SET-B
Answer all the Questions
(2 x 25 = 50 Marks)

Instructions: Answer the questions

Ql. No	Question	Marks
1	Let's say that someone uses a laptop that is connected to a router for browsing a website. The laptop sends the request of the site in a packet to the router, which passes it along to the web. But first, the router changes the outgoing IP address from a private local address toa public address. If the packet keeps a private address, the receiving server won't know where to send the information back. For both economic and security purposes, describe the process of assigning a unique public IP address so the information will make it back to the laptop using the router's public address, not the laptop's private one. NAT is implemented on a network that requires few addresses to accessthe Global Internet. A routing table is created on the router that containsa list of 'Inside' local address mapped to 'inside' global (legal IP) address. Let's say that someone uses a laptop that is connected to a router for browsing a website. The laptop sends the request of the site in a packetto the router, which passes it along to the web. But first, the router changes the outgoing IP address from a private local address to a publicaddress. If the packet keeps a private address, the receiving server won't know where to send the information back. For both economic and security purposes, describe the process of assigning a unique public IP address so the information will make it back to the laptop using the router's public address, not the laptop's private one. NAT is implemented on a network that requires few addresses to accessthe Global Internet. A routing table is created on the router that containsa list of 'Inside' local address mapped to 'inside' global (legal IP) address. In the example, the inside host wants to communicate with the outsideworld and the destination web server. Then it will send a data packet tothe NAT-enabled gateway router of the network for further communication.The inside station sends the first packet to the router which is checked for address match in the NAT table. The gateway router learns the source IP address of the packet and looks up in the table whether the packet meets the condition for translation. The gateway router maintains an access control list (ACL) which locates the	15

	authenticated hosts for internal network translation purposes.The insidestation connects to the outside station. Thus it will translate the inside local IP address into an inside global IPaddress. It will then saves this translation in the NAT table and the gateway router will route the packet to the destination. When the web server of the Internet reverts back to the request, the packet will revert back to the global IP address of the router. Now the gateway router will again look up in the NAT table to find outthe translated IP address corresponding to the global address. It then translates it to the inside local address and then the data packet is delivered to the host.This mapping is stored as a simple entry in the NAT table. If a match is not found in the table then the packet is discarded. If no match is found, the router refers to the available pool of outside addresses to translate the inside address to an outside address. The outside station receives the packet and replies to the outsideaddresses given by the NAT table.The router checks the table for inside to outside address mapping and forwards the packet to the inside station.The inside station receives the packet.	
	Show abbreviations for the following addresses:a. 0000:FFFF:FFFF:0000:0000:0000:0000:0000 b. 1234:2346:3456:0000:0000:0000:0000:FFFF c. 0000:0001:0000:0000:0000:FFFF:1200:1000 d. 0000:0000:0000:0000:FFFF:FFFF:24.123.12.6 **Solution** a. 0:0:FFFF:: b. 1234:2346::1111 c. 0:1::1200:1000 d. ::FFFF:24.123.12.6	10
	(OR)	
2.	Decompress the following addresses and show the completeunabbreviated IPv6 address: a. ::2222 b. 1111:: c. 0:1:2:: d. B:A:CC::1234:A **Solution** a. 0000:0000:0000:0000:0000:0000:0000:2222 b. 1111:0000:0000:0000:0000:0000:0000:0000 c. 0000:0001:0002:0000:0000:0000:0000:0000 d. 000B:000A:00CC:0000:0000:0000:1234:000A	10
	Consider a host with Ethernet address (F5-A9-23-11-9B-E3) has joined the network. What would be its global unicast address if the global unicast prefix of the organization is 3A21:1216:2165 and thesubnet identifier is A245:1232. **Ans:**	15

Step 1 : Creating a local link address by adding 10 bit prefix (1111 1110 10) and 54 zeros and append its 64 bitinterface ID extracted from the Ethernet address :
FE80 : :F7A9-23FF-FE11-9BE3(by inverting the seventhbit of 1st octet and adding FFFE after the third octet)

Step 2 : On assuming this uniqueness it send the router solicitation message upon receiving the advertisement message it complete the auto configuration process by extracting the global unicast prefix and subnet identifierfrom the message as follows

3A21:1216:2165:A245:1232 and append it to the locallink address

3A21:1216:2165:A245:1232: F7A9-23FF-FE11-9BE3

Consider the code value of next header in IPV6, Identify thetype of extension headers and explain with frame structure.

i. 00000000
Pad1. This option is 1 byte long and is designed for alignment purposes. Some options need to start at a specific bit of the 32-bit word (see the jumbo payload description to come). If an option falls short of this requirement by exactly one byte, Pad1 is added to make up the difference. Pad1 contains neither the option length field nor the option data field. It consistssolely of the option code field with all bits set to 0 (action is 00, the change bit is 0, and type is 00000).
Pad1 can be inserted anywhere in the hop-by-hopoption header

ii. 00000001
PadN. PadN is similar in concept to Pad1. The difference is that PadN is used when 2 or more bytes are needed for alignment. This option consists of 1 byte of option code, 1 byte of the option length, and avariable number of zero padding bytes. The value of the option code is 1 (action is 00, the change bit is 0, and type is 00001). The option length contains the number of padding bytes

iii. 11000010
Jumbo payload. Recall that the length of the payload inthe IP datagram can be a maximum of 65,535 bytes.
However, if for any reason a longer payload is
required, we can use the jumbo payload option to

	define this longer length. The jumbo payload option must always start at a multiple of 4 bytes plus 2 from the beginning of the extension headers. The jumbo payload option starts at the (4n + 2) byte, where n is asmall integer	
3 .	i) Imagine the length of a 10Base5 cable is 2500 meters. If the speed of propagation in a thick coaxial cable is 200,000,000 meters/second: *a.* How long does it take for a bit to travel from the beginning to theend of the network? (3) *b.* Find the maximum time it takes to sense a collision (worst case).(3) a. Distance = Velocity × Time $Time = \frac{Distance}{Velocity} = \frac{2500m}{200{,}000{,}000m/s} = \mathbf{12.5\mu s}$ Therefore, it takes 12.5µs for a bit to travel from beginning to the end of the network. b. Maximum time to sense a collision = 2 × 12.5 μs = **25 μs** ii)The data rate of 10Base5 is 10Mbps. How long does it take to createthe smallest frame? Show your calculations. (4) The smallest frame is 64 bytes or 512 bits.With a data rate of 10 Mbps, we have Tfr = (512 bits) / (10 Mbps) = 51.2 µs This means that the time required to send the smallest frameis the same at the maximum time required to detect the collision.	10
	iii) Identify and describe the special protocol which helps to controland manage the transfer of data over telephone lines. (8) iv) Explain about the layers of PPP? (3) v) Draw a neat diagram of PPP frame format and explain the fields indetail. (4)	15

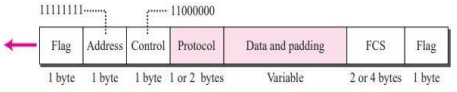
PPP

The telephone line or cable companies provide a physical link, but to control and manage the transfer of data, there is a need for a special protocol. The **Point-to-Point Protocol (PPP)** was designed to respond to this need.

PPP Layers

PPP has only physical and data link layers. No specific protocol is defined for the physical layer by PPP. Instead, it is left to the implementer to use whatever is available. PPP supports any of the protocols recognized by ANSI. At the data link layer, PPP defines the format of a frame and the protocol that are used for controlling the link and transporting user data. The format of a PPP frame is shown in Figure 3.31.

Figure 3.31 *PPP frame*



The descriptions of the fields are as follows:

1. **Flag field.** The flag field identifies the boundaries of a PPP frame. Its value is 01111110.
2. **Address field.** Because PPP is used for a point-to-point connection, it uses the broadcast address used in most LANs, 11111111, to avoid a data link address in the protocol.
3. **Control field.** The control field is assigned the value 11000000 to show that, as in most LANs, the frame has no sequence number; each frame is independent.
4. **Protocol field.** The protocol field defines the type of data being carried in the data field: user data or other information.
5. **Data field.** This field carries either user data or other information.
6. **FCS.** The frame check sequence field is simply a 2-byte or 4-byte CRC used for error detection.

(OR)

4	ATM Switching techniques creates fixed route between the data points before the communication begins and it uses TDM technique totransmit the data. Explain how the connections are established to transmit the data (10) Virtual Connection Connection between two end points is accomplished through transmission paths (TPs), virtual paths (VPs), and virtual circuits (VCs). A transmission path (TP) is the physical connection (wire, cable, satellite, and so on) between an end point and a switch or between two switches. Think of two switches as two cities. A transmission path is the set of all highways that directly connects the two cities. A transmission path is divided into several virtual paths. A virtual path (VP) provides a connection or a set of connections between two switches. Think of a virtual path as a highway that connects two cities. Each highway is a virtual path; the set of all highways is the transmission path. Cell networks are based on virtual circuits (VCs). All cells belonging to a single message follow the same virtualcircuit and remain in their original order until they reach their destination	25

The figure also shows the relationship between a transmission path (a physical connection), virtual paths (a combination of virtual circuits that are bundled together

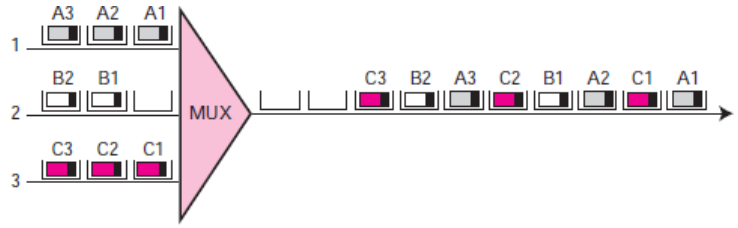
because parts of their paths are the same), and virtualcircuits that logically connect two points together.

In a virtual circuit network, to route data from one end pointto another, the virtual connections need to be identified. Forthis purpose, the designers of ATM created a hierarchical identifier with two levels: a virtual path identifier (VPI) anda virtual circuit identifier (VCI). The VPI defines the specific VP and the VCI defines a particular VC inside theVP. The VPI is the same for all virtual connections that arebundled (logically) into one VP.

Using TDM, each user is assigned a fixed time slot, and no other station can send in that time. Is a station having nothing to transmit when its time slot comes up, the time slot is sent empty and wanted.Explain how the empty time slots are handled by ATM efficiently. (10)

ATM uses asynchronous time-division multiplexing—thatis why it is called Asynchronous Transfer Mode—to multiplex cells coming from different channels. It uses fixed-size slots the size of a cell. ATM multiplexers fill a slot with a cell from any input channel that has a cell; the slot is empty if none of the channels has a cell to send.

The following figure shows how cells from three inputs are multiplexed. At the first tick of the clock, channel 2 has no cell (empty input slot), so the multiplexer fills the slot with a cell from the third channel. When all the cells from all the channels are multiplexed, the output slots areempty.



Basic ATM is asynchronous; slots are available on demand with information identifying the source of the transmission contained in the header of each ATM cell.

Discuss the asymmetric communication technology designed forresidential users and which is not suitable for business. (5)

ADSL The first technology in the set is asymmetric DSL (ADSL). ADSL, like a 56K modem, provides higher speed(bit rate) in the downstream direction (from the Internet to the resident) than in the upstream direction (from the resident to the Internet). That is the reason it is called asymmetric. Unlike the asymmetry in 56K modems, the designers of ADSL specifically divided the available bandwidth of the local loop unevenly for the residential customer. The service is not suitable for business customers who need a large bandwidth in both directions.

Voice. Channel 0 is reserved for voice communication.

❑ Idle. Channels 1 to 5 are not used, to allow a gapbetween voice and data communication.

❑ Upstream data and control. Channels 6 to 30 (25 channels) are used for upstream data transfer and control. One channel is for control, and 24 channels are for data transfer. If there are 24 channels, each using 4 kHz (out of
4.312 kHz available) with 15 bits per Hz, we have 24 × 4000 × 15, or a 1.44-Mbps band width, in the upstreamdirection.

❑ Downstream data and control. Channels 31 to 255 (225channels) are used for downstream data transfer and control. One channel is for control, and 224 channels are for data. If there are 224 channels, we can achieve up to
224 × 4000 × 15, or 13.4 Mbps