PES UNIVERSITY

BENGALURU - 560085

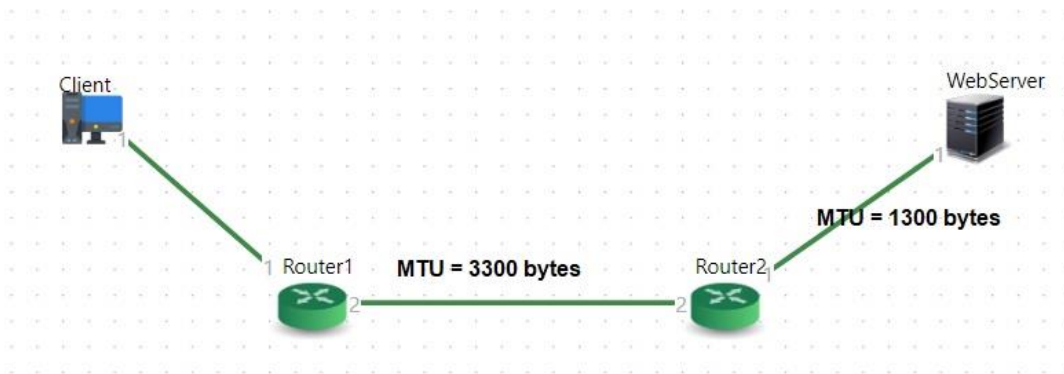
(Estd. Under Karnataka Act 10 of 2013)

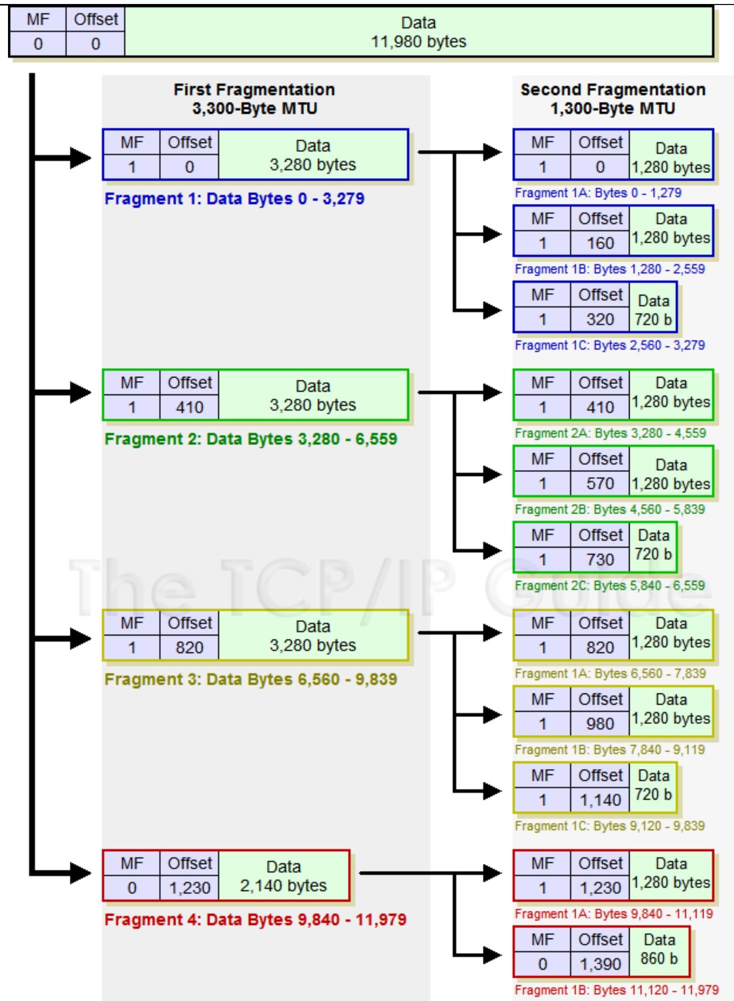
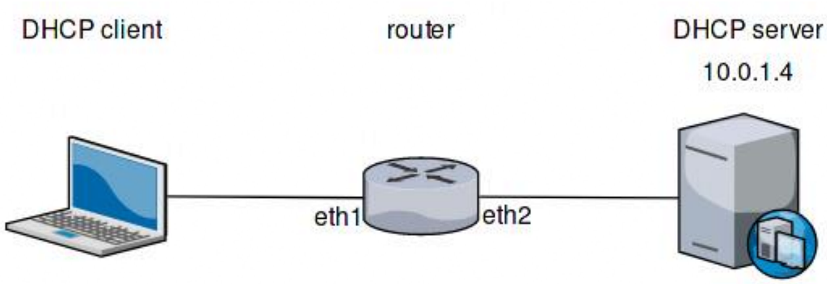
UE18CS301

November 2020: IN-SEMESTER ASSESSMENT (ISA-2)
B.Tech (CSE) – V SEMESTER

UE18CS301 – COMPUTER NETWORKS

Answer Scheme

1.	a)	Refer to the exhibit.  Assume that an IP message of 12,000 bytes wide (including the 20-byte IP header) from Client needs to be sent to the WebServer over two links with different MTU value of 3,300 bytes and 1300 bytes respectively. How does the two routers perform IP fragmentation?	6

			
	b)	Refer to the exhibit.  i. What are the IP destination and source addresses of a DHCP discover and offer message for the above? ii. Recall the three values that are contained in a DHCP server offer message.	3
		Discover message Destination: 255.255.255.255, Source: 0.0.0.0 **Offer message** Destination: 255.255.255.255, Source: 10.0.1.4 **Three Values** Proposed IP address for client, network mask, IP address lease time	
	c)	List out the three different techniques that are used in the switching fabric of a router that manage the actual switching of packets from an input port to an output port.	1
		Switching via memory, bus and interconnection network	

2.

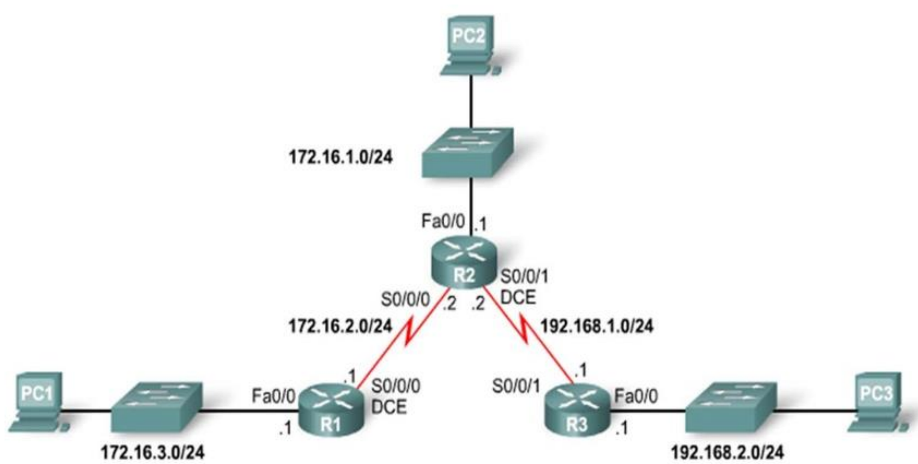
2.	a)	Calculate the subnet mask, number of addresses possible, first and last usable address on the subnetwork that the node 192.168.1.15/26 belongs to.	4

This is a class C address!
11111111.11111111.11111111.11000000 in bits
Subnet: **255.255.255.192**
CIDR value: /26 (Network prefix) & hence Host has: 32-26 = 6 bits
Number of possible host addresses: 2^6 = 64 or 64-2 = **62 usable addresses**
The first usable address is **192.168.1.1/26**
The last usable address is **192.168.1.62/26**

	b)	Assume a host with Ethernet address $(F5\text{-}A9\text{-}23\text{-}12\text{-}7A\text{-}B2)_{16}$ has joined the network. What would be its global unicast address if the global unicast prefix of the organization is 3A21:1216:2165 and the subnet identifier is 1232.	4

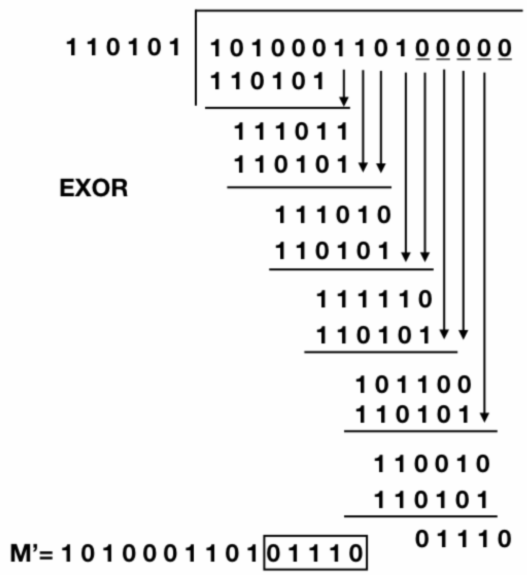
- ✓ The host first creates its interface identifier as **F7A9:23FF:FE12:7AB2** using the Ethernet address read from its card.
- ✓ The host then creates its link-local address as: **FE80:: F7A9:23FF:FE12:7AB2**.
- ✓ Assuming that this address is unique, the host sends a router solicitation message and receives the router advertisement message that announces the combination of global unicast prefix and the subnet identifier as **3A21:1216:2165:1232**.
- ✓ The host then appends its interface identifier to this prefix to find and store its global unicast address as: **3A21:1216:2165:1232:F7A9:23FF:FE12:7AB2**

	c)	Refer to the exhibit.	2

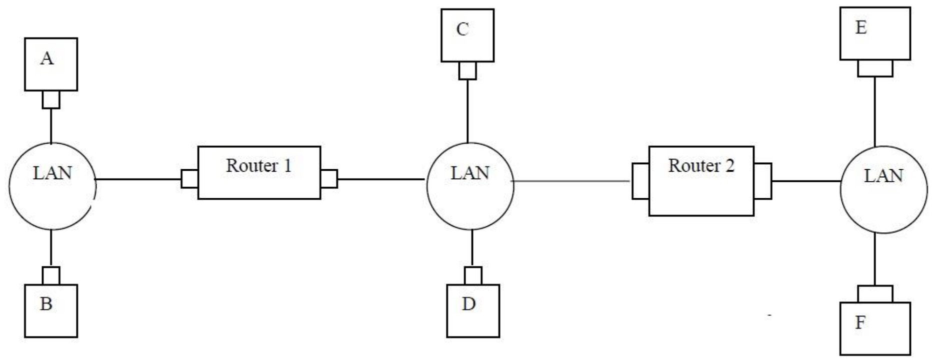


Add the static routing table entries for R1 and R2 in the table below.

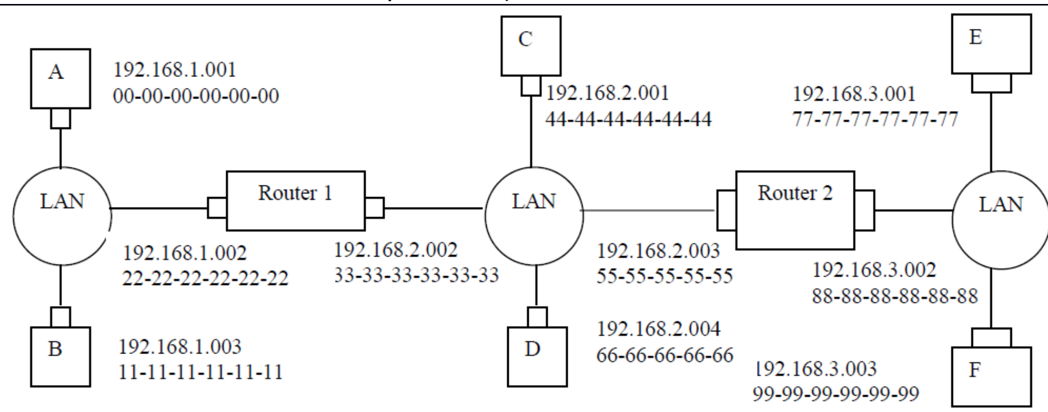
Routers	Destination Network	Next-hop gateway

		R1 172.16.1.0 172.16.2.2 192.168.1.0 172.16.2.2 192.168.2.0 172.16.2.2 **R2** 192.168.2.0 192.168.1.1 172.16.3.0 172.16.2.1	
3.	a)	Consider the following message M = 1010001101. Compute the cyclic redundancy check (CRC) for this message using the divisor polynomial $x^5 + x^4 + x^2 + 1$. What is the actual bit being transmitted?	4
		M = 1010001101 Divisor polynomial: $1.x^5+1.x^4+0.x^3+1.x^2+0.x^1+1.x0$ Divisor polynomial bit= 110101 Bits to be appended to message= (divisor polynomial bits – 1) = 5 Append 5 zeros to message bits, modified message: 101000110100000 CRC (reminder): **01110** Actual data transmitted: **101000110101110** 	

b) Consider three LANs interconnected by two routers, as shown below. 6



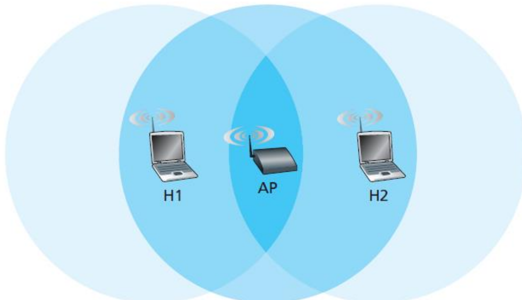
i. Assign IP addresses to all of the interfaces. For Subnet 1 use addresses of the form 192.168.1.xxx; for Subnet 2 use addresses of the form 192.168.2.xxx; for Subnet 3 use addresses of the form 192.168.3.xxx;
ii. Assign MAC addresses to all of the adapters.
iii. Consider sending an IP datagram from Host E to Host B. Suppose all of the ARP tables are up to date. Enumerate all the steps involved in sending this datagram.
iv. Repeat (iii), now assuming that the ARP table in the sending host is empty (and the other tables are up to date).



- ✓ Forwarding table in E determines that the datagram should be routed to interface 192.168.3.002.
- ✓ The adapter in E creates an Ethernet packet with Ethernet destination address 88- 88-88-88-88-88.
- ✓ Router 2 receives the packet and extracts the datagram. The forwarding table in this router indicates that the datagram is to be routed to 198.168.2.002.
- ✓ Router 2 then sends the Ethernet packet with the destination address of 33-33-33- 33-33-33 and source address of 55-55-55-55-55-55 via its interface with IP address of 198.168.2.003.
- ✓ The process continues until the packet has reached Host B.

ARP in E must now determine the MAC address of 198.168.3.002. Host E sends out an ARP query packet within a broadcast Ethernet frame. Router 2 receives the query packet and sends to Host E an ARP response packet. This ARP response packet is carried by an Ethernet frame with Ethernet destination address 77-77-77-77-77-77.

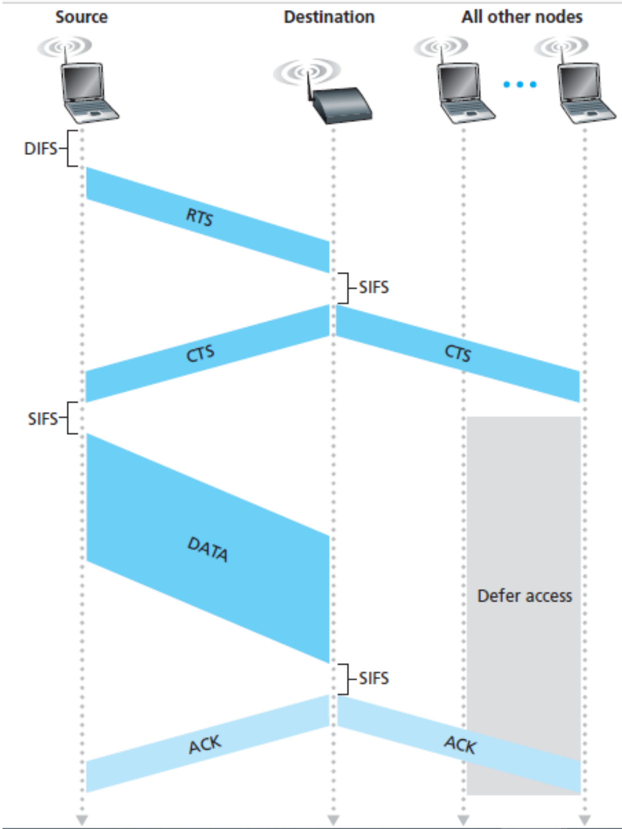
<table>
<tr>
<td>4.</td>
<td>a)</td>
<td>Consider the scenario of wireless networking with three wireless devices as shown below.



i. What happens when nodes H1 and H2 start sending a message simultaneously?
ii. With a neat diagram, describe how CSMA/CA is realized in the above case of the IEEE 802.11 protocol. For your explanation, assume that H1 wants to send a frame to the destination.
iii. Why are the link layer acknowledgements used in IEEE 802.11 but not in wired Ethernet?
iv. Why does the 802.11 protocol require sequence numbers?</td>
<td>10</td>
</tr>
</table>

Hidden terminal problem. Suppose Station H1 is transmitting a frame and halfway through H1's transmission, Station H2 wants to send a frame to the AP. H2, not hearing the transmission from H1, will first wait a DIFS interval and then transmit the frame, resulting in a collision. The channel will therefore be wasted during the entire period of H1's transmission as well as during H2's transmission.

Collision avoidance using the RTS and CTS frames



When a station in a wireless LAN sends a frame, the frame may not reach the destination station intact for a variety of reasons. To deal with this non-negligible chance of failure, the 802.11 MAC protocol uses link-layer acknowledgments. Hence robustness is increased through retransmissions and to perform this, acknowledgements are required. Usually no packet loss in wired Ethernet.

Because ACKs can get lost, the sender may send multiple copies of a given frame. Sequence numbers allow a receiver to distinguish between a newly transmitted frame and a retransmitted one.