CN CT2 - Answer key - ctpl 2 ans key

Computer Networks (SRM Institute of Science and Technology)

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2021-22 (ODD)

Test: CLA-T2 **Date: 29-10-2021**
Course Code & Title: 18CSC302J Computer Networks **Duration:** 2 Hour
Year & Sem: III Year / V Sem **Max. Marks:** 50

Course Articulation Matrix: ***(to be placed)***

S.No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	**CO1**	L	H		H	L				L	L		H
2	**CO2**	M	H		H	L				M	L		H
3	**CO3**	M	H		H	L				M	L		H
4	**CO4**	M	H		H	L				M	L		H
5	**CO5**	H	H		H	L				M	L		H
6	**CO6**.	L	H		H	L				L	L		H

Part - A
(20 x 1 = 20 Marks)

Instructions: Answer all

Q. No.	Question	Marks	BL	CO	PO	PI Code
1	When an application process calls socket(), the operating system allocates a new data structure to hold the information needed for communication, and fills in a new entry in the process _____ **Answer : socket descriptor table (SDT)**	**1**	**L1**	**2**	**1**	**1.4.1**
2	_____and _____ techniques are used by SCTP to prevent blind flooding attacks and avoid insertion attacks. **Answer: Cookie and Verification Tag**	**1**	**L2**	**2**	**2**	**1.4.1**
3	"Total length" field in UDP packet header is the length of _____ **Answer :** UDP header plus data	**1**	**L1**	**2**	**1**	**1.4.1**

4	Match Column A with Column B Column A / Column B 1. Bind() — A. Client side function 2. Connect() — B. associate socket with a port 3. Listen() — C. converts to network byte order 4. Htons() — D. returns -1 if error occurs **Ans: 1-B,2-A,3-D,4-C**	**1**	**L1**	**2**	**2**	**2.2.2**
5	----------Syntax used to restrict the total number of connections under the listener in Socket Programming **Ans: int listen(int sockfd, int backlog);**	**1**		**2**		**1.4.1**
6	Match the Following- One to Many Relationship – Enqueue the data For Lengthy Transactions- read (), write Communicate with server- Demultiplexing Input module- Concurrent Server **Answer :** One to Many Relationship – Demultiplexing For Lengthy Transactions- Concurrent Server Communicate with server- read (), write Input module- – Enqueue the data	**1**	**L1**	**2**	**1**	**2.2.2**
7	Match the following: Concerning the timing – Deliver Policy Arrive out of order - Send policy low overhead in terms of segment - Acknowledgement Policy Not receiving data - Accept Policy **Answer :** Concerning the timing – Acknowledgement Policy Arrive out of order - Accept Policy	**1**	**L1**	**2**	**2**	**2.2.2**

	Low overhead in terms of segment - Send policy Not receiving data - Deliver Policy					
	Match the following Socket - Associate with local address Bind - end point Listen - Connectionless SOCK_DGRAM - waiting for incoming connections Answer : Socket - end point Bind - Associate with local address Listen - waiting for incoming connections SOCK_DGRAM - Connectionless	**1**	**L1**	**2**	**2**	**2.2.2**
	When TCP/IP provides a concurrent server program called _____ **Ans: IMS Listener**	**1**	**L1**	**2**	**1**	**1.4.1**
	Which field of User datagram protocol each datagram can travel on the _____ **Answer: Different path**	**1**	**L1**	**2**	**1**	**1.4.1**
	Match the following Dynamic Document-Message –Proxy Server Mail server by WAN or LAN- WWW Network Information System- JSP Gateway between client and server- Access Agents **Answer :** Dynamic Document-Message – JSP Mail server by WAN or LAN - Access Agents Network Information System - WWW Gateway between client and server - Proxy Server	**1**	**L1**	**3**	**2**	**2.2.2**

13	Match the application layer protocol used in the following activities pertained to email. Sending an email from mail client to mail server - POP3 Downloading the emails from the server's mail box - HTTP to the mail Client. Checking email in a web browser - SMTP **Answer : a : SMTP; b: POP3 ; c: HTTP**	**1**	**L1**	**3**	**2**	**2.2.2**
14	Show the Full domain name always ends in a ---------- **Answer: null label**	**1**	**L2**	**3**	**1**	**1.4.1**
15	Match the following FTP - Registered host according to their generic behavior SMTP - Utility located in remote machine DNS - Server control process and server data transfer process TELNET - BOOTP DHCP - User Agent , Mail Transfer Agent **Answer :** FTP - Server control process and server data transfer process SMTP - User Agent , Mail Transfer Agent DNS - Registered host according to their generic behavior TELNET - Utility located in remote machine DHCP - BOOTP	**1**	**L1**	**3**	**2**	**2.2.2**
16	----------and -------- Protocol used to support the diskless Machine Communication **Ans: Binary sets, MIME**	**1**	**L2**	**3**	**1**	**1.4.1**
17	**FTP and HTTP uses _____data format for encoding** **Answer : DHCP Protocol**	**2**	**L2**	**3**	**1**	**1.4.1**
18	Consider a scenario where HTTP client request for	**2**	**L1**	**3**	**2**	**2.2.2**

	a web page to a web server. Initially browser cache is made as empty. Administrator configured the browser in non persistent mode of handling HTTP request. The web page consists of text and seven large images. Find out the minimum number of TCP connection required for display in your browser. **Answer :** Answer : **Minimum TCP Connection required is 8**					
18	Relate the Domain name system, if the label is terminated by null string it is called _____ **Answer : fully qualified domain names (FQDN)**	**2**	**L2**	**3**	**1**	**1.4.1**
19	_____ field is used by TELNET to separate data and control characters in data stream. **Answer : Interpret as Control (IAC)**	**2**	**L2**	**3**	**1**	**1.4.1**
20	Show the encoding scheme which uses 6-bit blocks of data that are encoded into 8bit ASCII characters, specify the type_____ used for this encoding scheme **Answer : Base 64**	**2**	**L2**	**3**	**2**	**2.1.3**

Part - A
(20 x 1 = 20 Marks)

Instructions: Answer all

Q. No	Question	Marks	BL	CO	PO	PI Code
1	Relate SCTP is a _____Oriented Protocol, efficiently handle _____, _____types of attacks **Answer : Message, Man in the Middle, Denial Of Service (DOS)**	**1**	**L2**	**2**	**2**	**1.4.1**
2	ctime() is used for_____ **Answer :** **Calculate the current date and time**	**1**	**L1**	**2**	**1**	**1.3.1**
3	_____ protocol is suitable for multicasting. **Answer:**	**1**	**L2**	**2**	**1**	**1.4.1**
4	How Telnet protocol uses the port type_____ to establish connection **Answer : port 23**	**1**	**L1**	**3**	**1**	**1.4.1**
5	**The information about the ports that are open is available in _____** **Answer : Control Block Table**	**1**	**L1**	**2**	**2**	**1.4.1**
6	Infer stream control transmission protocol (SCTP) control information and data information are	**1**	**L2**	**2**	**1**	**1.4.1**

<table>
<tr><td></td><td>carried in _____
Answer: separate chunks</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>7</td><td>Show the syntax of Bind() command is _____
Answer: int bind (int sockfd, struct sockaddr *my_addr, socklen_t addrlen)</td><td>1</td><td>L2</td><td>2</td><td>1</td><td>1.4.1</td></tr>
<tr><td>8</td><td>When protocol that creates a virtual network view to hide the underlying physical network is _____
Answer : Internet Protocol (IP)</td><td>1</td><td></td><td>2</td><td>1</td><td>1.4.1</td></tr>
<tr><td>9</td><td>List the application layer protocol that use the services of UDP
Answer : DHCP, SNMP, TFTP</td><td>1</td><td>L2</td><td>2</td><td>1</td><td>1.4.1</td></tr>
<tr><td>10</td><td>_____ is the socket descriptor used in UDP
Ans: sd = socket(PF_INET, SOCK_DGRAM, 0);</td><td>1</td><td>L2</td><td>2</td><td>1</td><td>1.4.1</td></tr>
<tr><td>11</td><td>Match the following:
<table><tr><td>Indicates the client is ready to send the email, and if the server is ready it responds with 354 Start Mail Input.</td><td>EHLO</td></tr><tr><td>initiates a standard SMTP session</td><td>DATA command</td></tr><tr><td>Initiates an SMTP session that supports mail service extensions.</td><td>HELO</td></tr></table>Answer : A-ii) ; B-i) ; C-iv) ; D-iii)</td><td>1</td><td>L1</td><td>3</td><td>2</td><td>2.2.2</td></tr>
<tr><td>12</td><td>Match Column A with Column B
<table><tr><td>Column A</td><td>Column B</td></tr><tr><td>IMAP</td><td>Port -25</td></tr><tr><td>DNS</td><td>Port-110</td></tr><tr><td>FTP</td><td>Port-53</td></tr><tr><td>POP3</td><td>Email Protocol</td></tr><tr><td></td><td>Port - 21</td></tr></table>Answer :
<table><tr><th>Column A</th><th>Column B</th></tr><tr><td>IMAP</td><td>Email Protocol</td></tr><tr><td>DNS</td><td>Port-53</td></tr><tr><td>FTP</td><td>Port - 21</td></tr><tr><td>POP3</td><td>Port-110</td></tr></table></td><td>1</td><td>L1</td><td>3</td><td>2</td><td>2.2.2</td></tr>
<tr><td>13</td><td>Match the below and select the correct option</td><td>1</td><td>L1</td><td>3</td><td>2</td><td>2.2.2</td></tr>
</table>

	Control-block table - General header is 12bytes SCTP - FREE / IN-USE Heartbeat - does not provide authentication TFTP - periodically probe the condition of an association **Answer :** Control-block table- FREE / IN-USE SCTP - General header is 12bytes Heartbeat - periodically probe the condition of an association TFTP - does not provide authentication					
14	Match the following: **List-I List-II** BGP Transport layer SMTP Physical layer PPP Data link layer TCP Network layer Application layer **Answer :** BGP - Network layer SMTP - Application layer PPP - Data link layer TCP - Transport layer	**1**	**L1**	**3**	**2**	**2.2.2**
15	What is the size of the email which we send or receive through POP3 protocol? **Answer: No Size Limit**	**1**	**L1**	**3**	**1**	**1.4.1**
16	Relate stored email in MDA(Mail Delivery Agent) can be retrieved by using **Answer: MUA (Mail User Agent)**	**2**	**L2**	**3**	**4**	**1.4.1**
17	Which _____ is a server whose zone consists of the whole tree. **Answer: root server**	**2**	**L1**	**3**	**1**	**1.4.1**
18	Recall data transfer mode of FTP, in which all the fragmenting has to be done by TCP is_____ **Answer: Stream mode**	**2**	**L1**	**3**	**2**	**1.4.1**
19	Show the Internet, the domain name space (tree) is divided into _____ different sections. **Answer: three**	**2**	**L1**	**3**	**1**	**1.4.1**
20	_____ is the port number for (Trivial File	**2**	**L2**	**3**	**2**	**1.4.1**

	Transfer Protocol) TFTP **Answer: 69**					
	Part – B **(3*10 = 30 Marks)**					
Q.No	Question	Marks	Blooms Level	CO	PO	PI
1	In Stream Control Transmission Protocol (SCTP) a packet is carrying two DATA chunks, each containing 22 bytes of user data. What is the size of each DATA chunk? What is the total size of the packet? **Answer :** CommonHeader = 12 Bytes Data Chunk1 Header = 16 Bytes User Data For First Chunk = 22 Bytes Padding Information = 2 Bytes Data Chunk2 Header = 16 Bytes User Data For Second Chunk = 22 Bytes Padding Information for second Data Chunk = 2 Byte Total = 92 Bytes Data Chunk1 Header = 16 Bytes User Data For FirstChunk = 22 Bytes Padding Information = 2Bytes Total = 40 Bytes Hence the Packet size is **92 Bytes** and Data Chunks size is **40 Bytes**	10	L3	2	2	2.4.1
2	The following is a dump of a SCTP DATA chunk in hexadecimal format 00000023 00000003 0002000B 00000000 48656C6C 6F000001 a. How many bytes of padding are carried by the chunk? b. Is this the first, the last, the middle, or the only fragment? c. What is the SI? d. What is the TSN? e. What is the SSN?	10	L3	2	2	2.4.1

	Answer : Data transfer in SCTP is controlled by numbering the data chunks. SCTP uses a transmission sequence number (TSN) to number the data chunks. In other words, the TSN in SCTP plays the analogous role as the sequence number in TCP. TSNs are 32 bits long and randomly initialized between 0 and 232 − 1. Each data chunk must carry the corresponding TSN in its header. In SCTP, there may be several streams in each association. Each stream in SCTP needs to be identified using a stream identifier (SI). Each data chunk must carry the SI in its header so that when it arrives at the destination, it can be properly placed in its stream. The SI is a 16-bit number starting from 0. When a data chunk arrives at the destination SCTP, it is delivered to the appropriate stream and in the proper order. This means that, in addition to an SI, SCTP defines each data chunk in each stream with a stream sequence number (SSN).					
✔	The following is a dump of a UDP header in hexadecimal format. CB84000D001C001C a. What is the source port number? b. What is the destination port number? c. What is the total length of the user datagram? d. What is the length of the data? e. Is the packet directed from a client to a server or vice versa? f. What is the client process? **Answer :** a. The source port number is the first four hexadecimal digits (CB8416), which means that the source port number is 52100. b. The destination port number is the second four hexadecimal digits (000D16), which means that the destination port number is 13. c. The third four hexadecimal digits (001C16) define the length of the whole UDP packet as	10	L3	2	2	2.4.1

	28 bytes. d. The length of the data is the length of the whole packet minus the length of the header, or 28 – 8 = 20 bytes. e. Since the destination port number is 13 (well-known port), the packet is from the client to the server. **f.** The client process is the Daytime					
	a) Assume that Host A is transferring a User Datagram Protocol datagram which has 10000 bytes of user data to host B through Ethernet. The Ethernet frames may carry data up to 1500 bytes. User Datagram Protocol header size: 8 bytes & Internet Protocol header size: 20 bytes. There is no option field in IP header. How many total number of IP fragments will be transmitted and what will be the contents of offset field in the last fragment? (5 Marks) **Answer :** UDP data = 10000 bytes UDP header = 8 bytes IP Header = 20 bytes Total Size excluding IP Header = 10008 bytes. **Number of fragments = (10008 / 1480) = (6.75) ~7** The fragments are numbered as 0 1st fragment 1 2nd fragment 2 3rd fragment 3 4th fragment 4 5th fragment 5 6th fragment 6 7th fragment **The contents of offset field in the last fragment: (6*1480)/8 = 1110**	10	L4	2	4	2.2.3
	b) Assume an IP packet of length: 10,000 bytes. It comprises of Internet protocol version 4 header: 20-byte & TCP header: 40-byte. This packet is sent to Internet protocol version 4 router which has capability to support MTU of 1000 bytes. Assume that the length of the IP header in all the outgoing fragments of this packet is 20 bytes and that the fragmentation offset value stored in the first fragment is 0. What is the fragmentation offset value stored in the third fragment? (5 Marks) **Answer :** Pack Length: 10000 bytes IP Payload=10000-20=9980 B MTU =1000 B					

	MTU Payload=1000B-20B =980B Nearest multiple of 8 : 976 (payload should be in multiple of 8) IP packet size :976B+20B= 996B Size of offset: 976/8=122 1st fragment :0 2nd fragment: 122 3rd fragment: 244					

5	a) Justify with the code snippets, how UDP and TCP/IP socket communication differs. (5 Marks)
	Answer :
	I. UDP socket is created, an Internet socket address structure is filled with wildcard address & server's well known port.
	
	sd=socket(AF_INET,SOCK_DGRAM,0);
	
	II. Sendto function is used to echo the message from server to client side
	
	if(sendto(sd,buff,sizeof(buff),0,(struct sockadddr*)&cliaddr,clilen)
	
	III. TCP socket is created, an Internet socket address structure is filled with wildcard address & server's well known port.
	
	IV. sd=socket(AF_INET,SOCK_STREAM,0);
	
	Send function is used on client side to send data given by user on client side to the server
	
	send(sd,buff,sizeof(buff)+1,0); printf("\n Data Sent ");
	
	recv(sd,buff,strlen(buff)+1,0); printf("%s",buff);
	
	b) How to track a IP Packet, state the available provisions. (5 Marks)
	Answer :
	
	Windows
	You can perform a trace route in Windows Vista, Windows 7 or Windows 8 when you go to **"Start"**, type in **"CMD"** and press enter. Command prompt should display a black box and you type **"tracert domain.com"** in the box replacing domain.com with your domain name or IP address.
	MAC
	To perform a trace route in Mac you need to open Terminal. You can open Terminal by going to **"Applications"**,
	then **"Utilities"** and double clicking on **"Terminal"**. Once open type in **"traceroute domain.com"** replacing domai
		10	L3	2	2	2.2.3

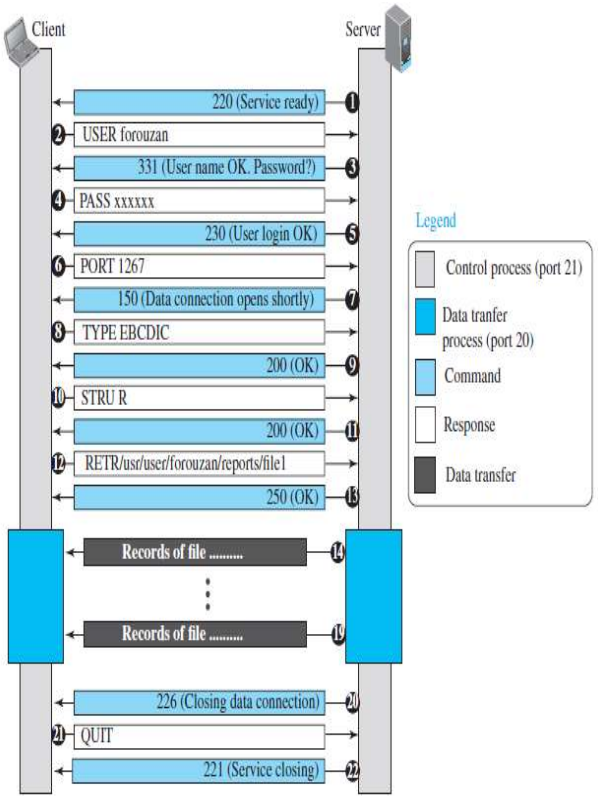
	n.com with your domain name or IP address. **Linux** To perform a trace route in Linux open Terminal and type in **"traceroute domain.com"** replacing domai n.com with your domain name or IP address. If you do not have trace route installed you may need to install it. For example in Ubuntu the command to install trace route is "sudo apt-get install traceroute".					
	a) Consider a scenario where client machine uses active monitoring program which request standard graphics primitives that are executed on the remote workstation. As a programmer you want to hide the communication details with your entity to others. How you can achieve this? (5 Marks) **Answer :** Remote Procedure Calls(RPC) is a standard protocol used to request for remote objects which are executed in the address space of the remote machine. The main idea of using RPC is that it hides the existence of network from a program. b) Assume Alice and Bob wants to communicate with each other. The client side Alice creates a TCP connection with Bob, server. Both client and server uses different types of transaction for longer time. Narrate on how this type of communication can be achieved successfully? (5 Marks) **Answer :** As both client and server uses different types of transaction for longer time, concurrent server can be used. To accept multiple transaction, client can create child process to handle transaction. TCP/IP provides a concurrent server program called IMS Listener.	10	L4	2	4	2.2.3
7	Ida Investigator, curious about the inner workings of the Internet, creates a simple software to send big UDP datagrams from her Gates office to her home PC. On her personal machine, she runs a simple listening server and monitors the traffic with Wireshark. She notes that when she transmits a UDP datagram with a payload of 4432 bytes, it arrives at her home machine as three IP pieces. Each IP fragment is 1500 bytes in length, including headers.	10	L4	2	4	2.2.3

	a) Why is Ida's datagram fragmented? (2 Marks) b) Would Ida's experiment result in the same fragmentation if she repeated it with a different pair of computers? If so, describe what makes the number 1500 unique. If not, specify a method for calculating the IP fragment size programmatically. (3 Marks) c) Assume that the route between Ida's office and home is clogged, and one of the three parts is lost in the network. The other two parts are delivered to Ida's home PC. Will the listening server receive her huge UDP datagram? Why do you think that is? Assume there are no duplicate fragments. (2 Marks) d) There are 8 bytes in the UDP header. Calculate the IP header size using this information. (3 Marks) **Answer :** Part a: The smallest Maximum Transmission Unit (MTU) value between Ida's office and her home is 1500 bytes. Her packet's payload size plus the headers (20+8=28 bytes) exceeds the MTU for some link on the route, so her packet is fragmented. Part b: 1500 happens to be the MTU for Ethernet (without jumbo frames), but Ida would not necessarily get the same results. She could write a simple echo client/server to determine the minimum MTU on the route. The client would use IP's DF (Don't Fragment) flag and exponentially increase the payload size until packets started to be dropped. Part c: No. There's no retransmission in IP or UDP, so if a fragment is lost, all fragments are dropped. 4. 20 bytes. 1500*3 = 4500 bytes total - 4432 bytes of payload = 68 bytes of headers. One UDP header = 8 bytes. 68 - 8 = 60 bytes for three IP headers (3 fragments). Thus, 60/3 = 20 bytes.					
8	Consider the Education institution decided to automate examination process through client-server Communication model. Students must be allowed to register for examination only from local host Available in their department lab. But result published by university must be accessed across the World. The system may use different address space to handle the request in	10	L4	2	4	2.2.3

	distributed network model. a) Design and implement the communication model for both criteria with suitable protocol. (3) b) Identify and include appropriate modules such as students' registration, courses available, and subject registration in the programming. (2) c) Justify the type method which you're planning to adopt for handling request from the different address space. (5) **Answer :** ❖ Student may use the TCP and UDP protocols to implement the given scenario ❖ Student may use the socket programming to implement in the client server model to exam registration ❖ Student use the Remote Procedure Call (RPC) to handle the request in different address space to establish distributed network model. ❖ Justification and relevant code to implement the model.					
9	Sonu is a system administrator working in Bangalore and John is also friend of Sonu who is also a system admin, working in Tamilnadu branch office, where both the friends wants to communicate each other regarding some official details . They want to establish a communication between two machines which are located in their respective places. For example, the first machine is located in Bangalore and the another machine is located in Tamil Nadu. Both the machines may use different protocols to communicate. a) Sonu wants to store the data before transmitting to John. Suggest sonu how the data's can be stored before transmission?(4) **Answer : Byte Ordering** b) After some days sonu and John wants to establish the communication between each	10	L4	2	4	2.2.3

	of them in such a way that , both of the connection establishment process can be achieved in such a manner that both of them can interact with other branch offices in the same connection. Help John and Sonu how they need to design the client server communication for the above scenario. You can also use diagrams to explain your solutions to John and Sonu. (4) **Answer : Iterative Server** c) Now, Sonu and John wants to use a protocol in such a way that it has very minimal amount of messages which has less overhead. Suggest them which protocol they can use and justify why you are suggesting this?(2) **Answer : UDP**					
10	Write the scenario for SMTP protocol services between for the Server and Client systems, which shows the mail transaction done by Kumar from host abc.com and also Bala, David and Arun both have forwarded the same way from host imp.com. Here assume that, for the above transaction the host abc.com contacts the host imp.com directly to exchange email messages. The mail has been received and accepted by Bala and Arun. but, David does not receive any email since he has not having mailbox at host imp.com. Explain the following scenarios (i) A Typical SMTP Transaction Scenario **Answer :** S: 220 imp.com Simple Mail Transfer Service Ready C: EHLO abc.com S: 250-imp.com greets abc.com S: 250-8BITMIME S: 250-SIZE S: 250-DSN S: 250 HELP C: MAIL FROM:<Kumar@abc.com> S: 250 OK C: RCPT TO:<Bala@imp.com> S: 250 OK C: RCPT TO:<David@imp.com> S: 550 No such user here	10	L4	3	2	2.2.3

	C: RCPT TO:<Arun@imp.com> S: 250 OK C: DATA S: 354 Start mail input; end with <CRLF>.<CRLF> C: Blah blah blah... C: ...etc. etc. etc. C: . S: 250 OK C: QUIT S: 221 imp.com Service closing transmission channel (ii) Aborted SMTP Transaction Scenario **Answer :** S: 220 imp.com Simple Mail Transfer Service Ready C: EHLO abc.com S: 250-imp.com greets abc.com S: 250-8BITMIME S: 250-SIZE S: 250-DSN S: 250 HELP C: MAIL FROM:<Kumar@abc.com> S: 250 OK C: RCPT TO:<Bala@imp.com> S: 250 OK C: RCPT TO:<David@imp.com> S: 550 No such user here C: RSET S: 250 OK C: QUIT S: 221 imp.com Service closing transmission channel					
11	In File Transfer Protocol transaction, assume a client with user name Abhishek needs to retrieve his file named as "Computer Networks 5" from the server systems directory /Course/Computer Networks/Unit3. After that, the client needs to upload the new file named as "Computer Network 6" is to the above same directory path available in the server. Show that, what are the commands used for the above transaction and also for response messages exchanged between the FTP client and the FTP server. The client system chosen ephemeral port number 58012 used for downloading the file from server and ephemeral port number 59050 used for uploading the file from client to server. Draw the necessary diagram to show the exact message exchange sequence.	10	L4	3	4	2.2.3

	Answer :  • In the above diagram, only downloading the file part from the server is mentioned. So, for uploading the file from client to server, the sequence 6 should be repeated after sequence 20. • Then at last when both downloading and uploading is done, QUIT message can be issued from the client side to terminate the control connection. **For diagram – 6 marks** **For explanation of sequence – 4 marks**					
12	Enumerate the sequence of activities involved in **uploading the files by implementing FTP client software.** **Answer :** 1. FTP is used to upload the files on the server from the client side where it is installed on the computer of clients. 2. FTP client is checked for the installation of the software and according to that the appropriate directory is uploaded on the hosting server. 3. The hosting server uploads the files that is being created by the user and	10	L3	3	1	1.4.1

	set the permissions for it so that public can access it. 4. Web hosting uses different directories like HTML that is used as var/www/html that is determined using the FTP client. 5. Initial local directory is being set up using FTP client and it is where the website gets stored. 6. The transfer mode is being determined for the files that need to be transferred either in ASCII or BINARY mode.					
13	(a) GET http://www.microsoft.com//file1 HTTP/1.1 , If-Modified-Since: Thu, 13 Sept 2015 05:00:00 GMT, What does the above URL represent? (5 Marks) HTTP/1.1 304 Not Modified Date: Sat, 15 Sept 2015 16:22:46 GMT5 Server: commonServer.com What does the above statements represent? Justify, the above two set of URL and statements? **Answer :** HTTP has a concept of *conditional requests*, where the result, and even the success of a request, can be changed by comparing the affected resources with the value of a *validator. So the first URL is conditional Request and the second statement is the response.* The If-Modified-Since request HTTP header makes the request conditional: the server will send back the requested resource, with a 200 status, only if it has been last modified after the given date. If the resource has not been modified since, the	10	L4	3	4	2.2.3

response will be a 304 without any body

(b) The professor Mark Allenwise sending congratulations email to Professor Forouzan for his book publication. Here you have to explain, what are the protocols used to send emails and also explain about the transaction request commands and responses related to the transaction. (5 Marks)

Hint:

Explain during transaction how the connections are established, email transferred and how connections are terminated using request commands & its responses.

Email id

Mark Allen wise: mawise@gmail.com

Forouzan: forouzan@gmail.com

Answer :

Connection Establishment

220 smtp.gmail.com SMTP server ready Thurs,22 Sept 2021…

HELO mail.gmail.com

250 smtp.gmail.com

Mail Transfer

MAIL FROM:mawise@gmail.com

250 sender< mawise@gmail.com> OK

RCPT TO:forouzan@gmail.com

250 Recipient forouzan@gmail.com OK

DATA

354 Ok send data ending with <CRLF>.<CRLF>

From:Mark Alen wise

To: Forouzan

	Message Connection termination 250 message received: gmail.com@mail.gmail.com QUIT 221 smtp.gmail.com SMTP server closing connection					
14	a) Which programming language constructs make differences with programming for FTP and Remote command execution, state with the major block of codes? (5 Marks)	10	L3	3	2	1.4.1

FTP	Remote command execution
Create a socket using socket function with family AF_INET, type as SOCK_STREAM.	Create a socket using socket function with family AF_INET, type as SOCK_DGRAM.
Within an infinite loop, send the name of the file to be viewed to the Server	Obtain the command to be executed in the server from the user
Receive the file contents, store it in a file and print it on the console	Receive the output from the server and print it on the console
Server side: sd=socket(AF_INET, SOCK_STREAM,0); bind(sd,(struct sockaddr*)&servaddr,sizeof(servaddr)); listen(sd,5); printf("%s\n","Server Is Running...."); ad=accept(sd,(struct sockaddr*)&cliaddr, &clilen); while(1) { bzero(buff,sizeof(buff)); bzero(file,sizeof(file)	Server side bind(sd,(struct sockaddr *)&servaddr,sizeof(servaddr)); while(1) { bzero(buff,sizeof(buff)); recvfrom(sd,buff,sizeof(buff),0,(struct sockaddr *)&cliaddr,&clilen); strcat(buff,">file1"); system(buff); fp=fopen("file1","r"); stat("file1",&x);

	<table><tr><td>);
	recv(ad,buff,sizeof(buff),0);
	fp=fopen(buff,"r");
	stat(buff,&x);
	size=x.st_size;
	fread(file,sizeof(file),1,fp);
	send(ad,file,sizeof(file),0); }}</td><td>size=x.st_size;
	fread(file,size,1,fp);
	sendto(sd,file,sizeof(file),0,(struct sockaddr *)&cliaddr,sizeof(cliaddr)); printf("Data Sent to UDPCLIENT %s",buff); } close(sd); return 0; } Client: udp</td></tr></table>
	b) Give an example scenario for any two socket descriptors used in different networking environments. (5 Marks)
	
	Answer :
	
	TCP/IP Uses SOCK_STREAM and UDP uses SOCK_DGRAM.
	
	Ex. For TCP/IP The scenario of the client and the server on the same local network (usually called LAN, Local Area Network) and For UDP, The client and the server may be in different LANs, with both LANs connected to a Wide Area Network (WAN) by means of *routers*					

15	a) Aditya often needs to access files stored on his office desktop computer, from his home laptop. Last week, he downloaded FTP server on her office desktop computer and kept all his files under the directory /root/aditya/projects. (5 Marks) (i) During weekends, he wants to access his saved files remotely using his home laptop. Explain what are the necessary steps required to access those files remotely. (ii) During his remote file access from the FTP server, he found that few packets were dropped and violates security. Suggest few solutions to avoid these issues. **Answer :** **1 a) i)** Aditya needs to download FTP Client on her laptop and request for file access from remote server. On the remote end, FTP server process should be running all the time waiting for clients to access it. **1 a) ii)** FTP are more prone to various attacks. Solution is Alice must use SFTP(Secure File Transfer Protocol) which prevents unauthorized	10	L4	3	4	2.2.3

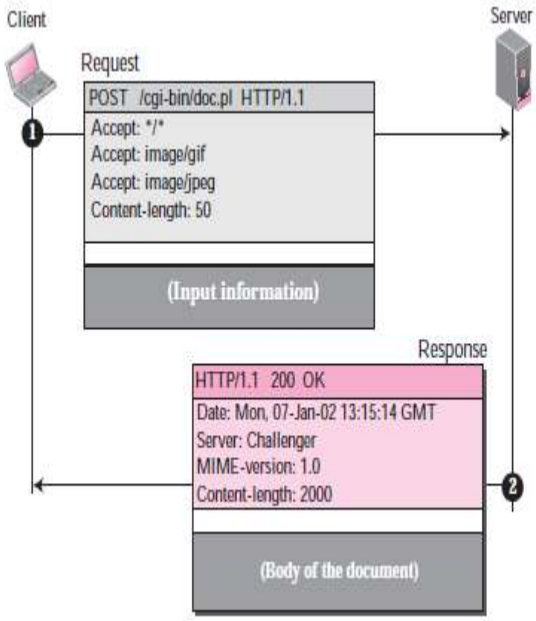
	access to sensitive information b) In a private organization, manager of ABC Company wants to submit auditing reports to his main office via browser HTTP. While transferring the information, it was noted that few messages were stealed and posted anonymously. Can you guess what would be the reason for the data leakage and suggest the ways to avoid the above scenario. (5 Marks) **Answer:** HTTP is a stateless protocol. The reason for message stealing and unauthorized access is due its lack in security policies. Moreover, if HTTP uses GET method for requesting data access, then messages which are transferred from client to server gets displayed on the address bar of the browser. To prevent this, HTTP must use POST method for data access.					
16	(a)How a client can directly connect to a server using TELNET, which logs into port 80? **Answer :** The first shows the request line (GET method), the second is the header (defining the host), and the third is a blank terminating the request. The server response is seven lines starting with the status line. The blank line at the end terminates the server response. The file of 14,230 lines is received after the blank line (not shown here). The last line is the output by the client.  	10	L3	3	2	1.4.1

Figure Common Gateway Interface

Example

$telnet www.mhhe.com 80

Trying 198.45.24.104...

Connected to www.mhhe.com (198.45.24.104).

Escape character is '^]'.

GET /engcs/compsci/forouzan HTTP/1.1

From: forouzanbehrouz@fhda.edu

HTTP/1.1 200 OK

Date: Thu, 28 Oct 2004 16:27:46 GMT

Server: Apache/1.3.9 (Unix) ApacheJServ/1.1.2 PHP/4.1.2 PHP/3.0.18

MIME-version:1.0

Content-Type: text/html

Last-modified: Friday, 15-Oct-04 02:11:31 GMT

Content-length: 14230

Connection closed by foreign host.

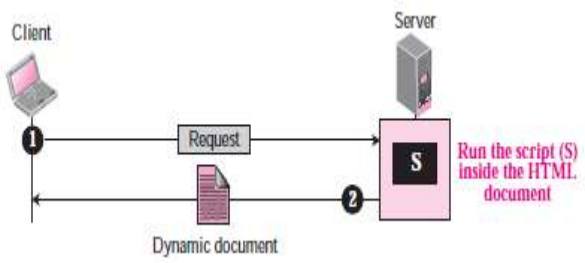
Conditional Request

A client can add a condition in its request. In this case, the server will send the requested Web page if the condition is met or inform the client otherwise. One of the most common conditions imposed by the client is the time and date the Web page I modified. The client can send the header line *If-Modified-Since* to the request to tell the server that it needs the page if it is modified after a certain point of time.

(b)How a client can imposes the modification of data and time condition on a request?

Answer :

Dynamic document using server-site script:



GET http://www.commonServer.com/information/file1

	HTTP/1.1 If-Modified-Since: Thu, Sept 04 00:00:00 GMT The status line in the responds shows the file is not modified after the defined point of time. The body of the response message is also empty. HTTP/1.1 304 Not Modified Date: Sat, Sept 06 08 16:22:46 GMT Server: commonServer.com (Empty Body)					
17	The client and server must agree on the port numbers for the distinct data transfer connection in the FTP architecture. The client opens a socket with a dynamic port and sends the IP address and port number to the server (using 10 existing control connections) so the server knows what client address and port number is to be used for the data transfer in one possible implementation approach that is known as "active mode." For example, a client with IP address 192.168.0.1 and port 49150 for the data connection might send a command to the control connection like "PORT 192.168.0.1 49150." The server selects a port number and advises the client (using the existing control connection) to create the data-transfer connection in a different implementation style known as "passive mode." a) When the client host is behind a NAT box, active mode can cause issues. What is the reason for this? b) Assume a NAT box needs to handle “active mode” FTP clients appropriately. What steps would the NAT box have to take in response to the client's FTP control messages? c) Why might these procedures impact the size of the underlying IP packets connected with the control connection? What would be the NAT's response to the change in packet sizes? d) What issues arise if other apps (other than FTP control) use port 21? What problems arise when the FTP client and server encrypt their data transmissions? e) In the presence of client-side NAT boxes, why is passive mode easier than active	10	L4	3	4	2.2.3

	mode? **Answer :** **1.a.** The NAT box maps the IP address and port number of the client's data connection to new values. As such, the arguments the client sends in the PORT command (sent over the control connection) would not match the values the NAT box would use. In addition, the server would have trouble initiating a data connection to a client lying behind a NAT box, without the NAT box already having a table entry for the associated connection; since the client has not transmitted any packets on the data connection yet, the NAT box would not yet have an entry installed when the server sends the initial SYN packet. Worse yet, the IP address in the PORT command is a private, non-routable address, so the FTP server would not be able to direct a packet with this destination address to the appropriate place. **1.b.** The NAT box would need to parse the messages sent on the FTP control connection (i.e., on port 21) to extract the arguments of the PORT command. The NAT box would need to create a table entry for the data connection and modify the arguments in the PORT message accordingly, so the FTP server can successfully create and use the data connection. **1.c**. The IP address and port numbers used by the NAT box may have a different number of decimal digits, when represented as the arguments in the PORT command. As such, the NAT box must change the packet sizes, as well as the TCP sequence numbers (when sending to the server) and acknowledgment numbers (when directing return packets to the client) to remain consistent. If the packet size increases, the new packet may exceed the MTU, requiring the NAT box to fragment the IP packets. **1.d.** If another application uses port 21, the NAT may mistakenly think the connection is an FTP control connection and try to parse the messages. If the other application also sends the string "PORT", the NAT box may					

	mistakenly modify the packet contents, leading to unpredictable affects. If the FTP client and server encrypt their communications, the NAT box cannot parse the PORT command (in the payload of TCP connection) and correctly map the IP address and port number. This can lead to significant confusion for users, when their FTP client works fine in the absence of encryption and then mysteriously does not work when encryption is enabled. **1.e.** In passive mode, the server selects an address and port number, and sends them to the client over the control connection. The client-side NAT does not need to modify the address and port number used by the remote server. (That said, passive mode is challenging in the presence of a server-side NAT box, though this is a much less common configuration.) If you are curious to learn more about the interaction of FTP and NAT.					
18	Consider an agriculture monitoring system to remotely monitor crops in an agricultural field. All the required components should be connected via Wi-Fi enabled internet technology to be accessed remotely. The Sensor deployed on the farm field to capture the crop growth and farm field details Like soil nutrition, prediction, soil temperature monitoring, water level monitoring etc., the client machine continuously monitor the crop details by requesting the server at pre-defined intervals. (a) Design and Establish the secure connection between the Client and Server machines to exchange the data with GUI based suitable protocol? (3) (b) Identify the type of domain and issues in the domain name with Client to access the information from the Server. (2) (c) Justify the domain and the type of protocol which you're planning to implement for the above scenario with example. (3)	10	L4	3	4	2.2.3

	(d) Illustrate how to assign the IP addresses to the new client and automate the process with proper protocol.(2) **Answer :** ➢ Student may implement the program using TCP/IP protocol with socket programming ➢ Student may choose SSH Protocol to exchange the encrypted data between client and server ➢ SSH support GUI based client server communication. ➢ Student may use DNS Generic Domain – example: .org, .com, .info ➢ Students can create their own domain address like www.studagri.org ➢ Proper Justification on selection of particular Domain and the protocol type. ➢ DHCP protocol used to assign the IP address to the client and automate the data exchange.					
19	Examine the procedure to Integrate DHCP and DNS? Analyze the limitations of Boot strap protocol which lead to the development of Dynamic Host Configuration Protocol (DHCP). Discuss the need for Inverse domain in Domain Name System (DNS). **Answer :** procedure to Integrate DHCP 1. Traditionally, DNS and DHCP servers have been configured and managed one at a time. Similarly, changing authorization rights for a particular user on a group of devices has meant visiting each one and making configuration changes. 2. DHCP integration with DNS allows the aggregation of these tasks across devices, enabling a company's network services to scale in step with the growth of network users, devices, and policies, while reducing administrative operations and costs. This integration provides practical operational efficiencies that lower total cost of	10	L3	3	2	1.4.1

ownership.

3. Creating a DHCP network automatically creates an associated DNS zone, for example, reducing the number of tasks required of network administrators. And integration of DNS and DHCP in the same database instance provides unmatched consistency between service and management views of IP address-centric network services data.

b) Limitations of Boot strap protocol

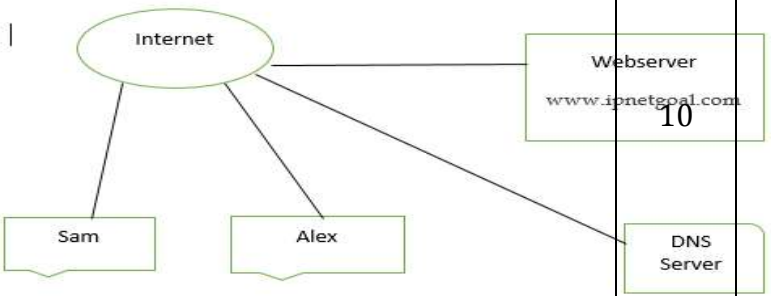
Answer:

1. It is a client server protocol designed to provide information for a diskless computer or a computer that booted at first time
2. The host running on BOOT P client can request a static configuration from a DHCP server
3. There is no option of Dynamic configuration of IP similar to DHCP such as ISP's because it allows a host to obtain a temporary IP address
4. Binding between physical address and IP address is static in BOOTP

c) Need for Inverse domain in Domain name system

Answer:

1. Inverse domain is used to map address to a name
2. When a server has received a request from a client to do a task, whereas the server has a file that contains a list of authorized clients server list only the address of the client
3. To determine if the client is on the authorized list it can send a query to the DNS server and ask for a mapping of address to a name
4. Type of query called an inverse or pointer (PTR) query
5. To handle the pointer query the inverse domain is added to the

	domain name space with the first level node					
20	Barbara is the owner of a company named ABC. His company is placed in Texas His Company wants to establish the communication across various branch offices in India. In this occasion, a system admin named Bob who is working in the Delhi branch wants to communicate with the Texas office regarding requisition of few data to Barbara. Bob sends his system IP address to server and requesting for a domain name. a) Whether Bob can get a domain name even if the Delhi server is not having rights to give domain name? Justify your answer **Ans: Mapping addresses to names and recursive resolution** b) Bob also wants to ask the questions repeatedly from the server. But some questions can't be answered directly by the Delhi office. Surprisingly, Bob is getting answers, how it is possible?(3) **Ans: Iterative Server** c) Not only that Bob got full authority to control all the messages. How it is achieved(3.5) **Ans:DNS Messages-Authoritative Answer**	10	L4	3	4	2.2.3
21	Consider the below figure. Sam and Alex are two users they are connected via internet. Sam is located in India and Alex is located in Kenya. The Web Server is located in US and the DNS Server in Singapore.  a) If HTTP data can be sent or received from user 1(Sam) to the Web Server, what has to be established before? b) If suppose the DNS Server goes down	10	L4	3	4	2.2.3

during the data transfer between the web server and the user, will the communication be disrupted between the Web Server and the users. Justify your answer?

c) User 2 (Alex) pings www.ipnetgoal.com. Is the DNS Server required for the ping to be successful?

d) If suppose both the users Sam and Alex simultaneously types www.ipnetgoal.com. on the browser of the respective computers. Explain in detail how does the server differentiate between the connections?

e) If Sam types www.ipnetgoal.com on the browser window. What would be the destination port number when the DNS request is sent to the DNS Server by Sam.

Answer :

a) The user1′s computer has to establish a TCP 3-way handshake between the client and the server before data can be sent or received.

b) The DNS server is required only for retrieving the IP address associated with a name. Once the IP address is retrieved, the DNS server is not required, until the next time the user tries to access the website and the information is not available in the local DNS cache of the computer.

c) For ping to be successful, the name www.ipnetgoal.com has to be resolved into an IP address for which a DNS Server is required.

d) The server differentiates the connection based on the tcp source port numbers and source IP address in the incoming packet.

e) DNS works on UDP port 53. The DNS request would be sent to UDP port 53 on the DNS server.

3Register Number															

SRM Institute of Science and Technology
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SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Academic Year: 2022-23 (ODD)

Batch -1 Set - A

Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Course Articulation Matrix:

S.No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	CO2	2	3	-	2	1	-	-	-	2	1	-	3
2	CO3	2	3	-	3	1	-	-	-	2	1	-	3

Part – A
(5 x 1 mark = 5 Marks)

Instructions: 1) Answer ALL questions. 2) Write the correct answer in the answer booklet

Q. No	Question	Marks	BL	CO	PO	PI Code
1	SCTP allows _____ service in each association. a) Single stream **b) Multistream** c) Double stream d) None of the above	1	L1	2	1	1.6.1
2	If error occurs in the data transfer between the client and the server, the send and receive function will return a) 0 b) 1 **c) -1** d) 0 or 1	1	L2	2	1	1.6.1
3	RPC works between two processes. These processes must be _____ a) on the same computer b) on different computers connected with a network **c) on the same computer and also on different computers connected with a network**	1	L1	2	1	1.6.1

	d) on none of the computers					
4	In the process of fetching a web page from a server , the HTTP request/response takes a) 2 RTT **b) 1 RTT** c) 4 RTT d) 3 RTT	1	L2	3	1	1.6.1
5	The facilities available in the internet are (i) electronic mail (ii) remote login (iii)file transfer (iv)word processing a. i, ii **b. i, ii, iii** c. i, ii, iv d. ii, iii and iv	1	L1	3	1	1.6.1

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Batch -1 Set - A

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Test: CLA-T2 | Date: 19-10-2022
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Year & Sem: III Year / V Sem | Max. Marks: 25

Part – B
(2 x 10 marks = 20 Marks)

Instructions: Answer the questions

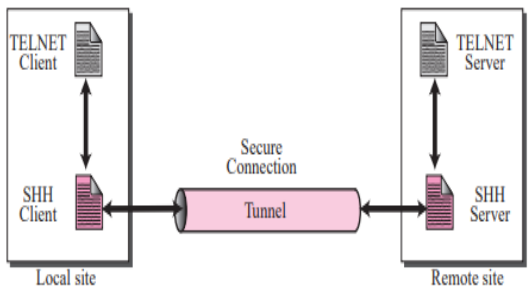
Q. No	Question	Marks	BL	CO	PO	PI Code
6 a.	If an application developer needs to modify the code that is running on a Linux server, How the developer establishes the remote connection in a secured mode and explains the connection protocol in detail.	10	L3	2	2	4.1.1

Answer:-

Port Forwarding

One of the interesting services provided by the SSH protocol is to provide **port forwarding**. We can use the secured channels available in SSH to access an application program that does not provide security services. Application such as TELNET (see Chapter 20) and SMTP (see Chapter 23) can use the services of SSH using port forwarding mechanism. SSH port forwarding mechanism creates a tunnel through which the messages belonging to other protocol can travel. For this reason, this mechanism is sometimes referred to as SSH **tunneling**. Figure 20.18 shows the concept of port forwarding.

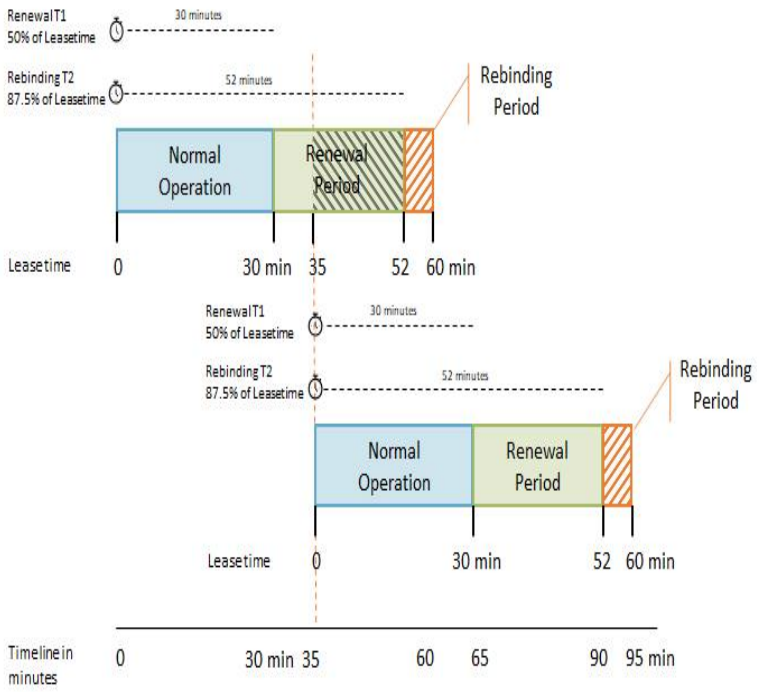
Figure 20.18 *Port Forwarding*

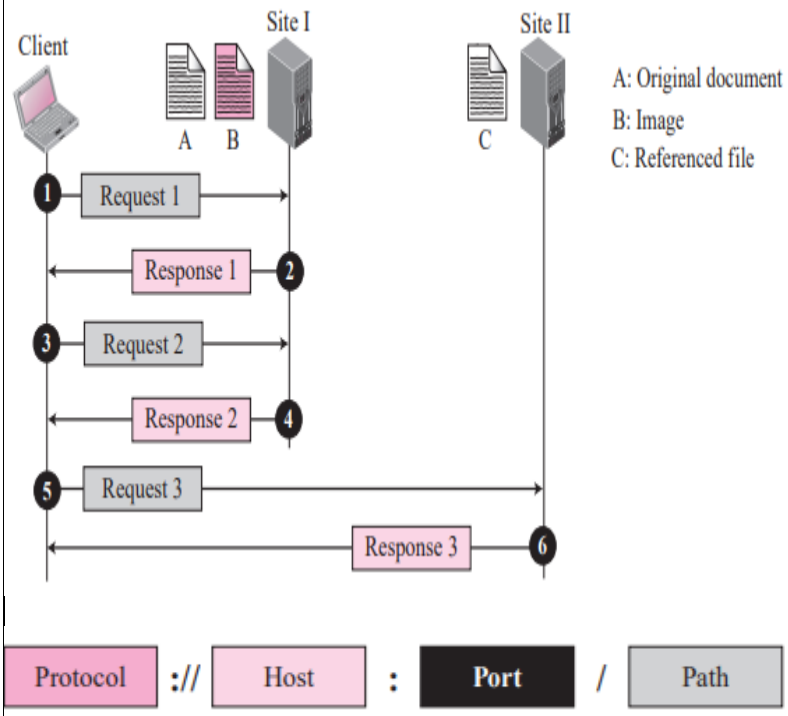


We can change a direct, but insecure, connection between the TELNET client and the TELNET server by port forwarding. The TELNET client can use the SHH client on the local site to make a secure connection with the SSH server on the remote site. Any

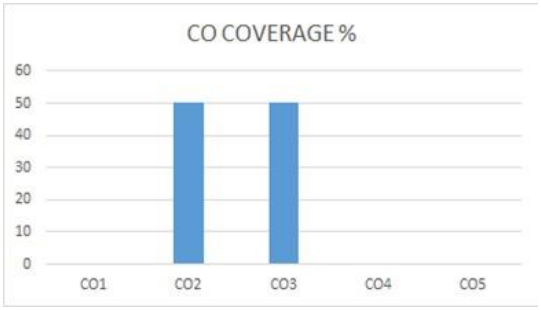
	request from the TELNET client to the TELNET server is carried through the tunnel provided by the SSH client and server. Any response from the TELNET server to the TELNET client is also carried through the tunnel provided by the SSH client and server.					
	(OR)					
6 b.	A receiver received a SCTP packet contains five different chunks such as chunk 1, chunk2 … chunk 5. Chunk 1 the value of type field is 1. Chunk 2 is a data chunk and its flag bits B and E shows the value 1 and 0. Chunk 3 is a data chunk and its flag bits indicates the value of B is 1 and E is 1. Chunk 4 the value of type field is 0, flag bits value of B is 0 and E is 1. 1. Identify the type of Chunk1 and give description for the same. What will be the value of flag field for the chunk1? (2) 2. What is the value of Chunk2 type field and chunk 2 is a fragment or not? (2) 3. What are all the data chunk is a fragment chunk 1, chunk2, chunk3 or chunk4? Give your justification for the same. (2) 4. In SCTP Packets How the receiver knows there is a padding or not? Give your justification. (2) 5. Chunk 5 carries no information. what will be the value of length field? (2) **Answer:-** 1. Identify the type of Chunk1 and give description for the same. What will be the value of flag field for the chunk1? (2) • The value of type field is 1. So chunk 1 is INIT chunk (initiation chunk). • Initiation chunk is the first chunk sent by an end point to establish an association 2. What is the value of Chunk2 type field and chunk 2 is a fragment or not? (2) • Chunk 2 is a data chunk. So its value of type field will be 0. • Chunk 2 is fragment because The B (beginning) and E (end) bits together define the position of a chunk in a message that is fragmented for the chunk 2 beginning is 1 and end is 0. 3. What are all the data chunk is a fragment chunk 1, chunk2, chunk3 or chunk4? Give your justification for the same. (2)	10	L2	2	2	2.7.1

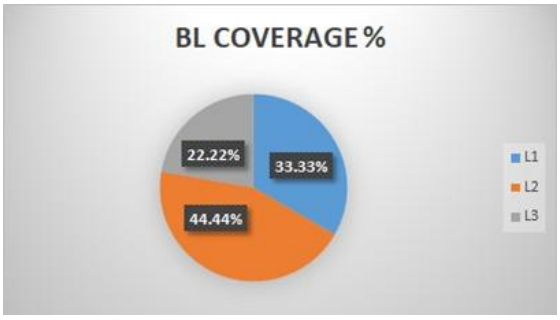
	• Chunk 2 and chunk 4 is fragmented. • Chunk 1 is INIT chunk • Chunk 2, 3, and 4 having value of B and F. • Chunk2 B=1 and E=0 it is the first fragment. • Chunk3 B=1 and E=1 no fragment. • Chunk4 B=0 and E=1 it is the last fragment. 4. In SCTP Packets How the receiver knows there is a padding or not? Give your justification. (2) The length of the padding, if any, is not included in the calculation of the length field. This helps the receiver find out how many useful bytes a chunk carries. If the length field value is not a multiple of 4, the receiver knows there is padding. 5. Chunk 5 carries no information. what will be the value of length field? (2) If a chunk carries no information, the value of the length field is 4 (4 bytes).					
7 a.	The DHCP mandates a minimum address lease of 24 hours. Can you imagine a situation in which DHCP's lease time causes inconvenience? Explain with an example. **Answer:-** **Students needs to explain by considering their own scenario as an example given below.** **Scenario:** If you have a coffee bar and you get 400 visitors a day. They stay on average 30 to 60 minutes and you have a DHCP Pool of 200 IP Address (192.168.0.10 – 192.168.0.210 for example). When you leave the DHCP Lease Time on the default 24 hours (1440 minutes) after 200 guest no other guest can use the free WIFI network. Because all the 200 IP Addresses are reserved for the first 200 guests. So, in this case you want to lower the DHCP Lease Time to one hour for example. This way the reservation is	10	L3	3	2	2.7.1

	released soon enough for the other guests:  With a lease time one hour, the client will try to renew the lease after 30 minutes. At 35 min it contacts the DHCP server to extend/renew the lease. It's granted so the timers reset, a new lease is acquired for another 60 minutes. In total, the IP Address is reserved for 95 minutes. With 200 addresses available you can have 130 guests per hour on average on your network.					
	(OR)					
7 b.	Assume you need to retrieve a scientific document that contains one reference to another text file and one reference to a large image. The main document and the image are stored in two separate files on the same site (file A and file B); the referenced text file is stored on another site (file C). Demonstrate the three transactions to see the whole document. Also, give the uniform resource locator format to locate any kind of information on the Internet. **Answer:-**	10	L2	3	1	1.6.1

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions





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Batch -1 Set - B

Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Course Articulation Matrix:

S.No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	CO2	2	3	-	2	1	-	-	-	2	1	-	3
2	CO3	2	3	-	3	1	-	-	-	2	1	-	3

Part – A
(5 x 1 mark = 5 Marks)

Instructions: 1) Answer ALL questions. 2) Write the correct answer in the answer booklet

Q. No	Question	Marks	BL	CO	PO	PI Code
1	Intel follows _____ type of ordering to store the data. a. Both Little and Big Endian b. Little or Big Endian c. Big Endian **d. Little Endian**	1	L1	2	1	1.6.1
2	In a connection, the value of cwnd is 4000 and the value of rwnd is 5000. The host has sent 1,000 bytes, which have not been acknowledged. How many more bytes can be sent? a. 4000 b. 1000 c. 2000 **d. 3000**	1	L2	2	1	1.6.1
3	The FIN + ACK segment consumes _____ sequence number if it does not carry data. a. 0 **b. 1** c. 2 d. 3	1	L2	2	1	1.6.1
4	Which of the following statement is wrong? a) telnet is a general purpose client-server program b) telnet lets user access an application on a remote computer **c) telnet can also be used for file transfer** d) telnet can be used for remote login	1	L1	3	1	1.6.1
5	The port number _____ and _____is used for data and control connection a) 21, 20	1	L1	3	1	1.6.1

	b) 20,21 c) 20,12 d) 12,21					

Register Number															

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Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Part – B
(2 x 10 marks = 20 Marks)

Instructions: Answer the questions

Q. No	Question	Marks	BL	CO	PO	PI Code
6 a.	The problem is to implement a client - server user-level application using sockets API in C/C++. The Server application has to support at least five clients simultaneously. Server accepts strings from clients (even multiple strings from each client) and replies with reverse strings. For example, when client sends "NAME", Server replies with "EMAN". Both server and client(s) have to output both sending & receiving strings on the terminal.	10	L3	2	2	2.6.3

Answer:-

Client

```
#include <arpa/inet.h>
#include <netinet/in.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
#include <unistd.h>

#define PORT 8090

// Driver code
int main()
{
    struct sockaddr_in address;
    int sock = 0, valread;
    struct sockaddr_in serv_addr;
    char str[100];

    printf("\nInput the string:");
    scanf("%[^\n]s", str);

    char buffer[1024] = { 0 };
```

```
    // Creating socket file descriptor
    if ((sock = socket(AF_INET,
                       SOCK_STREAM, 0))
        < 0) {
        printf("\n Socket creation error \n");
        return -1;
    }

    memset(&serv_addr, '0', sizeof(serv_addr));
    serv_addr.sin_family = AF_INET;
    serv_addr.sin_port = htons(PORT);

    // Convert IPv4 and IPv6 addresses from
    // text to binary form 127.0.0.1 is local
    // host IP address, this address should be
    // your system local host IP address
    if (inet_pton(AF_INET, "127.0.0.1",
                  &serv_addr.sin_addr)
        <= 0) {
        printf("\nAddress not supported \n");
        return -1;
    }

    // connect the socket
    if (connect(sock, (struct sockaddr*)&serv_addr,
                sizeof(serv_addr))
        < 0) {
        printf("\nConnection Failed \n");
        return -1;
    }

    int l = strlen(str);

    // send string to server side
    send(sock, str, sizeof(str), 0);

    // read string sent by server
    valread = read(sock, str, l);

    printf("%s\n", str);

    return 0;
}
```

Server

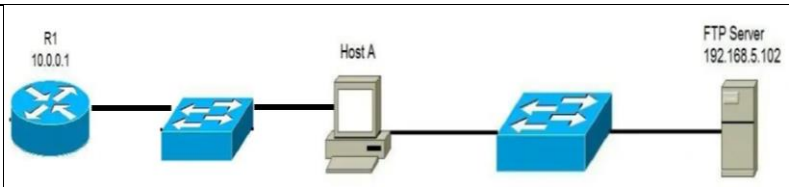
```
#include <netinet/in.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/socket.h>
#include <unistd.h>

#define PORT 8090
```

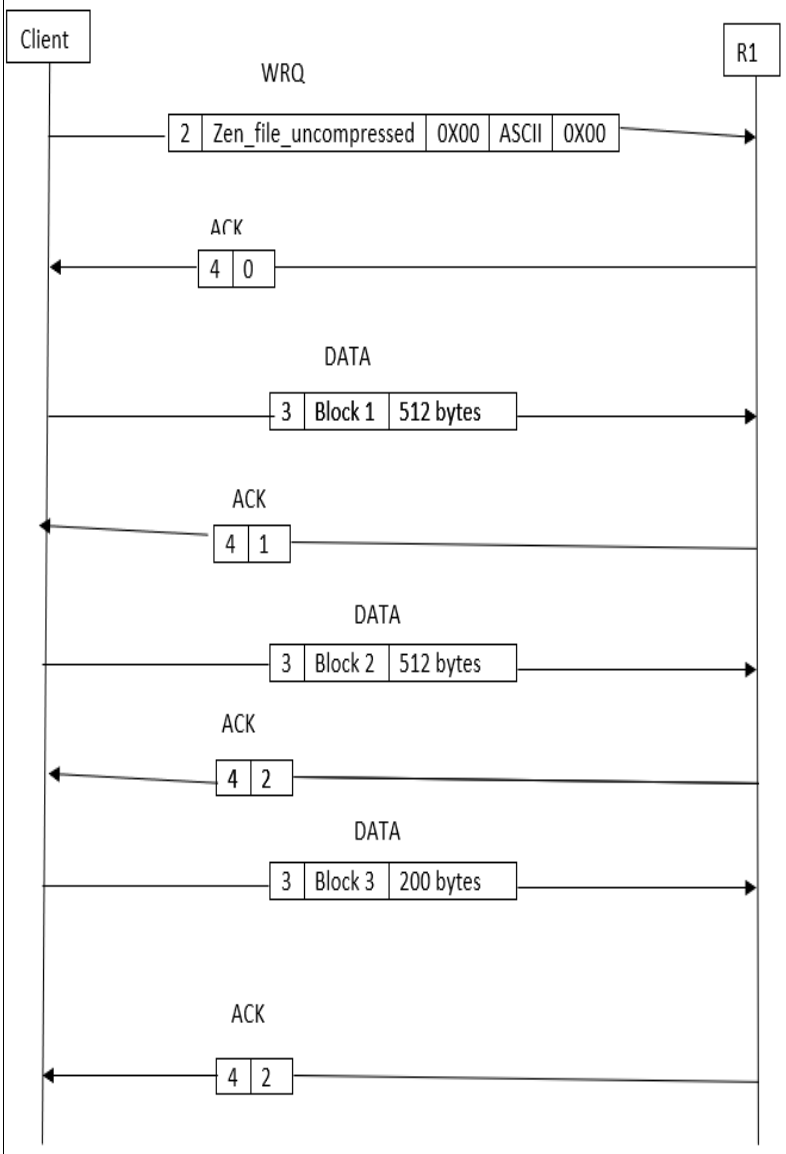
```
// Driver code
int main()
{
    int server_fd, new_socket, valread;
    struct sockaddr_in address;
    char str[100];
    int addrlen = sizeof(address);
    char buffer[1024] = { 0 };
    char* hello = "Hello from server";

    // Creating socket file descriptor
    if ((server_fd = socket(AF_INET,
                        SOCK_STREAM, 0)) == 0) {
        perror("socket failed");
        exit(EXIT_FAILURE);
    }

    address.sin_family = AF_INET;
    address.sin_addr.s_addr = INADDR_ANY;
    address.sin_port = htons(PORT);

    // Forcefully attaching socket to
    // the port 8090
    if (bind(server_fd, (struct sockaddr*)&address,
                        sizeof(address)) < 0) {
        perror("bind failed");
        exit(EXIT_FAILURE);
    }

    // puts the server socket in passive mode
    if (listen(server_fd, 3) < 0) {
        perror("listen");
        exit(EXIT_FAILURE);
    }
    if ((new_socket = accept(server_fd,
                (struct sockaddr*)&address,
                (socklen_t*)&addrlen)) < 0) {
        perror("accept");
        exit(EXIT_FAILURE);
    }

    // read string send by client
    valread = read(new_socket, str,
                  sizeof(str));
    int i, j, temp;
    int l = strlen(str);

    printf("\nString sent by client:%s\n", str);

    // loop to reverse the string
    for (i = 0, j = l - 1; i < j; i++, j--) {
        temp = str[i];
        str[i] = str[j];
        str[j] = temp;
    }
```

	// send reversed string to client
	// by send system call
	send(new_socket, str, sizeof(str), 0);
	printf("\nModified string sent to client\n");
	
	return 0;
	}					

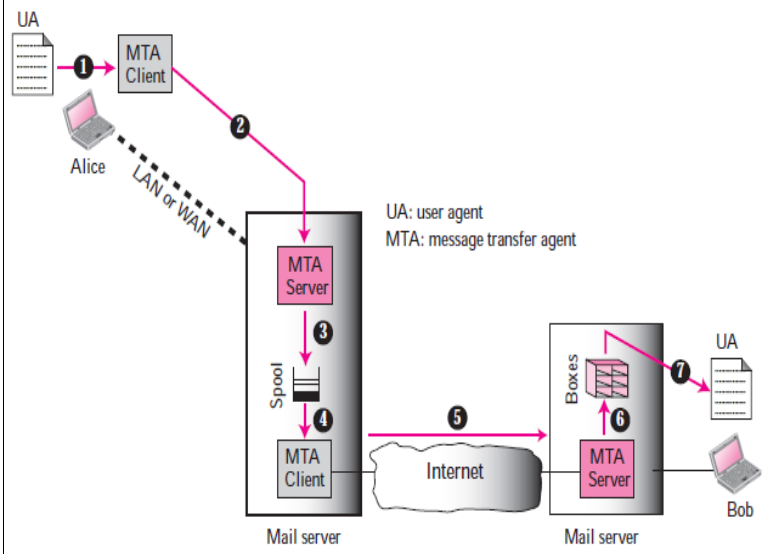
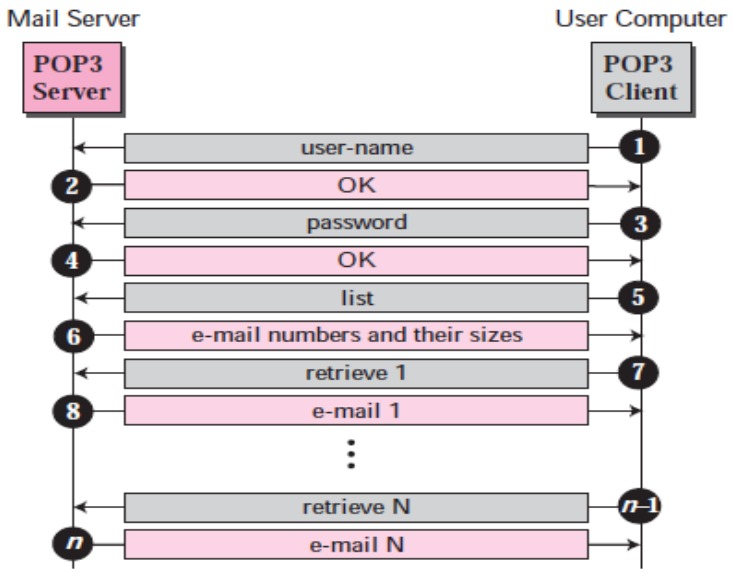
	(OR)					
6 b.	1. A client uses UDP to send data to a server. The data length is 16 bytes. Calculate the efficiency of this transmission at the UDP level (5 Marks) **Answer:-** Length of Header = 8 bytes Data length = 16 Bytes Total bytes transferred = Length of Header+ Data length = 24 bytes Efficiency = useful bytes transferred / Total Bytes Transferred = 16/24 =66.667% 2. Answer below question. i) Discuss about the types of Byte ordering. (2) ii) What are the examples of Byte ordering? (1) iii) Does bigendian affects file formats? (1) iv Which one is better byte ordering? (1) **Answer:-** i) An arrangement of bytes when data is transmitted over the network is called byte ordering. Different computers will use different byte ordering. ●When communication taking place between two machines byte ordering should not make discomfort. ●Generally an Internet protocol will specify a common form to allow different machines byte ordering. TCP/IP is the Internet Protocol in use. ●Two ways to store bytes : Big endian and little endian ●Big-endian –High order byte is stored on starting address and low order byte is stored on next address ●Little-endian –Low order byte is stored on starting address and high order byte is stored on next address	10	L2	2	1	1.6.1

	ii) Intel based processors are little endians. ARM processors were little endians. Current generation ARM processors are bi-endian. Motorola 68K processors are big endians. PowerPC (by Motorola) and SPARK (by Sun) processors were big endian. Current version of these processors are bi-endians. iii) File formats which have 1 byte as a basic unit are independent of e.g., ASCII files. Other file formats use some fixed endianness format e.g, JPEG files are stored in big endian format. iv) The term little and big endian came from Gulliver's Travels by Jonathan Swift. Two groups could not agree by which end an egg should be opened -a- the little or the big. Just like the egg issue, there is no technological reason to choose one-byte ordering convention over the other, hence the arguments degenerate into bickering about sociopolitical issues. As long as one of the conventions is selected and adhered to consistently, the choice is arbitrary.					

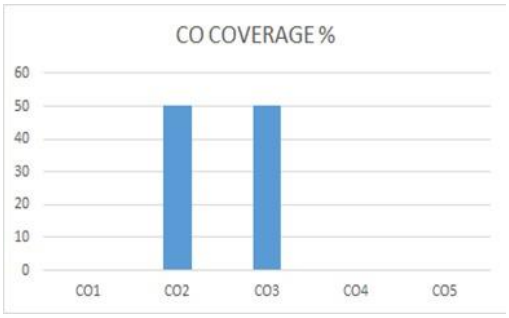
7 a.	 **1.** Zen access the host A machine needs to download the ascii file "Zen_file" in compressed form from the FTP Server. The file resides in the path "ftpd/user/Zen". Identify the suitable protocol and suggests Zen in framing the appropriate commands to download the file. **Answer:-** **File Transfer Protocol** 220 (Service ready) USER Zen 331 (User name OK. Password?) PASS yyy 230 (User login OK) PORT 1267 150 (Data Connection opens shortly) TYPE ASCII 200 (OK) STRU F 200 (OK) MODE C 200 (OK) RETR ftpd/user/Zen/Zen_file 250 (OK) (Data Transfer from server to client) 226 (Closing data connection) QUIT 221 (Service closing) **2.** Zen uncompresses the received Zen_file and needs to store in R1. The uncompressed Zen_file consumes 1224 bytes of data. Identify the suitable protocol and suggest Zen in framing message structure in writing the content to R1. **Answer:-** **Trivial File Transfer Protocol**	10	L3	3	2	2.6.3

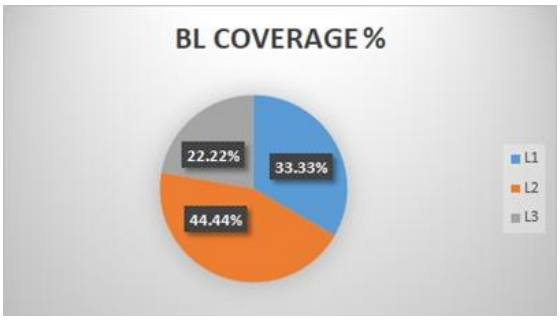

Client
R1
WRQ
2
Zen_file_uncompressed
0X00
ASCII
0X00
ACK
4
0
DATA
3
Block 1
512 bytes
ACK
4
1
DATA
3
Block 2
512 bytes
ACK
4
2
DATA
3
Block 3
200 bytes
ACK
4
2

(OR)

7b.	1. In Email communication system, A sender is connected to the mail server via LAN/WAN, identify the component requirements and draw the system architecture. **Answer:-**  2. Why Message Access Agent is required, and with a neat interaction diagram, specify the interaction between user computer and POP3 server. **Answer:-** The actual mail transfer is done through message transfer agents. To send mail, a system must have the client MTA, and to receive mail, a system must have a server MTA. The first and the second stages of mail delivery use SMTP. However, SMTP is not involved in the third stage because SMTP is a push protocol; it pushes the message from the client to the server.  	10	L2	3	1	1.6.1

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions





CO2 – 50%, CO3 – 50%

Register Number															

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Batch -2 Set - C

Academic Year: 2022-23 (ODD)

Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Course Articulation Matrix:

S.No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	CO2	2	3	-	2	1	-	-	-	2	1	-	3
2	CO3	2	3	-	3	1	-	-	-	2	1	-	3

Part – A
(5 x 1 mark = 5 Marks)
Instructions: 1) Answer ALL questions. 2) Write the correct answer in the answer booklet

Q. No	Question	Marks	BL	CO	PO	PI Code
1	The Socket API function that converts an unconnected active TCP socket into a passive socket is _____. a. Bind Function b. Socket Function **c. Listen Function** d. Accept Function	1	L1	2	1	1.6.1
2	TCP connection is transferring the file of size 4000 bytes. The first byte is numbered 20,001. What will be the sequence number for the third segment if data are sent in four segments each carrying 1000 bytes? a. 20,001 b. 21,001 **c. 22,001** d. 23,001	1	L1	2	1	1.6.1
3	The UDP header in hexadecimal format is given as **CD83000B001C001C.** What is the source port number? **a. 52611** b. 52100 c. 52099 d. 52355	1	L2	2	1	1.6.1
4	The value of the magic cookie is _____ a. 99.130.81.88 **b. 99.130.83.99** c. 99.131.82.99 d. 99.99.99.99	1	L2	3	1	1.6.1
5	In the _____ encoding scheme, 24 bits become 4 characters, and eventually are sent as 32 bits.	1	L1	3	1	1.6.1

	a. 8bit b. 16bit **c. base64** d. binary					

Register Number															

SRM Institute of Science and Technology
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Academic Year: 2022-23 (ODD)

Batch -2 Set - C

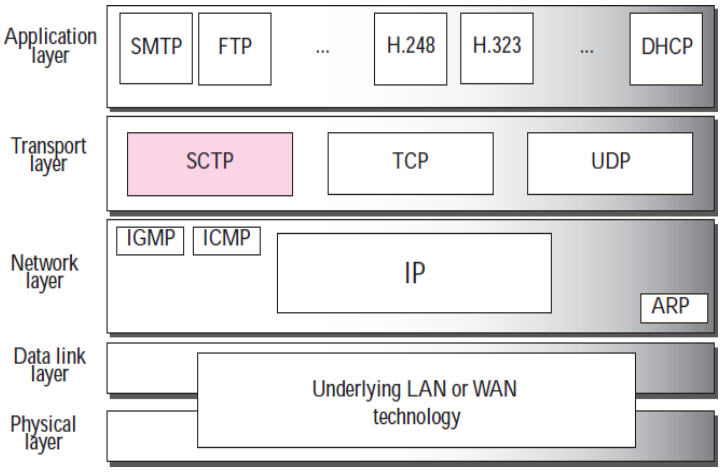
Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Part – B
(2 x 10 marks = 20 Marks)

Instructions: Answer the questions

Q. No	Question	Marks	BL	CO	PO	PI Code
6 a.	User1 wants to communicate with user2 for transfer data with each other. For communicating of each user can create a socket module for data transfer. Each user can transmit data to another user. Format of the data transfer between host and user in byte order. The following question are as i) What is byte ordering in network programming? (2M) ii) Why byte order functions is need for network (2M) programming? iii) Socket module provides various functions for translating host order to network order (6M) **Solution:** i) This convention, known as network byte order, defines the bit-order of network addresses as they pass through the network. The TCP/IP standard network byte order is big-endian. In order to participate in a TCP/IP network, little-endian systems usually bear the burden of conversion to network byte order. ii) To allow machines with different byte order conventions communicate with each other, the Internet protocols specify a canonical byte order convention for data transmitted over the network. This is known as Network Byte Order. iii) htonl() translates an unsigned long integer into network byte order. htons() translates an unsigned short integer into network byte order. ntohl() translates an unsigned long integer into host byte order. ntohs() translates an unsigned short integer into host byte order.	10	L3	2	2	2.6.3

(OR)

6 b.	Alice and Bob discuss about the use of computer network for a particular application. They want to share multiple audio and video streams of data in each connection with increasing reliability or performance. They want to use a reliable message oriented protocol for this purpose. Help them with the explanation of such a protocol. Also differentiate in what ways this protocol is different from the existing protocols used for similar use. Outline the services provided by such protocol. **Solution:** **Key:** Identifying the need for SCTP (4) Comparison and contrasting of UDP, TCP, and SCTP (3) Outlining the SCTP services (3) SCTP (4): SCTP is designed as a general-purpose transport layer protocol that can handle multimedia and stream traffic, which are increasing every day on the Internet. It is a new reliable, message-oriented transport-layer protocol.  Comparison and contrasting of UDP, TCP, and SCTP (3)	10	L2	2	1	1.6.1

UDP	TCP	SCTP
Message-oriented protocol	Byte-oriented protocol	Best features of UDP and TCP
UDP conserves the message boundaries	No preservation of the message boundaries	Preserves the message boundaries along with detection of lost data, duplicate data, and out-of-order data
UDP is unreliable	TCP is a reliable protocol	SCTP is a reliable message oriented Protocol
Lacks in congestion control and flow control	TCP has congestion control and flow control mechanisms	It has congestion control and flow control mechanisms

SCTP services (3)

Process-to-Process Communication

Multiple Streams

Multihoming

Full-Duplex Communication

Connection-oriented service

Reliable service

7 a.	A customer connects to the ISP and wants to send request for websites to the ISP. The servers and routers in the ISP send these requests to its own DNS cache server and Name Servers, sometimes have to send a query to a Root Name	10	L3	3	2	2.6.3

Server outside of the ISP if it is unable to resolve the requested domain name within its system. When the Root Server resolves the request, the ISP will add this information to its own DNS system.

The solution had to be able to capture DNS traffic in such a way that shows every bit of information about what was happening during the DNS query process, while also being able to store the data and able to run analysis on the data.

i) How do you capture DNS traffic and look at every specific detail of the packet in order to identify the issues, or important traffic information?

In order to solve the main issue for all DNS solutions is that they need to reply to queries quickly and with the correct information. The correct information means that the ISP can resolve the request with the correct address, and hopefully, not direct the end−user to a malicious site. Thus, one of the main problems DNS systems face is Security.

ii) Discuss about possible corruptions happening in DNS server records.

Solution:

i)

Traffic Analysis:

How do you capture DNS traffic and look at every specific detail of the packet in order to identify the issues, or important traffic information?

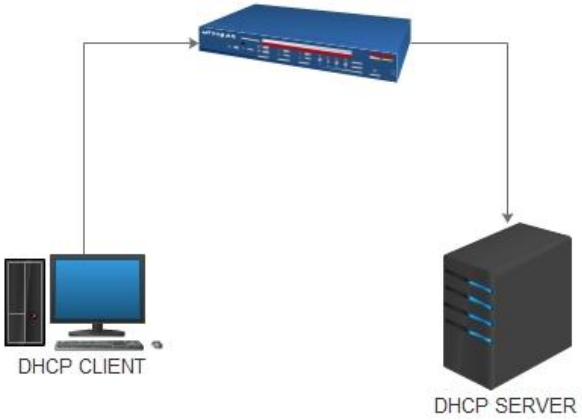
This was one of the major concerns for the ISP since their current solution could not capture and do a Deep Packet Inspection with the detail they needed. They needed to be able to look at captured data overa period of time and look at historical bits of information. This information could provide them the abilityto see traffic patterns, trends, errors, DNS attacks, and even misconfigured network elements such as routers, switches and DNS servers.

Another issue is that of dropped packets. Yes, packets can be dropped in a DNS query and an error is sentto the client. Through traffic analysis, the ISP can see why, and where, the packets are being dropped.

They also want to see when an address is queried and is not resolved, but directs the client to a default search engine or specific page. They want to be able to tell why it's not being resolved. It may not be a malicious redirect, but rather a request typed incorrectly by the client, or the domain may not exist anymore. There are many possibilities for this, but being able to find the exact reason why, quickly, is of major importance as the ISP has to be concerned with the satisfaction of their customers.

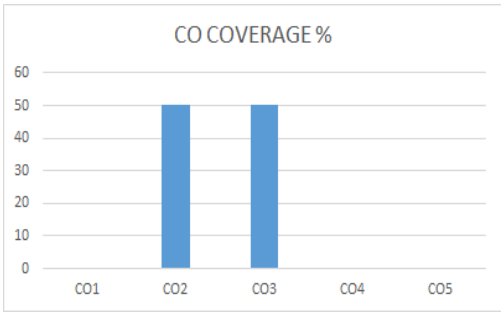
Differences between a DNS cache system and the Name Server can cause many issues for a DNS resolversystem. Symmetry between these systems is a key issue that the ISP was concerned about. If the DNS cache is not updated by the Name Servers, then it will always query the Name Servers for the domain name, creating an

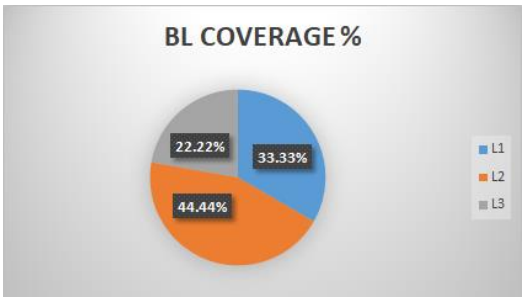
	unnecessary step and extra traffic in the query process. ii) **Security Issues:** 1. DOS attacks − Servers supporting recursive DNS queries are vulnerable to phony requests thatflood a particular IP address with the results of each server's query. This can overwhelm the IPaddress with a volume of traffic, causing the site/server to crash. 2. Cache Poisoning − the attacker corrupts a DNS server by replacing a legitimate IP address in theserver's cache with a re−direct address in order to redirect traffic to a malicious website. 3. DNS amplification − a form of DDoS, the attacker takes advantage of a DNS server that permits recursive lookups and uses recursion to spread the attack to other DNS servers. The system sends requests to the targeted IP address (victim), causing a storm of responses to flood the IPaddress and shuts the site down. DNS Fast−Flux − is a DNS technique used by botnets to hide phishing and malware delivery sites behind an ever−changing network of compromised hosts acting as proxies. The basic idea behind Fast flux is to have numerous IP addresses associated with a single fully qualified domain name, where the IP addresses are swapped in and out with extremely high frequency, through changing DNS records. 4. DNS Fast−Flux − is a DNS technique used by botnets to hide phishing and malware delivery sites behind an ever−changing network of compromised hosts acting as proxies. The basic idea behindFast flux is to have numerous IP addresses associated with a single fully qualified domain name, where the IP addresses are swapped in and out with extremely high frequency, through changingDNS records.					
(OR)						

7 b.	i) Can DHCP prevent unauthorized laptops from using a network that uses DHCP for dynamic addressing? ii) Explain the communication flow between a DHCP client and server on a network with two DHCP Servers. iii) Consider the below diagram, a DHCP client and server is connected to a switch. How does the DHCP process start?  **Solution:** **i) 3M** **Answer** – No, DHCP is not capable of distinguishing between a permanent MAC address and the address by the user. So, it cannot stop unauthorized access to a network and cannot control the IP addresses used by users. ii) 3M The first packet the DHCP Client initiates would be the DHCP Discover packet. The DHCP Discover packet is broadcast in nature and would be received by both the DHCP servers. The DHCP servers would respond with DHCP offer packet containing the IP addresses which they offer. Based on the first DHCP offer the client receives, the client would respond with DHCP request packet which contains the IP address which it would be using along with the DHCP servers IP address which had provide the respective. This packet is sent as broadcast. The packet, when received by the other DHCP server would understand that the IP address which it had leased to the client (In the DHCP offer packet) is not taken. So, the DHCP server would put the IP address back to its pool. iii) 4M The TCP/IP of the client would be configured with the option 'Obtain IP address automatically'. This is meant for DHCP clients. This configuration would automatically trigger a DHCP Discover packet from the PC. This packet	10	L2	3	1	1.6.1

	would reach the DHCP server which would then respond with the DHCP offer packet.					

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions





CO2 – 50%, CO3 – 50%

Register Number															

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Batch -2 Set - D

Academic Year: 2022-23 (ODD)

Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Course Articulation Matrix:

S.No.	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	CO2	2	3	-	2	1	-	-	-	2	1	-	3
2	CO3	2	3	-	3	1	-	-	-	2	1	-	3

Part – A (5 x 1 mark = 5 Marks)
Instructions: 1) Answer ALL questions. 2) Write the correct answer in the answer booklet

Q. No	Question	Marks	BL	CO	PO	PI Code
1	Winsock and Socket are examples of _____. a. DSL **b. API** c. IPX d. VCN	1	L1	2	1	1.6.1
2	Echo protocol in TCP uses _____ port number to echo the received datagram back to the sender. **a. 7** b. 9 c. 11 d. 13	1	L2	2	1	1.6.1
3	A packet is carrying a COOKIE ECHO message and a DATA chunk. If the size of the cookie is 300 bytes and that of the user data is 15 bytes, what is the size of the packet? **a. 347** b. 350 c. 345 d. 315	1	L2	2	1	1.6.1
4	When both sender and receiver are connected to a mail server via a LAN or a WAN, we need _____. a. three UAs, and three pairs of MTAs b. two UAs, and two pairs of MTAs c. two UAs, two pairs of MTAs, and two pairs of MAAs **d. two UAs, two pairs of MTAs, and a pair of MAAs**	1	L1	2	1	1.6.1
5	_____ is more powerful and complex than _____ a. POP3; IMAP4 **b. IMAP4; POP3** c. SMTP; POP3 d. SMTP; IMAP4	1	L1	2	1	1.6.1

Register Number															

SRM Institute of Science and Technology
College of Engineering and Technology
School of Computing
SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Batch -2 Set - D

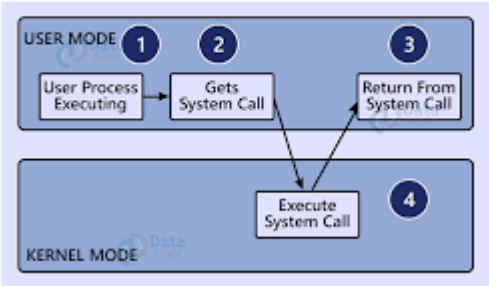
Academic Year: 2022-23 (ODD)

Test: CLA-T2 | Date: 19-10-2022
Course Code & Title: 18CSC302J – Computer Networks | Duration: 1 Period
Year & Sem: III Year / V Sem | Max. Marks: 25

Part – B
(2 x 10 marks = 20 Marks)

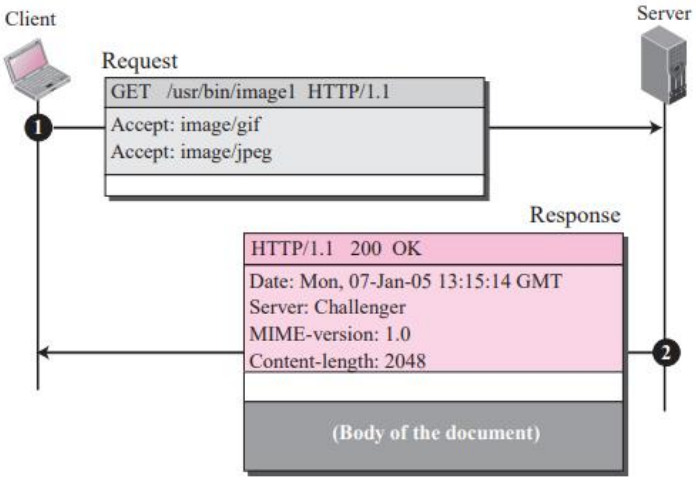
Instructions: Answer the questions

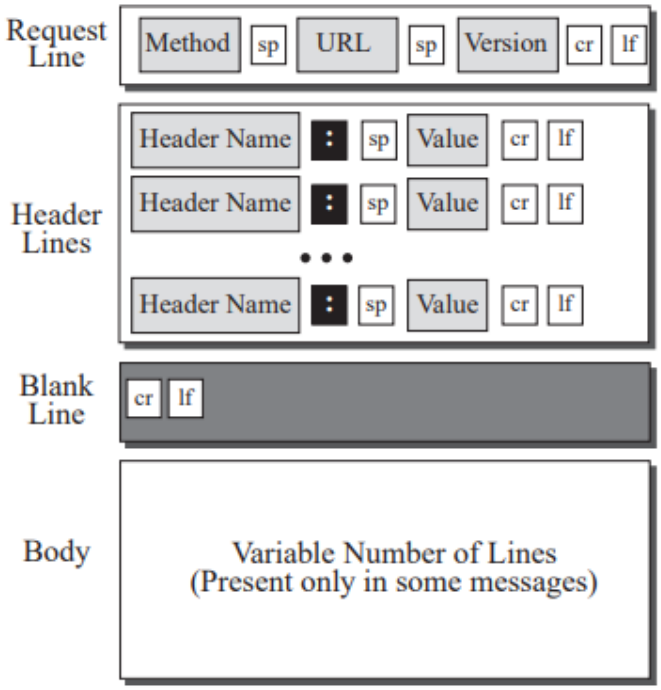
Q. No	Question	Marks	BL	CO	PO	PI Code
6 a.	Sam was studying for computer networks exam. While studying he got a doubt regarding which programmatic way provides the services to interact with the operating system. Help him in identifying the relevant concept to clear his doubt. Also list out the services provided by the identified concept with a diagrammatic representation. **Solution:** **System Call** In computing, a system call is the programmatic way in which a computer program requests a service from the kernel of the operating system it is executed on. A system call is a way for programs to interact with the operating system. A computer program makes a system call when it makes a request to the operating system's kernel. System call provides the services of the operating system to the user programs via Application Program Interface (API). It provides an interface between a process and operating system to allow user-level processes to request services of the operating system. System calls are the only entry points into the kernel system. All programs needing resources must use system calls. **Services Provided by System Calls:** 1. Process creation and management 2. Main memory management 3. File Access, Directory and File system management	10	L3	2	2	2.6.3

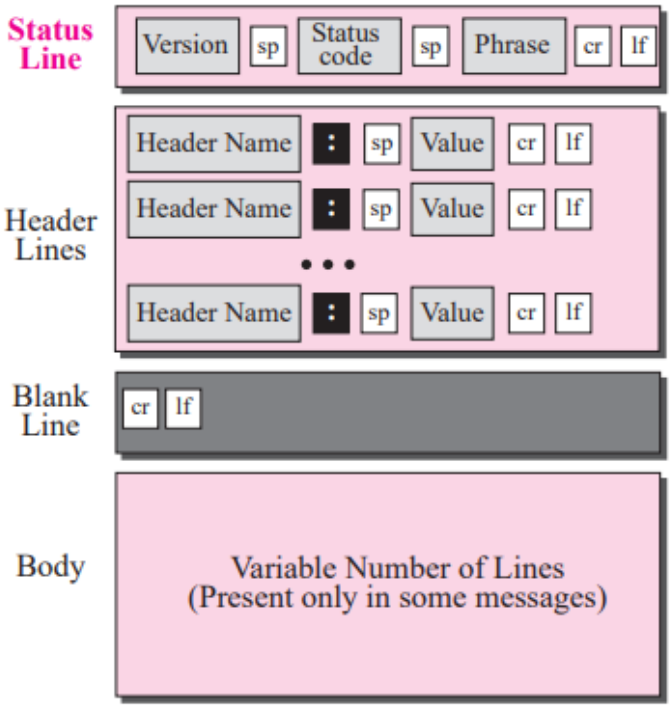
	4. Device handling(I/O) 5. Protection 6. Networking, etc. **Types of System Calls**: There are 5 different categories of system calls – 1. Process control: end, abort, create, terminate, allocate and free memory. 2. File management: create, open, close, delete, read file etc. 3. Device management 4. Information maintenance 5. Communication WORKING OF A SYSTEM CALL  					
	(OR)					
6 b.	The following is a dump of a UDP header in hexadecimal format. 0045DF0000580000 i. What is the source port number? ii. What is the destination port number? iii. What is the total length of the user datagram? iv. What is the length of the data? v. Has the sender calculated checksum for this packet? **Solution:** a. 0045 = 69 b. DF00 = 57088 c. 0058 = 88 bytes d. 88 bytes – 8 bytes header= 80 bytes e. Last 16 bits are zeros so no calculated checksum	10	L2	2	1	1.6.1
7 a.	Sketch the format of the HTTP request and response message. Illustrate the following scenario, assume in HTTP transactions for communication between client and server use the GET method to retrieve an image with the URL, path	10	L3	3	2	2.6.3

/usr/bin/image1. The client can accept images in GIF or JPEG format. The request does not have a body. The response message must contain the date, server, MIME version, and length of the document which is 2048. Followed by a header the body of the document can be blank.

Solution:







(OR)

7 b. Rahul sends a mail to his parents. As Email has some limitations supplementary protocols are used so that non-ASCII data can be sent through e-mail. Some specific header fields are added with respective to the conversion done in the message.

i. Explain as when the RFC subtype and Partial subtype will be used?

ii. In Which type of the encoding scheme the non-ASCII character is represented as three characters.

iii. Explain how the following set of bits (Non-Ascii Data) can be encoded using Base 64.

10110100	10000001	00000101

iv. Draw the structure of MIME Header for MIME version 1.1.

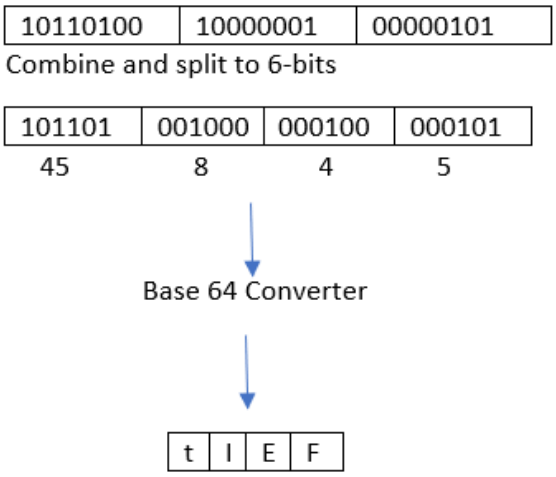
10 | L2 | 3 | 1 | 1.6.1

Solution:

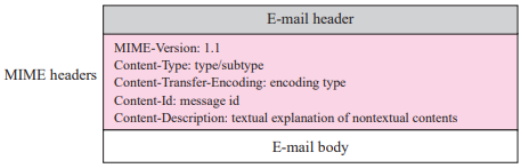
a. RFC822, partial, and external-body. The subtype RFC822 is used if the body is encapsulating another message (including header and the body). The partial subtype is used if the original message has been fragmented into different mail messages and this mail message is one of the fragments. The fragments must be reassembled at the destination by MIME. Three parameters must be added: id, number, and the total. The id identifies the message and is present in all the fragments. The number defines the sequence order of the fragment. The total defines the number of fragments that comprise the original message.

b. Quoted-printable

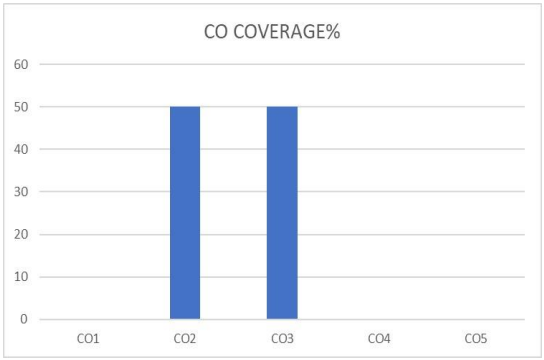
c. Base64 transforms this type of data to printable characters, which can then be sent as ASCII characters or any type of character set supported by the underlying mail transfer mechanism. Base64 divides the binary data (made of streams of bits) into 24-bit blocks. Each block is then divided into four sections, each made of 6 bits

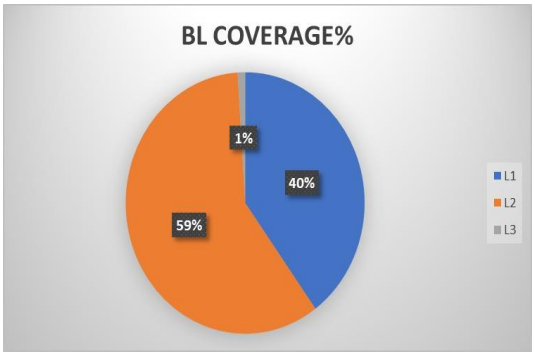


d.



Course Outcome (CO) and Bloom's level (BL) Coverage in Questions





CO2 – 50%, CO3 – 50%