

1. a) Write about Physical Layer.

b) What is the Transmission media?
Explain.

c) What is Multiplexing? Define (channel capacity).

2. a) What is Twisted Pair cable?

Explain.

b) What is Power Lines? Explain briefly.

c) Describe the Fiber optics.

3. a) What is wireless Transmission?

Explain.

b) Briefly Explain the Radio
Transmission.

c) What is Infrared Transmission?

Define Microwave Transmission.

4. a) What is Time Division Multiplexing? Explain.

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Explain briefly.

5. a) Define the Transport Layer

briefly.

b) Write Transport Layer Functions.

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6. a) What is Error Control and Flow Control?

b) Write the Features of TCP.

c) What is the Crash Recovery?

Explain briefly.

7. a) What is Bandwidth Management?

Explain.

b) Write three algorithms for congestion control.

c) Which types of timer TCP use?

8. a) Discuss the Requirement of UDP.

b) Write the Features of UDP.

c) What is Multiplexing? Write VDP application.

MUX is connected with switch

① Different demand will be handled

selected multiplex

Same port will be used for different

Demand
will be satisfied
with switch

selected port

Free slot will be used for other

Free slot will be used for other

slot is connected with switch

Ans to the Q.No ~ 01

a) Write about Physical layer.

Answer: Physical layer in the OSI model plays the role of interacting with actual hardware and signaling mechanism. Physical layer is the only layer of OSI network model which actually deals with the physical connectivity of two different stations. This layer defines the hardware equipment, cabling, wiring, frequencies, pulses used to represent binary signals etc. Physical layer provides its services to Data link layer. Data-link layer hands over frames to Physical layer. Physical layer converts them to electrical pulses which represent the binary data.

b) What is the Transmission Media?

Explain.

Answer: The media over which the information between two computer systems is sent, called transmission media. Transmission media comes in two forms:-

1. Guided Media: All communication wires/cables are guided media such as UTP, coaxial cables and fiber optics. In this media the sender and receiver are directly connected and the information is send through it.

2. Unguided Media: Wireless or open air space is said to be unguided media. Because there is no connectivity between the sender and receiver.

c) What is Multiplexing? Define channel capacity.

Answer : Multiplexing is a technique to mix and send multiple data streams over a signals medium. This technique requires system hardware called multiplexing the streams and sending on a medium.

The speed of transmission of information is said to be channel capacity. we count it as data rate in digital world. It depends on numerous factors such as:-

- Bandwidth: The Physical limitation of underlying media.
- Error-rate: Incorrect reception of information because of noise.
- Encoding: The number of levels used for signaling.

Ans to the Q. NO ~ 02

a) What is Twisted Pair Cable? Explain.

Answer: A twisted pair cable is made of two plastic insulated copper wires twisted together to form a single media. Out of these two wires, only one carries actual signal and another is used for ground reference. The twists between wires are helpful in reducing noise and crosstalk.

There are two types of twisted pair cables:

1. Shielded Twisted Pair (STP) cables.

2. Unshielded Twisted Pair (UTP) cables.

b) What is power Lines ? Explain briefly.

Answer: Power Line communication (PLC) is Layer-1 (Physical layer) technology which uses Power cables to transmit data signals. In PLC modulated data is sent over the data cables. The receiver on the other end de-modulates and interprets the data. Because Power lines are widely deployed, PLC can make all powered devices controlled and monitored. PLC works in half-duplex.

There are two types of PLC:-

- Narrow band PLC
- Broad band PLC

c) Describe the Fiber Optics.

Answer: fiber optics works on the properties of light. When light ray hits at critical angle it tends to refracts at 90 degree. This property has been used in fiber optics. The core of fiber optic cable is made of high quality glass or plastic. From one end of it light is emitted, it travels through it and at the other end light detector detects light stream and convert it to electric data. Fiber optic provides the highest mode of speed. It comes in two modes, one is single mode fiber and second is multimode fiber.

Ans to the Q.No 03

a) What is Wireless Transmission? Explain.

Answer: Wireless transmission is a form of unguided media. Wireless communication involves no physical link established between two or more devices, communicating wireless. Wireless signals are spread over in the air and are received and interpreted by appropriate antennas. When an antenna is attached to electrical circuit of a computer or wireless device, it converts digital data into wireless signals and spread over within its frequency range. The receptor on the other end receives these signals and converts them back to digital data.

b) Briefly Explain the Radio Transmission.

Answer: Radio frequency is easier to generate and because of its large wavelength from 1mm - 100000 km and have frequency range from 3Hz to 300 GHz. Radio frequencies are sub-divided into six bands. Radio waves at lower frequencies can travel through walls whereas higher RF can travel in straight line and bounce-back. The power of low frequency waves decreases sharply as they cover long distance. High frequency radio waves have more power. Lower frequencies such as VLF, LF, MF bands can travel on the earth upto 1000 Kilometers over the earth surfaces.

c) What is Infrared Transmission? Define Micro-wave Transmission.

Answer: Infrared wave lies in between visible light spectrum and microwaves. It has wavelength of 700-nm to 1-mm and frequency range from 300-GHz to 430-THz.

Electromagnetic waves above 100 MHz tend to travel in a straight line and signals over them can be sent by beaming those waves towards one particular station. Because microwaves travels in straight lines, both sender and receiver must be aligned to be strictly in line of sight.

Microwaves can have wavelength ranging from 1-mm - 1-meter and frequency ranging from 300 MHz to 300 GHz.

→ Part (a) Ans to the Q.No. 04 ↗

a) What is Time Division Multiplexing? Explain.

Answer: Time Division Multiplexing is applied primarily on digital signals but can be applied on analog signals as well. In TDM the shared channel is divided among its users by means of time slot. Each user can transmit data within the provided time slot only.

Digital signals are divided in frames equivalent to time slot, frame of an optimal size which can be transmitted in given time slot. TDM works in synchronized mode. Both ends i.e. Multiplexer and De-multiplexer are timely synchronized and both switch to next channel.

b) Define the Network Switching.

Answer: Switching is process to forward packets coming in from one port to a port leading towards the destination. When data comes on a port it is called ingress and when data leaves a port or goes out it is called egress. A communication system may include number of switches and nodes. At broad level, switching can divided into two major factors :-

1. Connectionless : The data is forwarded on behalf of forwarding tables.

2. Connection Oriented : Before switching data to be forwarded to destination, there is no need to pre-established circuit along the path.

c) What is Circuit switching? Explain briefly.

Answer: When two nodes communicate with each other over a dedicated communication path, it is called circuit switching. There is a need of pre-specified route from which data will travel and no other data is permitted. In circuit switching to transfer the data circuit must be established so that the data transfer can take place.

Circuits can be permanent or temporary. Applications which use circuit switching may have to go through three phases:-

1. Establish the circuit.
2. Transfer the data.
3. Disconnect the circuit.

Ans to the Q.NO~05

a) Define the Transport layer briefly.

Answer: The Transport layer in OSI Model is recognized as layer-4. All modules and procedures pertaining to transportation of data and data stream are categorized into this layer. As all other layers, this layer communicates with its peer Transport layer of the remote host. The Transport layer offers Peer-to-Peer and end-to-end connection between two processes on remote hosts. Transport layer takes data from upper layers and then breaks it into smaller size segments, numbers each byte, hands over to lower layers for delivery.

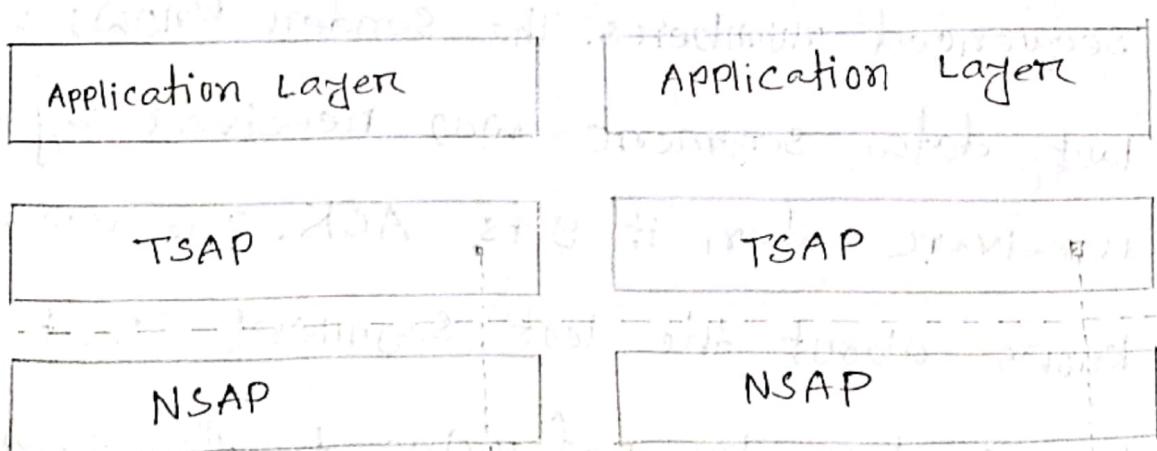
b) Write Transport Layer functions.

Answer:

- This layer is the first one which breaks the information data, supplied by application layer into smaller units called segments. It numbers every byte in the segment and maintains their accounting.
- This layer ensures that data must be received in the same sequence in which it was sent.
- This layer provides end to end delivery of data between host which may or may not be belong to the same subnet.
- All Server Processes intend to communicate over the network, are equipped with TSAPs also known as Port number.

c) Explain End-to-End Communication.

Answer: A process on one host identifies its peer host on remote network by means of TSAPs also known as port numbers. TSAPs are very well defined and a process which is trying to communicate with its peer knows this in advance.



For example, when a DHCP clients want to communicate to remote DHCP server, it always request on Port number 67.

Ans to the Ques. NO-06

a) What is Error Control and Flow Control?

Answer: TCP uses Port numbers to know what application process it needs to hand-over the data segment. Along with that, it uses sequence numbers to synchronize itself with the remote host. All data segments are sent and received with sequenced numbers. The sender knows which last data segment was received by the receiver when it gets ACK. The receiver knows about the last segment sent by the sender by referring to the sequence number of recently received packet. If two packet segments arrive with the same sequence number, the TCP timestamp value is compared to make decision.

b) Write the features of TCP.

Answer:

- TCP ensures that the data reaches intended destination in the same order it was sent.
- TCP is connection oriented. TCP requires that connection between two remote points be established before sending actual data.
- TCP provides error-checking and recovery mechanism.
- TCP provides end to end communication.
- TCP provides flow control and quality of service.
- TCP operates client/server Point to Point mode.
- TCP provides full duplex service.

C) What is the Crash Recovery? Explain briefly.

Answer: TCP is very reliable protocol.

It provides sequence numbers to each of bytes sent in a segment. It provides the feedback mechanism i.e. when a host receives a packet it is bound to ACK that packet having the next sequence

number expected. When a TCP server crashes mid-way communication and re-starts its process it sends TPDU broadcast to all its hosts. The hosts can then send the last data segment which was never acknowledged and carry onwards.

Ans. to the Q.NO-07

a) What is Bandwidth Management? Explain.

Answer: TCP uses the concept of window size to accommodate the need of Bandwidth management. Window size tells the sender at the remote end, the number of data byte segments the receiver at this end can receive. TCP uses slow start phase by using window size 1 and increases the window size exponentially after each successful communication, for example, the client uses windows size 2 and sends 2 bytes of data. When the acknowledgement of this segment received the windows size is doubled to 4 and next send the segment sent will be 4 data bytes long.

b) Write three algorithms for congestion control.

Answer: When large amount of data is fed to system which is not capable of handling it, congestion occurs. TCP controls congestion by means of window mechanism. TCP sets a window size telling the other end how much data segment to send. TCP may use three algorithms for congestion control:-

1. Additive increase, multiplicative decrease
2. Slow Start
3. Timeout React

c) Which types of timer TCP use?

Answer :-

- Keep-alive timer :-

- This timer is used to check the integrity and validity of a connection.

- When keep-alive time expires, the host sends a probe to check if the connection still exists.

- Retransmission timer :-

- This timer maintains stateful session of data sent.

- Persist timer :-

- Persist timer helps to avoid deadlocks in communication.

- Timed-Wait :-

- Timed-out can be a maximum of 240s.

Ans to the Q.No~08

a) Discuss the Requirement of UDP.

Answer: A question may arise, why do we need an unreliable protocol to transport the data. We deploy UDP where the acknowledgement packets share significant amount of bandwidth along with the actual data. For example, in case of video streaming thousands of packets are forwarded towards its users. Acknowledging all the packets is troublesome and may contain huge amount of bandwidth wastage. The best delivery mechanism of underlying IP protocol ensures best efforts to deliver its packets.

b) Write the features of UDP.

Answer:

- UDP is used to when acknowledgement of data does not hold any significance.
- UDP is good Protocol for data flowing in one direction.
- UDP is simple and suitable for query based communications.
- UDP is not connection oriented.
- UDP is stateless.
- UDP does not provide congestion control mechanism.
- UDP does not guarantee ordered delivery of data.

c) What is Multiplexing? Write UDP application.

Answer: The technique to combine two or more data streams in one session is called multiplexing.

Here are few applications where UDP is used to transmit data.

- Domain Name Service
- Simple Network Management Protocol
- Trivial File Transfer Protocol
- Routing Information Protocol
- Kerberos.