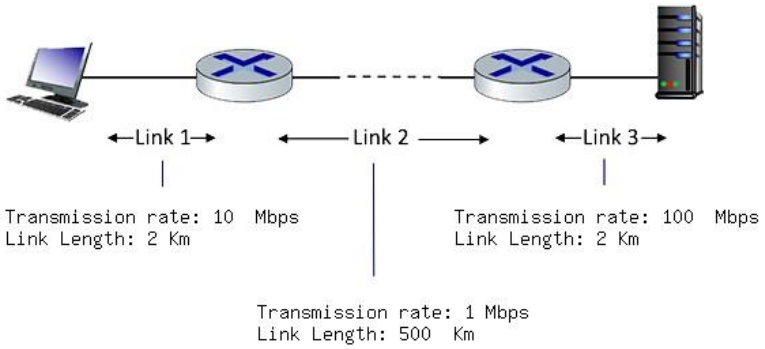
Minor Examination (ISA-1)		
Course Code:	19ECSC302	Course Title: Computer Network-1
Duration	75 Mins	
Max. Marks	40	
Note: Answer any two full questions		

Q.No.	Questions	Marks	CO	BL	PO	PI code
1a	With suitable diagram briefly explain the TCP/IP protocol stack. List at least two services offered by each layer.	6	CO1	L2	1	1.4.5
1b	Explain Dynamic Host Configuration Protocol (DHCP) with neat diagram. Illustrate the different types of messages exchanged between host and the DHCP server.	6	CO2	L3	2	2.2.3
1c	 **Figure 1 Network topology** Consider the figure 1, with three links, each with the specified transmission rate and link length. Assume the length of a packet is 4000 bits. The speed of light propagation delay on each link is 3x10^8 m/sec. Assuming that the queuing and processing delays are not considered. Given:Link1 – transmission rate : 10 Mbps, link length = 2 Km. Link2 – transmission rate : 1 Mbps, link length = 500 Km. Link3 – transmission rate : 100 Mbps, link length = 2 Km. a) What is the transmission and propagation delay of link 1, link 2 and link 3? b) What is the total delay?	8	CO1	L3	1	1.4.5
2a	Consider a situation where Ramesh who has a Web-based e-mail account, sends a message to Suresh. Suresh is able to access the mail received from Ramesh though his mail server using POP3. Based on the given scenario explain along with the application layer protocols that are used to move message from Ramesh's host to Suresh's host.	6	CO2	L2	1	1.4.5
2b	Explain the circuit switching and packet switching with neat diagram. Also briefly discuss what advantage does a circuit-	6	CO1	L2	1	1.4.5

	switched network have over a packet-switched network?					
2c	A file of size F = 25 Gbits, is to be distributed to each of the 5 peers. Given the server upload rate u = 60 Mbps. The upload rate of the 5 peers are u1 = 10 Mbps, u2 = 20 Mbps, u3 = 25 Mbps, u4 = 15Mbps and u5 = 30 Mbps. The download rate of the 5 peers are d1 = 5 Mbps, d2 =25Mbps, d3 = 14Mbps, d4 = 10 Mbps and d5 = 35Mbps. a. Calculate the minimum time needed to distribute this file from the server to all the 5 peers using the client server model. What is the root cause of this specific minimum time? b. Calculate the minimum time needed to distribute this file from the server to all the 5 peers using the peer to peer model. What is the root cause of this specific minimum time: the server (s), client (c), or the combined upload of the clients and the server (cu)?	8	CO2	L3	2	2.2.3
3a	Explain packet sniffing and IP spoofing with suitable diagrams.	6	CO1	L2	1	1.4.5
3b	i. Why is DNS distributed database used in name resolution? Explain the different types of name resolution in DNS. ii. Write resource record format for the following URL given the IP address for vtu.ac.in server as 192.168.2.3 and the organization mail server IP address is 192.168.3.4 with time to live (ttl) field as 64. a) www.vtu.ac.in b) mail.vtu.ac.in	6	CO2	L3	2	2.2.3
3c	Consider the scenario shown below, with four different servers connected to four different clients over four three-hop paths. The four pairs share a common middle hop with a transmission capacity of R = 100 Mbps. The four links from the servers to the shared link have a transmission capacity of R_S = 40 Mbps. Each of the four links from the shared middle link to a client has a transmission capacity of R_C = 20 Mbps. a. What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fairly shared (divides its transmission rate equally)? b. Which link is the bottleneck link? Format as Rc, Rs, or R. Justify the answer. c. Assuming that the servers are sending at the maximum rate possible, what are the link utilizations for the server links (R_S)?	8	CO1	L3	1	1.4.5

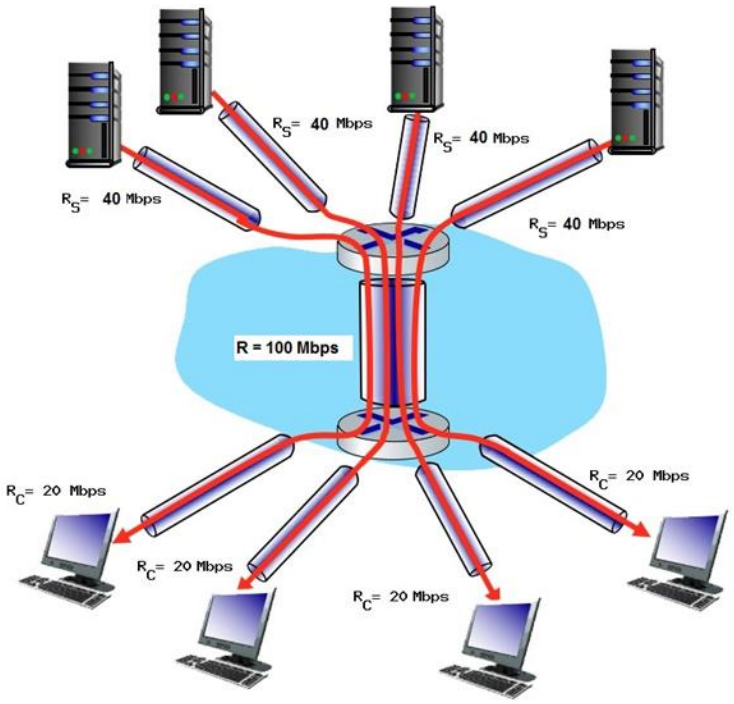


Figure 2 Client server architecture.

ISA1 – Scheme solution

Course : **Computer Networks-1**	USN :
Course Code : **19ECSC302**	Semester :V
Date of Exam :16.10.20	Duration :75 mins

Note: Answer any two full questions

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1a	With suitable diagram briefly explain the TCP/IP protocol stack. List at least two services offered by each layer.	6

⇨ **Block diagram of TCP/IP model with explanation. 4M**

5	Application	HTTP, SMTP, etc..	Messages	n/a
4	Transport	TCP/UDP	Segment	Port #'s
3	Network	IP	Datagram	IP address
2	Data Link	Ethernet, Wi-Fi	Frames	MAC Address
1	Physical	10 Base T, 802.11	Bits	n/a

⇨ **Mentioning two services each. 2M**

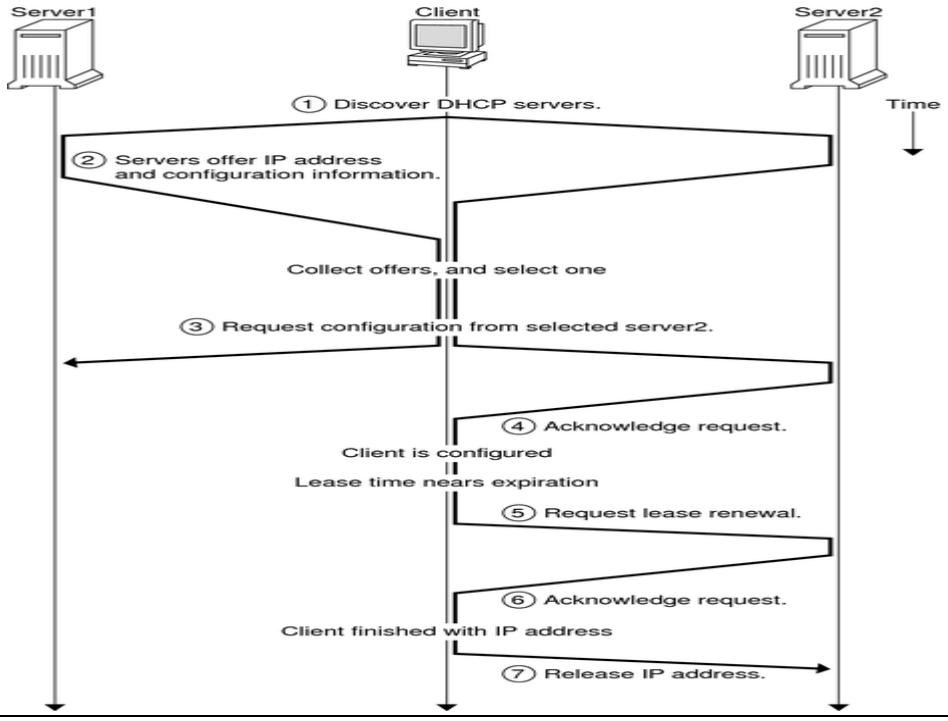
Physical Network Layer

The physical network layer specifies the characteristics of the hardware to be used for the network. For example, physical network layer specifies the physical characteristics of the communications media. The physical layer of TCP/IP describes hardware standards such as IEEE 802.3, the specification for Ethernet network media, and RS-232, the specification for standard pin connectors.

Data-Link Layer

The data-link layer identifies the network protocol type of the packet, in this instance TCP/IP. The data-link layer also provides error control and "framing." Examples of data-

	link layer protocols are Ethernet IEEE 802.2 framing and Point-to-Point Protocol (PPP) framing. Internet Layer The Internet layer, also known as the network layer or IP layer, accepts and delivers packets for the network. This layer includes the powerful Internet Protocol (IP), the Address Resolution Protocol (ARP), and the Internet Control Message Protocol (ICMP). Transport Layer The TCP/IP transport layer ensures that packets arrive in sequence and without error, by swapping acknowledgments of data reception, and retransmitting lost packets. This type of communication is known as end-to-end. Transport layer protocols at this level are Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Stream Control Transmission Protocol (SCTP). TCP and SCTP provide reliable, end-to-end service. UDP provides unreliable datagram service. Application Layer The application layer defines standard Internet services and network applications that anyone can use. These services work with the transport layer to send and receive data. Many application layer protocols exist	
1b	Explain Dynamic Host Configuration Protocol (DHCP) with neat diagram. Illustrate the different types of messages exchanged between host and the DHCP server. ⇨ **DHCP purpose and explanation ------2M** ⇨ **Diagram …2M** ⇨ **Types of messages : DORA – Discover, Offer, Request and ACK ----2M**	6



1c — 8

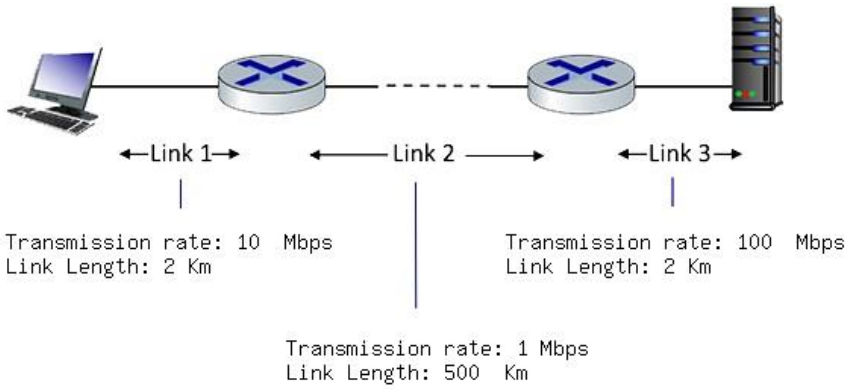


Figure 1 Network topology

Consider the figure 1, with three links, each with the specified transmission rate and link length. Assume the length of a packet is 4000 bits. The speed of light propagation delay on each link is 3x10^8 m/sec. Assuming that the queuing and processing delays are not considered.

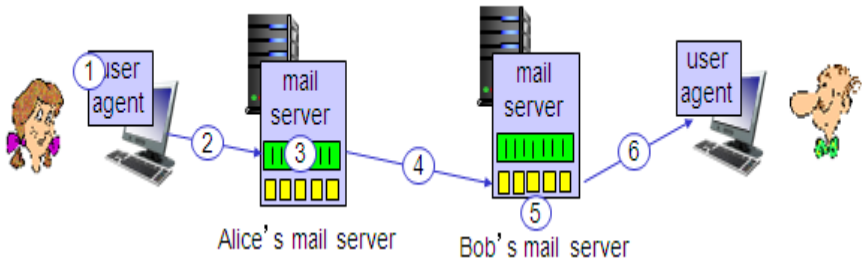
Given:Link1 – transmission rate : 10 Mbps, link length = 2 Km.
Link2 – transmission rate : 1 Mbps, link length = 500 Km.
Link3 – transmission rate : 100 Mbps, link length = 2 Km.

a) What is the transmission and propagation delay of link 1, link 2 and link 3?
b) What is the total delay?

a. **6M**

Link1	Transmission Delay	Propagation delay
1	0.0004 s 0.4 ms	0.00667ms
2	4ms	0.0016 s 1.6ms
3	0.04ms	0.00667ms

b. total delay== 6.05ms **2M**

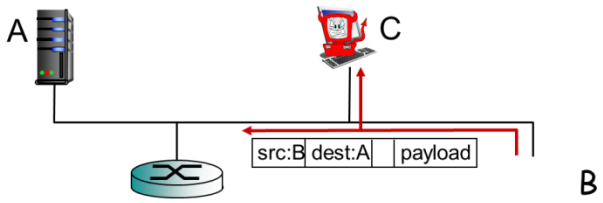
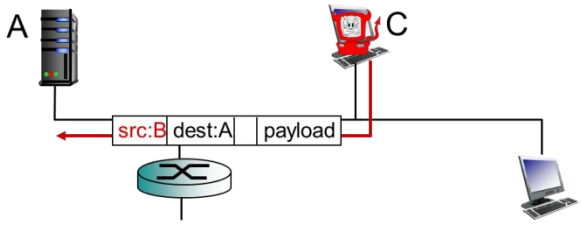
2a	Consider a situation where Ramesh who has a Web-based e-mail account, sends a message to Suresh. Suresh is able to access the mail received from Ramesh though his mail server using POP3. Based on the given scenario explain along with the application layer protocols that are used to move message from Ramesh's host to Suresh's host. ⇨ **Block diagram with explanation of POP3 and IMAP protocol. 2M**  ⇨ **Components of given scenario and its discussion. 2M** **The message is first sent from Ramesh host to her mail server over HTTP. Ramesh mail server then sends the message to Suresh mail server over SMTP. Bob then transfers the message from his mail server to his host over POP3. 2M**	6
2b	Explain the circuit switching and packet switching with neat diagram. Also briefly discuss what advantage does a circuit-switched network have over a packet-switched network? ⇨ **Explanation of circuit switching and packet switching 3M** **end-end resources allocated to, reserved for "call" between source & dest:**	6

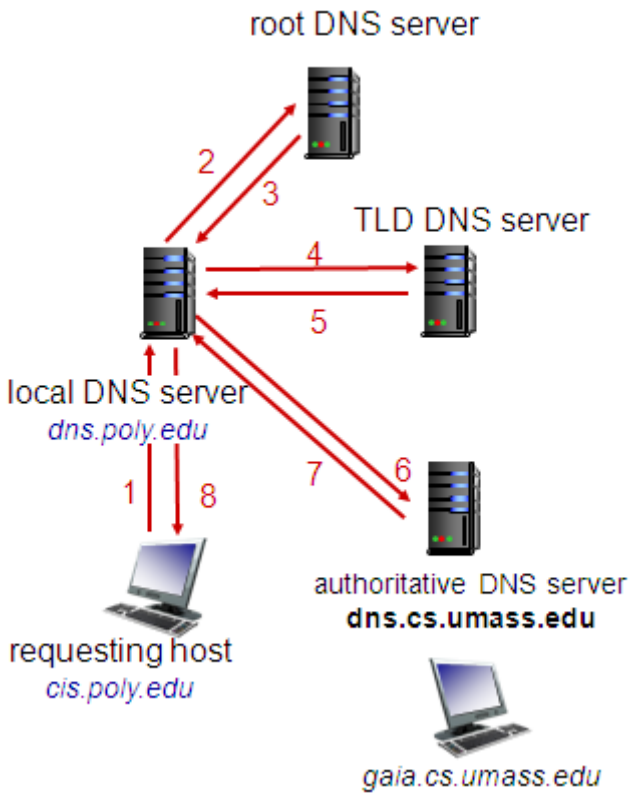
- **In diagram, each link has four circuits.**
  - **call gets 2nd circuit in top link and 1st circuit in right link.**
- **dedicated resources: no sharing**
  - **circuit-like (guaranteed) performance**
- **circuit segment idle if not used by call *(no sharing)***

⇨ **Mentioning the advantages over packet switched network 3M**

	Circuit – Switching	**Packet-Switching**
1	It is a connection oriented network switching technique.	It is a connectionless network switching technique.
2	A dedicated path has to be established between the source and the destination before transfer of data commences. Once, the data is transmitted, the path is relinquished.	There is no need to establish a dedicated path from the source to the destination.
3	It is inflexible in nature since data packets are routed along the same dedicated path.	Each packet is routed separately. Consequently, it is flexible in nature where the different data packets follow different paths.
4	It was initially designed for voice transfer.	It was initially designed for data transfer.
5	The entire message is received in the order sent by the source.	The individual packets of the message are received out of order and so need to be reassembled at the destination.
6	It is implemented at Physical Layer.	It is implemented at Network Layer.

	7	It has two approaches – • Space division switching, and • Time division switching	It has two approaches – • Datagram, and • Virtual Circuit	
	8	It is not a store and forward transmission.	It is store and forward transmission.	
	9	Data is processed and transmitted at the source only.	Data is processed and trans	
2c	A file of size F = 25 Gbits, is to be distributed to each of the 5 peers. Given the server upload rate u = 60 Mbps. The upload rate of the 5 peers are u1 = 10 Mbps, u2 = 20 Mbps, u3 = 25 Mbps, u4 = 15Mbps and u5 = 30 Mbps. The download rate of the 5 peers are d1 = 5 Mbps, d2 =25Mbps, d3 = 14Mbps, d4 = 10 Mbps and d5 = 35Mbps. a. Calculate the minimum time needed to distribute this file from the server to all the 5 peers using the client server model. What is the root cause of this specific minimum time? b. Calculate the minimum time needed to distribute this file from the server to all the 5 peers using the peer to peer model. What is the root cause of this specific minimum time: the server (s), client (c), or the combined upload of the clients and the server (cu)? Solution: a. Minimum time needed to distribute this file from the server to all the 5 peers using the client server model. ----2M The root cause of this specific minimum time --- 2M **5000. Client is the root cause.** b. The minimum time needed to distribute this file using the peer to peer model. ---2M The root cause of this specific minimum time: the server (s), client (c), or the			8

	combined upload of the clients and the server (cu) ------2M **5000. Client is the root cause.**	
3a	Explain packet sniffing and IP spoofing with suitable diagrams.  Packet sniffing: ⇨ broadcast media (shared ethernet, wireless) ⇨ promiscuous network interface reads/records all packets (e.g., including passwords!) passing by ⇨ wireshark software used for end-of-chapter labs is a (free) packet-sniffer IP spoofing: send packet with false source address  **Diagram ….3M** ⇨ **Explanation…3M**	6
3b	i. Why is DNS distributed database used in name resolution? Explain the different types of name resolution in DNS. ii. Write resource record format for the following URL given the IP address for vtu.ac.in server as 192.168.2.3 and the organization mail server IP address is 192.168.3.4 with time to live (ttl) field as 64. a) www.vtu.ac.in b) mail.vtu.ac.in **i. Explanation of DNS: Look for the name in the local cache ƒ Try a superior DNS server, which responds with: – another recommended DNS server – the IP address (which may not be entirely up to date)** **Different Types: recursive, iterative, and non-recursive.**	6

	 Reason for DNS distributed database------2M Different types of name resolution Iterated and recursive ……3M Resource Record format (Name, Value, Type, TTL) a) www.vtu.ac.in (www.vtu.ac.in, 192.168.2.3, A , 64) b) mail.vtu.ac.in (mail.vtu.ac.in,192.168.3.4, MX , 64) ……1M	
3c	Consider the scenario shown below, with four different servers connected to four different clients over four three-hop paths. The four pairs share a common middle hop with a transmission capacity of R = 100 Mbps. The four links from the servers to the shared link have a transmission capacity of R_S = 40 Mbps. Each of the four links from the shared middle link to a client has a transmission capacity of R_C = 20 Mbps. a. What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fairly shared (divides its	8

transmission rate equally)?

b. Which link is the bottleneck link? Format as Rc, Rs, or R. Justify the answer.

c. Assuming that the servers are sending at the maximum rate possible, what are the link utilizations for the server links (R_S)?

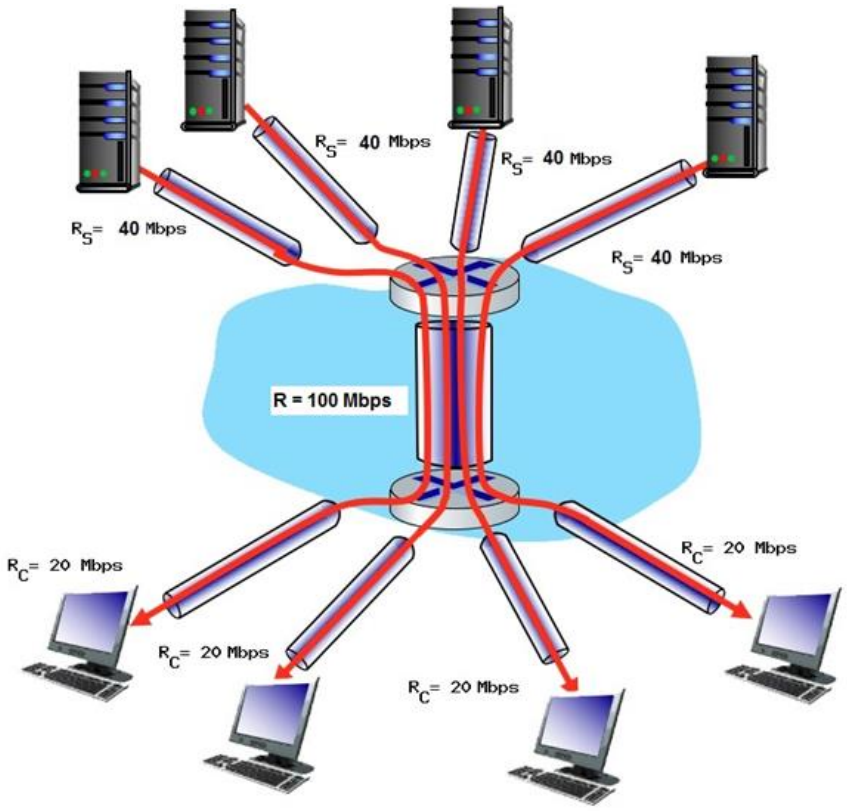


Figure 2 Client server architecture.

Solution

a.Maximum achievable end-to-end throughput – 20Mbps

Because the Rbottleneck link is the min{20,40,100/4} = 20Mbps.

b. The server's utilization = Rbottleneck / RS =Link utilization of the server = 20/40 = 0.5

c. The shared link's utilization = Rbottleneck / (R / 4) = 20 / (100 / 4) = 20/25 =0.8