# DATA COMMUNICATION AND NETWORKING QUESTIONS AND ANSWERS

**Q1** A. **What are the various types of connecting devices?**

ANS; Hub, Repeater, Bridge, Switch, Router, Gateways.

B. **What are the responsibilities of the Data Link Layer?**

ANS: 1. Data link layer is responsible for error detection and correction.

2. Responsible for Error control.

C. **What are the responsibilities of the Transport Layer?**

ANS: 1. Transport layer does segmentation.

2.It ensures that data must be received in the same sequence in which it was sent.

D. **Give two comparisons connectionless service & connection-oriented service**.

ANS:**1.** Connectionless service involves the creation and termination of data between two or more devices.

2. It provide connection and termination process for transferring the data over a network.

1. connection-oriented service is used to create an end to end connection between the sender and the receiver before transmitting the data over the same networks.

2. In connection-oriented service, packets are transmitted to the receiver in the same order the sender has sent them.

E. **Define the following terms**: Node, Router and Gateway

ANS: **Node:** Is **a connection point inside a network that can receive, send, create, or store data**.

**Router: Is** a particular type of device used to connect two or more subnets that cannot be similar.

**Gateway**: Is a network device that forms a passage between two networks operating with different transmission protocols.

**F. Name the different types of Computer networks.**

ANS:1. Personal Area Network

2. Local Area Network

3. Metropolitan Area Network

4. Wide Area Network

G. **Write one difference between Telnet and FTP**

ANS: TELNET is used to access a device through its remote log-in features. FTP is used to transfer files from one computer to another,

H. **Mention the difference types of Network topology**.

ANS: Mesh Topology

Star Topology

Bus Topology

Ring Topology

Hybrid Topology

Tree topology

**1 List the advantages of computer network**.

ANS: It enhances communication and availability of information**.**

It makes file sharing easier.

It is highly flexible.

It boosts storage capacity.

Faster Problem solving

Security through Authorization

**List the various Network services**

ANS: Directory Services

File Services

Communication Services
Application **Services**

Q2. (MCQ)

1.Which of the following items is not used in Local Area Networks (LANs)?

A. Computer Modem

B. Cable

C. Modem

D. Interface card

2. Which of the following is not a network device?

A. Router

B. Modem

C. Bridge

D. Switch

3. A device operating at the physical layer is called a

A. Bridge

B. Router

C. Repeater

D. All of these

4. Encryption and decryption are the function of

A. Session layer

B. Presentation layer

C. Transport layer

D. None of the above

5. How many layers are in the TCP/IP model?

A. 4 layers

B. 5 layers

C. 7 layers

D. 8 layers

6. An alternate name for the completely interconnected network topology is

A. Mesh

B. Star

C. Tree

D. Ring

7. Hub is associated with_____ network.

A. Bus

B. Star

C. Ring

D. Mesh

8. When connecting to a router that has the IP address 192.168.1.100 on a standard, default Class C network using the subnet mask 255.255.255.0, which of the following is a valid IP address for the network adapter?

A. 192.168.0.1

B. 192.168.1.1

C. 192.168.100.1

D. 192.168.1.100

9. A manager's computer cannot connect to the Internet. Examine the following ipconfig results and select the best answer as to why this has occurred.

IPv4 Address. . . . . ..: 10.254.254.1

Subnet Mask . . . . . ... : 255.255.255.0

Default Gateway . . . . . .: 10.254.254.255

A. The subnet mask is incorrect.

B. The IP address is incorrect.

C. The default gateway is incorrect.

D. The subnet mask and the IP address are incorrect

10. A device has been installed that has two IP addresses. One, 64.51.216.27, is displayed to the Internet. The other, 192.168.50.254, communicates with the LAN. Which type of technology has been implemented

A. Subnetting

B. IPv6

C. Network Address Translation

D. Class A public IP address

**Q3.**

A). Match the following to one or more layers of the OSI model:

a. Reliable process-to-process message delivery. ANS: **Transport Layer**

b. Route selection. ANS: **Session Layer**

c. **Defines frames**.: ***Frame*** is a unit of data. A ***frame*** works to help identify data packets used in ***networking*** and telecommunications structures.

d. Provides user services such as e-mail and file transfer. ANS: **Presentation Layer, Application Layer.**

e. Transmission of bit stream across physical medium. ANS: **Physical Layer**.

B). Match the following to one or more layers of the OSI model:

a. Format and code conversion services ANS: **Presentation Layer.**

b. Establishes, manages, and terminates sessions. ANS: **Session Layer.**

c. Ensures reliable transmission of data. ANS: **Transport Layer.**

d. Log-in and log-out procedures. ANS**: Session Layer**

e. Provides independence from differences in data representation. ANS**: Presentation Layer.**

C). Find the netid and the hostid of the following IP addresses.

a. 114.34.2.8

b. 132.56.8.6

c. 208.34.54.12

ANS:

a. netid: **114** and hostid: **34.2.8**

b. netid: **132.56** and hostid: **8.6**

c. netid: **208.34.54** and hostid: **12**

D). A block of addresses is granted to a small organization. We know that one of the addresses is 205.16.37.39/28.

a) What is the first address in the block?

b) Find the last address for the block

ANS: a) **First address is:** 11001101 00010000 00100101 00100000

b) **Last address is:** 11001101 00010000 00100101 00101111

E). An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the first and last addresses in subnet 1.

d. Find the first and last addresses in subnet 500

ANS: a. Mask = /17

b. Number of addresses in each subnet.is 32.768

c. The first address is 16.0.0.0 and the last address is 16.0.127.255 in subnet 1.

d. The first address is 16.249.128.0 and the last address is 16.249.255.255 in subnet 500

**Q4 a) C a t e g o r i z e the following IP address into private and public address**

8.6.8.3, 10.0.1.2, 10.2.2.1, 176.16.0.1, 172.16.32.4, 192.240.24.2, 192.220.14.3, 176.19.4, 192.168.3.2, 192.168.8.8, 4.5.6.2, 114.34.2.8, 129.14.6.8, 208.34.54.12, 23.56.77.32, 200.17.21.128, 17.34.16.0, 180.34.64.64

| ANS: **PRIVATE IP ADDRESS** | **PUBLIC IP ADDRESS** |
|---|---|
| 10.0.1.2, | 8.6.8.3, |
| 10.2.2.1, | 176.16.0.1, |
| 172.16.32.4, | 176.19.4, |
| 192.240.24.2, | 4.5.6.2, |
| 192.220.14.3, | 114.34.2.8, |
| 192.169.3.2, | 129.14.6.8, |
| 192.168.8.8 | 208.34.54.12, |
| | 23.56.77.32, |
| | 200.17.21.128, |
| | 17.34.16.0, |
| | 180.34.64.64 |

E

b) A host was given the IP addresses **192.168.3.219 /27**. Consider this address and indicate:

(i) The network address to which the host belongs.
(ii) The network broadcast address to which the host belongs.
(iii) The total number of hosts available in the network

ANS(i)The network address to which the host belongs is 192.168.3.192

(ii) The network broadcast address to which the host belongs is 192.168.3.223

(iii)The total number of hosts available in the network is 25-2 or 30.

## c) **What are the reasons or benefits for subnetting**?

ANS:1. Subnetting divides broadcast domains, meaning that traffic is router.

2.A subnet mask ensures that traffic remains within its designated subnet.

3.With different subnets within your larger network, you can be more aware of route maps.

4.Subnetting help you to identify potential threats

**Q5**

**A. Identify the five components of a data communications system.**

*1*. **Message:**

The message is the information (data) to be communicated. Popular forms of information include text, numbers, pictures, audio, and video.

*2*. **Sender:**

The sender is the device that sends the data message. It can be a computer, workstation, telephone handset, video camera, and so on.

*3*. **Receiver:**

The receiver is the device that receives the message. It can be a computer, workstation, telephone handset, television, and so on.

*4.* **Transmission medium***:*

The transmission medium is the physical path by which a message travels from sender to receiver. Some examples include twisted-pair wire, coaxial cable, fiber-optic cable, and radio waves.

*5*. **Protocol:**

A protocol is a set of rules that govern data communications. It represents an agreement between the communicating devices.

B. **What are the three criteria necessary for an effective and efficient network?**

1. Performance
2. Reliability
3. Security

C**. Give the advantages and disadvantages of any four topologies.**

**ANS: Advantages of Mesh topology**

1. Mesh topology is reliable and robust.
2. Fault detection is easy.

**Disadvantages of Mesh topology**

1. Cost of implementation and maintenance is higher.
2. Configuration and installation are difficult.

**Advantages of Star topology**

1.Easier to install

2.Hub can be easily replaced

**Disadvantages of Star topology**

1.Installation cost is high.

2.Failure of the hub will stop the transmission.

**Advantages of bus topology**

1.Take less time to set up.

2.Easy to expand.

**Disadvantages of bus topology**

1.Difficultly in fault detection.

2.No bi-directional communication

**Advantages of Ring Topology**

1.Easy to install.

2.Cheap to set up and expand

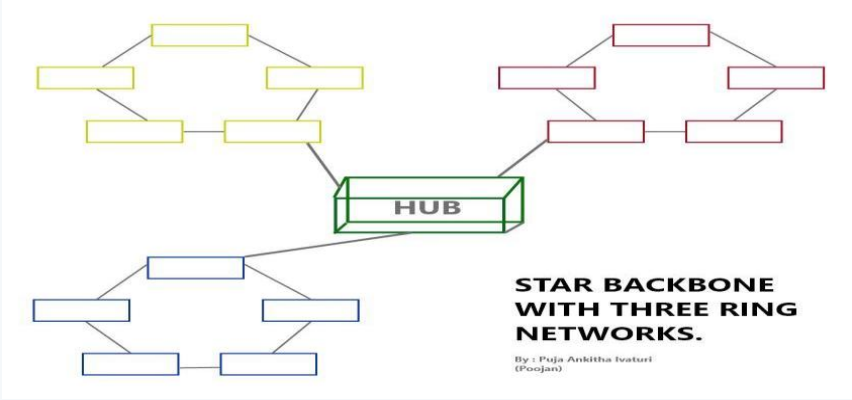
**Disadvantages of Ring Topology**

1.Difficult to troubleshoot.

2.Failure in a single computer can lead to disturbing the whole network

D **Draw a hybrid topology with a star backbone and three ring networks**

**ANS: DIAGRAM OF A HYBIRD TOPOLOGY WITH A STAR BACKBONE**




Q6

A **What is the difference in the service offered to applications by the TCP and UDP protocols**?

ANS: 1. The speed for TCP is very slow whereas UDP is very fast as error recovery is not permeated.

2.TCP provides error checking and recovery mechanism whereas UDP does not provide congestion control mechanism

3.TCP provides end-to-end communication whereas UDP is good for data flowing in one direction.

4.TCP connection-oriented protocol whereas UDP is a connectionless protocol.

5.TCP Header size is 20 bytes whereas UDP size is 8 bytes.

B. **For each of the following applications determine whether you would use TCP or UDP and explain the reasons for your choice.**

i. File transfer

ii. Watching a real time streamed video

iii. Web browsing

iv. A Voice Over IP (VoIP) telephone conversation

ANS: 1. we use TCP because it allows the exchange of data files between computer systems**.**

2. We use UDP because it allows you to talk to people you have invited. Also, it makes sure they stay private,

3.. We TCP because it allows us to bring information resources to the user**.**

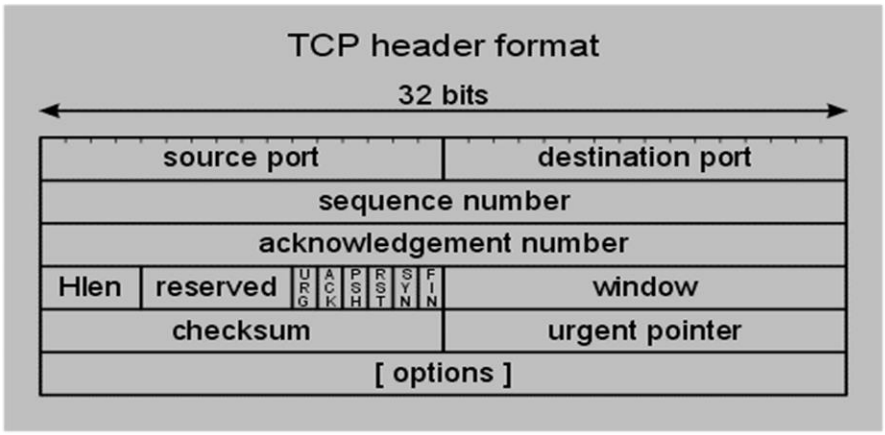
**iv.** We use TCP because it converts voice audio into packets of data can travel through the Internet like any other type of data such as text or pictures.

C. **Both TCP and UDP use port numbers. What are these port numbers used for?**

ANS:1. Port numbers are used to determine what protocol incoming traffic should be directed to.

2. Port numbers allow a single host with a single IP address to run network services.

3. port numbers identifies a distinct service, each host can have 65535 ports per IP address.




D. **Illustrate the TCP datagram and what are the important information contained in the TCP header**?

ANS: TCP DATAGRAM

## Important information contained in the TCP:

Source port(16-bits)
Destination port(16-bits)
Sequence number(32-bits)
Acknowledgment number(32-bits)
Data offset(4-bits)
Reserved(3-bits)
Flags (1-bit each)

Q7 A. The OSI Reference Model defines seven protocol layers, each of which is responsible for a specific range of functions. By considering this model, explain the main functions performed and devices operating at:

1.The Physical layer
2.The Data Link layer
3.The Application layer

**FUNCTIONS OF PHYSICAL LAYER**

ANS: 1. It is responsible for sending data bits over the communication media.

2. It is also responsible for defining data rates

3. It decides the communication mode i.e. simple or half duplex or full duplex

**DEVICES:** Repeaters, Hubs, Cables and Connectors.

**FUNCTIONS OF DATA LINK LAYER**

ANS: 1. Data link layer converts Packets into frames.

2.Adds the physical address of the sender in frames.

3. Responsible for Error control

**DEVICES:** bridges and switches.

**FUNCTIONS OF APPLICATION LAYER**

ANS: 1. It allows users to log on to a remote host.

2.This layer provides various e-mail services

3. It is responsible for converting a domain name

**DEVICES**: Gateways and Firewalls, phones.

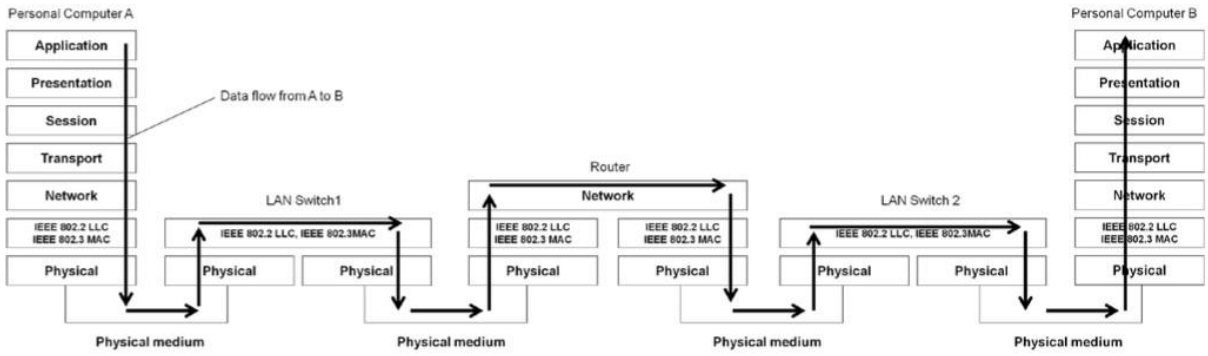
B. Give the names of the seven layers of the ISO Reference Model and the names of the four corresponding layers in the TCP/IP protocol stack, showing the correspondence explicitly. Give one example of a device on a network that is required to operate all seven layers of the OSI Reference Model.

| ANS: **OSI MODELS** | **TCP/IP MODELS** |
|---|---|
| 1.Application Layer | Application Layer |
| 2.Presentation Layer | |
| 3.Session Layer | |
| 4.Transport Layer | Transport Layer |
| 5.Network Layer | Internet Layer |
| 6.Data Link Layer | Link Layer |
| 7.Physical Layer | |

Example of a device on a network that required to operate all seven layers of the OSI reference is: DESKTOP

c) Figure 3 shows part of a network in which two personal computers A and B, are each connected to a switch (LAN switch 1 and 2) which are themselves interconnected by a router. Consider the transmission of data from personal computer A to B and produce a OSI l layer diagram that clearly shows how data passes through all of the layers of the ISO Reference model that are used within the PCs, switches and router.

ANS:




Q8.a) In classifying addressing, the IP address space is divided into 5 classes. Indicate the classes of each of the following address expressed in binary. Indicate how the class was identified.

(i) 11110111 11110011 10000111 11011101
(ii) 10101111 11000000 11110000 00011101
(iii)11011111 10110000 00011111 01011101
(iv)11101111 11110111 11000111 00011101

ANS: (i) Class E starts in 1111
(ii) Class B starts in 10
(iii)Class C Starts in 110
(iv)Class D starts in 1110

CLASSES OF IP ADDRESS

There are five classes of IP addresses which are: class A, B, C, D, and E. Each class has a range of valid IP addresses.

**0 = Class A**

**1 - 0 = Class B**

**1 - 1 - 0 = Class C**

**1 - 1 - 1 - 0 = Class D**

**1 - 1 - 1 = Class E**

**Class A** is from **0 to 127**

**Class B** is from **128 to 191**

**Class C** is from **192 to 223**

**Class D** is from **224 to 239**

**Class E** is from **240 to 255**