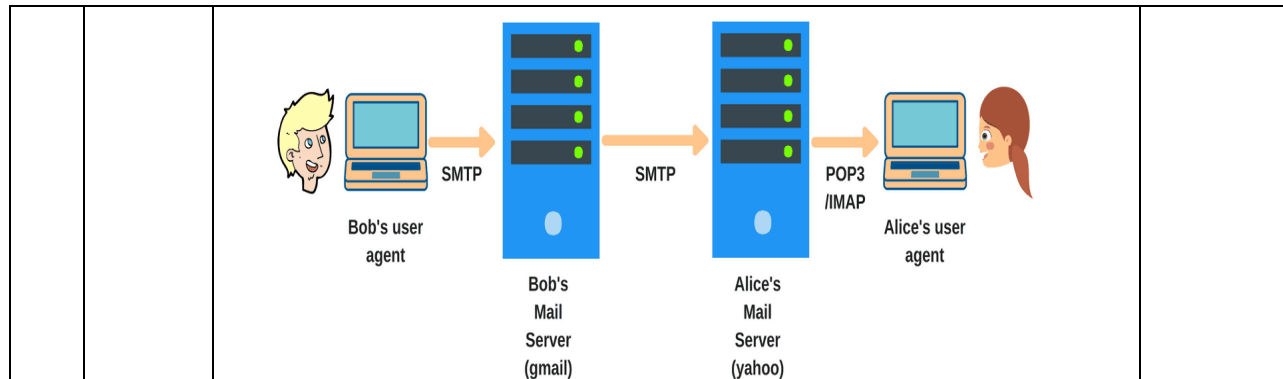
Working of SMTP 2M

Example 1M

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(b)		**Draw & explain structure of IPV6 address. Highlights major enhancement w.r.f. IPV4.**	**6M**
Ans.			

Format of an IPv6 datagram

Version: This four-bit field specifies the version of the IP, i.e., 6 in this   case.
Priority: It defines the priority of the packet concerning traffic congestion.

Diagram 2M

Descript

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		Flow label: The reason for designing this protocol is to facilitate with special controlling for a certain flow of data. **Payload length:** It defines the total length of the IP datagram excepting the base header. **Next header:** It's an eight-bit field describe the header that trails the base header in the datagram. The next header is one of the optional extension headers which IP uses or the header for an upper layer protocol such as UDP or TCP. **Hop limit:** This eight-bit hop limit field assist with the same functions at the TTL field in IPv4. **Source address:** It is a 16 bytes internet address identifies the source of the datagram. **Destination address:** This is 16-byte internet address that generally describes the final destination of the datagram. Major enhancement in IPv6. 1. IPv4 has 32-bit address length whereas IPv6 has 128-bit address length. 2. IPv4 addresses represent the binary numbers in decimals. On the other hand, IPv6 addresses express binary numbers in hexadecimal. 3. IPv6 uses end-to-end fragmentation while IPv4 requires an intermediate router to fragment any datagram that is too large. 4. Header length of IPv4 is 20 bytes. In contrast, header length of IPv6 is 40 bytes. 5. IPv4 uses checksum field in the header format for handling error checking. On the contrary, IPv6 removes the header checksum field. 6. In IPv4, the base header does not contain a field for header length, and 16-bit payload length field replaces it in the IPv6 header. 7. The option fields in IPv4 are employed as extension headers in IPv6. 8. The Time to live field in IPv4 refers to as Hop limit in IPv6. 9. The header length field which is present in IPv4 is eliminated in IPv6 because the length of the header is fixed in this version. 10. IPv4 uses broadcasting to transmit the packets to the destination computers while IPv6 uses multicasting and anycasting. 11. IPv6 provides authentication and encryption, but IPv4 doesn't	*ion 2M* *List of Any 4 Enhanc ement 2M*

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			provide it.		
	(c)		**Differentiate between peer-to-peer, client server and distributed modes of computing. (Any four points).**		**6M**
	Ans.				

BASIS FOR COMPARISON	PEER-TO-PEER	CLIENT-SERVER	DISTRIBUTED MODES
Basic	Clients and server are not distinguished; each node act as client and server.	There is a specific server and specific clients connected to the server.	All nodes are kept at different/distributed location
Service	Each node can request for services and can also provide the services.	The client request for service and server respond with the service.	Each node is capable to accept input and produce result.
Focus	Connectivity.	Sharing the information.	Sharing Resources and performing dedicated task
Data	Each peer has its own data.	The data is stored in a centralized server.	Data is stored at local and over network as well.
Server	As the services are provided by several servers distributed in the peer-to-peer system, a server in not bottlenecked.	When several clients request for the services simultaneously, a server can get bottlenecked.	Each node can act as dedicated server if required.
Expense	Peer-to-peer areless expensive to	The client-server are expensive to	This is very expensive architecture as it

Any four points 1½M each

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| | | implement. | implement. | requires special hardware | |
| | Stability | Peer-toPeer suffers if the number of peers increases in the system. | Client-Server is more stable and scalable. | Extremely stable and scalable. | |

6.		**Attempt any TWO of the following:**	**12**
	(a)	**Enlist steps to share a printer in a network and share a scanner within two computers.**	**6M**
	Ans.	1. **Install the printer drivers:** In order to share a printer, it must be installed on the computer it is connected to. Most modern printers connect via USB and will install automatically when they are connected.	*Steps to share printer 4M*
		2. **Open the Control Panel:** You can access the Control Panel in Windows 7 by clicking the Start menu and selecting Control Panel. In Windows, press ⊞Win+X and select Control Panel from the menu.	
		3. **Open the Network and Sharing Center:** If your Control Panel is in Category view, click "Network and Internet", and then select "Network and Sharing Center". Click on "Network and Internet". If your Control Panel is in Icon view, click the "Network and Sharing Center" icon.	
		4. **Click the "Change advanced sharing settings" link.** This is located in the left navigation pane of the Network and Sharing Center.	
		5. **Expand the profile you need to change.** You will see three different options when you open the "Advanced share settings": Private, Guest or Public, and All Networks. If you are on a Home network, expand the Private section.	
		6. **Enable "File and printer sharing".** Toggle this on to allow other devices to connect to your printer. This will also allow you to share files and folders with other computers on the network.	
		7. **Toggle the password protection.** You can decide whether or not you want to enable password protection for your printer. If it is turned on, only users who have a user account on your computer will be able to access the printer. You can toggle password	

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		protection in the "All Networks" section. 8. **Share the printer.** Now that file and printer sharing has been turned on, you will need to share the printer itself. To do this, go back to the Control Panel and open the Devices and Printers option. Right-click on the printer you want to share and click "Printer properties". Click the Sharing tab, and then check the "Share this printer" box. **Sharing Scanner within two machine:** 1. Open the Start menu and select "Control Panel." 2. Type "network" in the search box 3. Find the scanner in the list of devices, right-click it, then select "Install." 4. Follow the on-screen instructions to finish adding the scanner.	*Steps to share scanner 2M*
(b) **Ans.**	**Elaborate the procedure to divide networks into subnets. Divide given network address in four equal part to hold maximum 50 devices in each subnet.** **IP address 192.168.14.14/25** *(Note: The problem is solved considering the given address as Host address with class C type and 2 bits considered for subnetting. Any other correct solution shall be considered).* 1. Convert to binary: Convert given IP address and Subnet mask into binary equivalent values. 2. Calculate the subnet address: To calculate the subnet address perform a bit-wise AND operation (1 .1=1, 1 . 0 or 0 . 1 =0, 0 . 0=0) on the host IP address and subnet mask. The result is the subnet address in which the host is situated. 3. Find host range.The Subnet address is identified by all 0 bits in the Host part of the address. The first host within the subnet is identified by all 0s and a 1. The last host is identified by all 1s and a 0. The broadcast address is the all 1s. 4. Calculate the total number of subnets and the hosts per subnet. Knowing the number of Subnet and Host bits we can now calculate the total number of possible subnets and the total number of hosts per subnet. We assume in our calculations that all-zeros and all-ones subnets can be used. Step 1: <table><tr><td>IP Address (Decimal)</td><td>192.168.14.14</td></tr><tr><td>IP Address (Binary)</td><td>11000000 .10101000 .00001110</td></tr></table>	**6M** *Procedure to divide network 3M*

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	.00001110
Subnet Mask (Decimal)	255. 255. 255.192
Subnet Mask (Binary)	11111111 . 11111111. 11111111. 10000000

Division of given network 3M

Since we need 4 subnetworks subnet mask of 25 will not work because with subnet mask of 25 one can divide network in two parts. So we borrow a bit from host bit.

Step 2:

IP Address (Decimal)	192.168.14.14			
IP Address (Binary_	11000000 .	10101000.	00001110.	00001110
Subnet Mask (Binary)	11111111	11111111	11111111	11000000
Subnet Address (Binary)	11000000	10101000	00001110	00000000
Subnet Address (Decimal)	192.168.14.0			

Step 3:
We know already that for subnetting this Class C address we have borrowed 2 bits from the Host field. These 2 bits are used to identify the subnets. The remaining 6 bits are used for defining hosts within a particular subnet.

Step 4:

Network Address	Usable Host Range	Broadcast Address:
192.168.14.0	192.168.14.1 - 192.168.14.62	192.168.14.63
192.168.14.64	192.168.14.65 - 192.168.14.126	192.168.14.127
192.168.14.128	192.168.14.129 -	192.168.14.191

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	192.168.14.190	
192.168.14.192	192.168.14.193 - 192.168.14.254	192.168.14.255

Since we want 50 in each subnetwork we can adjust it as follows.

Network Address	Usable Host Range	Broadcast Address:
192.168.14.0	192.168.14.1 - 192.168.14.50	192.168.14.63
192.168.14.64	192.168.14.65 - 192.168.14.114	192.168.14.127
192.168.14.128	192.168.14.129 - 192.168.14.178	192.168.14.191
192.168.14.192	192.168.14.193 - 192.168.14.242	192.168.14.255

(c)   **Design a network with 15 host divided into 3 equal size sub-networks each with different network topology. i.e. bus, star and ring. Connect these sub-networks with suitable network device. Specify IP address to each sub-network with its Broadcast and Network address.**
(Note: Any other Class of IP address with different set of subnets shall be considered).

Ans.   <u>List of available IP Address, Broadcast and Network Address:</u>

Name of Topology	Network Address	Broadcast Address:	Usable Host Range
BUS	192.168.14.0	192.168.14.63	192.168.14.1 - 192.168.14.5
RING	192.168.14.64	192.168.14.127	192.168.14.65 - 192.168.14.69
STAR	192.168.14.128	192.168.14.191	192.168.14.129 - 192.168.14.133

6M

List of Broadcast and Network address for 3 networks 1M each

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192.168.14.1
to
192.168.14.5

192.168.14.65
to
192.168.14.69

192.168.14.129
to
192.168.14.133

Gateway/Router

Design of Network 3M