Question Paper

Exam Date & Time: 04-Jul-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH. (INFORMATION TECHNOLOGY) DEGREE EXAMINATIONS - JUNE/JULY 2023
SUBJECT: ICT 2255/ICT-2255 - COMPUTER NETWORK PROTOCOLS

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Missing data, if any, may be suitably assumed.

1A) Suppose you are an IT Administrator for a newly founded medical college and hospital. The IT administrator has assigned a block containing one of the address as 112.10.34.78/15. You have been assigned the task of allocation and management of IP addresses to its sub block as given below: (5)
a) Hospital has 50 departments, each department need 100 addresses.
b) Medical college has 128 departments; each department need 64 addresses.
i) Specify the range of addresses for the first and last addresses of hospital and medical college.
ii) Design the sub-blocks and give the slash notation for each sub-block.
iii) Compute the total number of unallocated address in a block.
iv) Generate an IPv4 address for network address of 63rd user from medical college.

1B) Two packets belonging to the same message leave the source one after another. However, these packets reach the destination through the switch, as shown in Figure. Each packet travel at the same uniform speed of $2 * 10^8$ m/s. The delay introduced by Sw is 3 ms. The length of the two packets is 50000 and 60000 bits, respectively, and the packets are transmitted with data rate of 10 Mbps and 20 Mbps by the source and switch, respectively. In figure d_{SSw}, and d_{SwD} denote the distances between source and switch and switch and destination, respectively (Refer Fig.1B). (3)

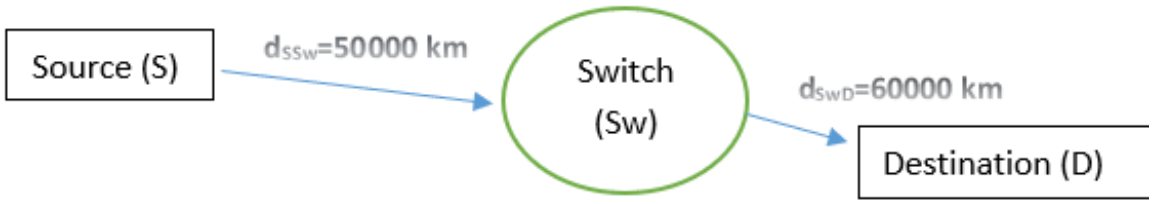

Fig Q.1B: Packets transmission through virtual circuit switching mode.

Calculate the following given below!
1) Transmission and propagation delay for each packet.
2) Total delay for each packet at destination.
Total delay involved in one communication cycle.

1C) Assume that the two hosts are using private IP addresses in a same network and try to access the two different external servers with one global IP address. Analyse the given scenario and give the comments (problems) on development of NAT routing table. (2)

2A) Host A and B connected via many router's. Following table gives fragmentation information about packet forwarded from Router P. The details of table are data range, offset field, Don't fragment field(DF) and More Fragment (MF) field are given. These packets arrive at Router Q from router P. The packets formed at serial no. 1 & 2 has to be forwarded via router Q's interface "130.78.90.45" with MTU size of 150 bytes. Serial no. 3 & 4 has to be forwarded via router Q's interface (5)

"200.78.90.45" with MTU 200 bytes. Packet with information of serial no. 5 & 6 has to be forwarded via router Q's interface "98.77.90.45" with MTU 92 bytes.
Write the fragment fields in IP header for the fragments forwarded via each interface. Find the total fragments formed form interface of Router Q. (Refer Fig. 2A)

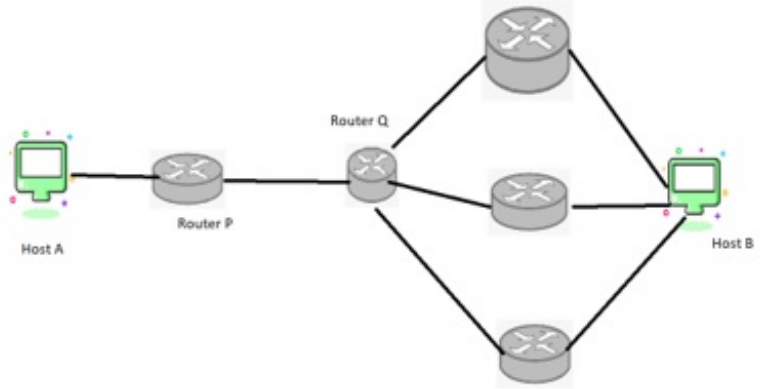

Fig. 2A

Table Q.2A

Sl. No	Data Range	Offset	DF	MF
1	0 to 175	0	0	1
2	176 to 351	22	0	1
3	352 to 527	44	0	1
4	528 to 703	66	0	1
5	704 to 879	88	0	1
6	880 to 970	110	0	0

2B) For a given organization the host with IP address 120.224.60.70 and physical address B2:34:55:10:80:90 has to send a data packet to another host B with a IP address 120.224.80.90 and physical address A4:6E:F4:59:50:AB. The two hosts are belonging to the same Ethernet network. Show the ARP request and reply data packets encapsulated in Ethernet frames (hexadecimal representation). (3)

2C) Consider a host A generates a packet to host B and transmits it through the internet. The host B receives the packet and replies to the host A. The respective timestamps are mentioned in the ICMP frame structure as shown in the figure. At the end the host A receives the reply packet from host B at 8:40 PM. (2)

Type : 13 or 14	Code : 0	Checksum
Identifier	Sequence number	
Original timestamp (8:10 PM)		
Receiver timestamp (8:30 PM)		
Transmit timestamp (8: 35 PM)		

Fig 2C: ICMP frame structure.

Explain the significance of type 13, 14 and code 0 in the ICMP frame structure and calculate the following.
i) Sending time.
ii) Receiving time.

3A) Use the Dijkstra algorithm to find the shortest paths from A to B, C, D, E, F, G, H as shown in the Figure 3A. Indicate the backtracking path. (5)

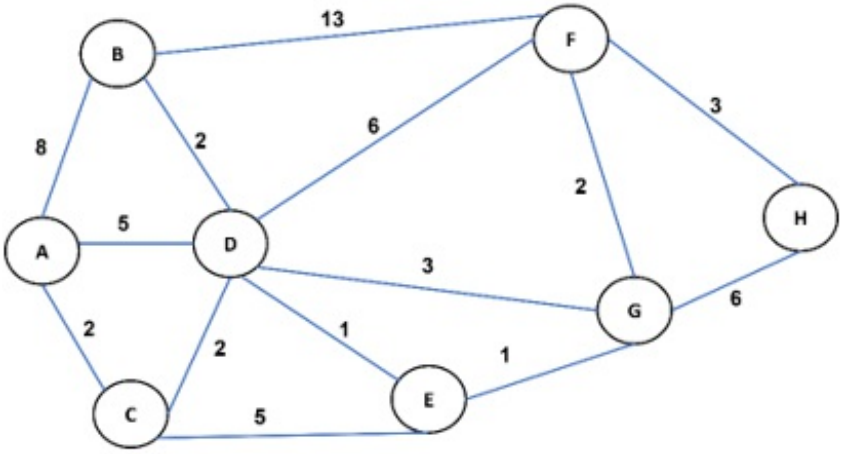

Figure. 3A

3B)	For dump of a UDP header in hexadecimal format, FA4500A20051001C i) What is the source port number? ii) What is the destination port number? iii) What is the total length of the data? iv) What is the length of the data? v) Is the packet directed from client to a server or vice versa?	(3)
3C)	Justify the significance of TIME-WAIT Timer. Compare its usage in the half-close and 3-way handshake connection termination with suitable diagram.	(2)
4A)	TCP opens a connection using an initial sequence number (ISN) of 14,534. The other party opens the connection with an ISN of 21,732. i) Show the three TCP segments during the connection establishment. ii) Show the contents of the segments during the data transmission if the initiator sends a segment containing the message "Hello dear customer" and the other party answers with a segment containing "Hi there seller." iii) Show the contents of the segments during the connection termination.	(5)
4B)	With sequence diagram explain TCP's general policy for handling congestion with three phases.	(3)
4C)	Suppose a TCP connection is transferring a file of 5,000 bytes. The first byte is numbered 10,001. What are the sequence numbers for each segment if data are sent in five segments, each carrying 1,000 bytes?	(2)
5A)	With an illustration, compare and contrast recursive and iteration resolution in DNS.	(5)
5B)	Show an example of a DHCP packet with an end-of-list option.	(3)
5C)	Show the encoding for the OCTET STRING "Hello World."	(2)

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