Question Paper

Exam Date & Time: 09-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH (CCE) END SEMESTER EXAMINATIONS, MAY 2024

COMPUTER NETWORKS AND PROTOCOLS [ICT 2226]

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

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Assume a mobile manufacturing company has assigned a block containing one of the addresses as 13.18.13.5/17. You have been assigned the task of allocation and management of IP addresses to its sub block as given below: (5)

A)

a. Hardware section has 16 divisions; each need approximately 58 addresses.

b. Software section has 32 divisions; each need approximately 145 addresses.

c. Customer service section has 129 divisions; each need approximately 89 addresses.

i. Assign the IP addresses (network id and broadcast id) and subnet mask efficiently for each subblock (second level hierarchy) in the same order as shown above.

ii. Find the range of host IP addresses assigned to the systems (from and to IP addresses), and total IP addresses wasted in each subblock (first level of the hierarchy).

iii. Compute an IP address range of 123rd division from customer service section

B) In a network setup illustrated in a Figure 1B, three packets originating from the same message sequentially depart from the source. These packets traverse through two intermediary routers before reaching the final destination. All packets move at a consistent speed of 2 * 10^8 m/s. The routers R1 and R2 introduce delays of 2 and 3 milliseconds respectively. The packet lengths are 10010, 10020, and 10030 bits, and they are transmitted by the source, R1, and R2 at rates of 1 Mbps, 2 Mbps, and 3 Mbps, respectively. The distances between the source to R1, R1 to R2, and R2 to the destination are 32000 km, 35000 km, and 30000 km, respectively. Compute the following: (3)

i. Transmission delay for each packet.

ii. Propagation delay for each packet.

iii. Total delay for each packet at the destination.

Figure 1B. Host connected through routers.

C) Assume a university has three division: Admission, Medical education, and Technical education. The university is connected to all divisions via private WAN lines with address of 10.0.0.0/8 network and university is connected to rest of the world via global IP address. The university grants a different private IP address for three division. The technical education is granted with 66536 bunch of private IP addresses, medical education is granted with 4500 bunch of private IP addresses and admission division is granted with 254 bunch of private IP addresses. (2)

i. Identify the perfect and efficient class of private IP address for the divisions.

ii. Compute the valid host IP address range for each division.

2) Compute a routing table for router R1 using the topology in Figure 2A and write the forwarding process if a packet arrives at R1 with the destination address 221.16.17.32. (5)

A)

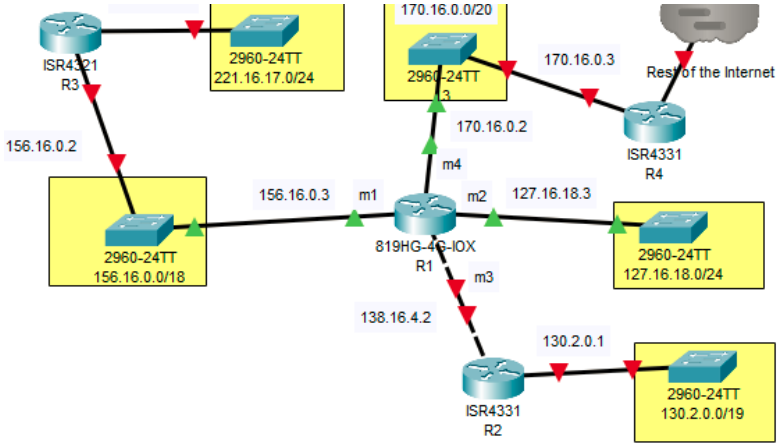

Figure 2A. Network Scenario

B) Suppose a transport layer segment of 6000 bytes are passed to the network layer for delivery across 2 networks of the internet, from source host A to destination host B. Assume that host A is connected to host B through router R1. The first network (from host A to router R1) can allow an IP datagram of size 2200 bytes to pass through it, while the second network (from router R1 to host B) allows an IP datagram of size 800 bytes to pass through it. If all the fragments reach safely at the destination, show the offset and flag values for each of the fragments. Assume all IP headers are 20 bytes. (3)

C) Explain Count to Infinity problem by taking suitable scenario (2)

3) Consider the network given in the Figure 3A . Router R1 sends a RIP request message to router R4. Construct the RIP response message that the route R4 sends to router R1. (5)

A)

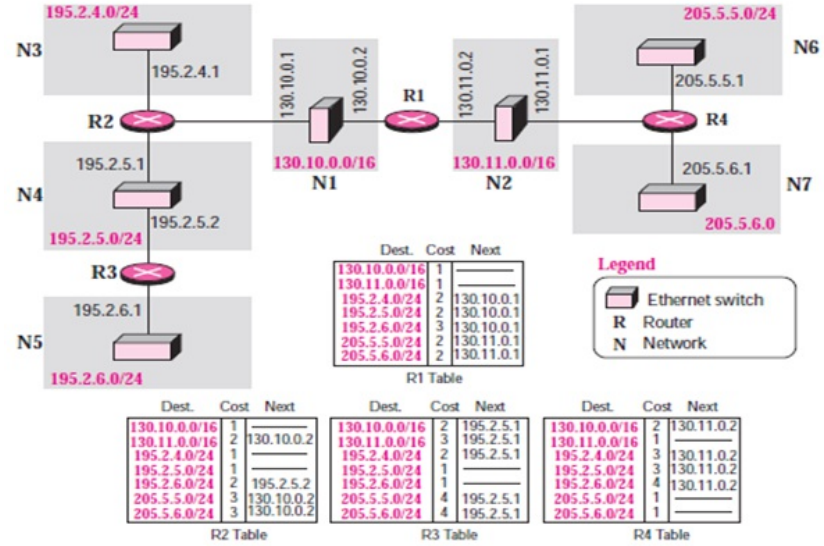

Figure 3A. Network Scenario

B) What is a silly window syndrome? Explain the handling of the silly window syndrome at the receiver. (3)

C) URG and PSH are two control fields of TCP header. Compare and contrast the usage of both in suitable scenarios (2)

4) What is window size in TCP? Distinguish between additive increase and multiplicative decrease in TCP appropriate examples (5)

A)

B) UDP is commonly referred to as an unreliable protocol despite its usage in networking. Provide detailed reasons for its categorization as unreliable, highlighting its key characteristics and comparing them to those of TCP. (3)

C) ICMP error messages are an essential component of network troubleshooting and diagnostics, there are circumstances where they may not be generated due to protocol-specific behaviour. List any two such circumstances and analyze the issue. (2)

5) Illustrate the HTTP transactions between the client and server with suitable diagram by clearly mentioning various sections of HTTP request message format and response message format. Also articulate various HTTP methods. (5)

A)

B) In a network scenario, Host A (192.168.10.20/24) seeks to transmit data to Host C (120.224.43.6/24) but lacks its MAC address. These two hosts are on the different ethernet network shown in Figure 5B. The router interface address is 192.168.10.22/24 and physical address is C3:33:F4:34:83:4B. Show the ARP request packet sent and reply packets received by Host A. Also show the ethernet frames with suitable fields. MAC address of Host A and Host C are A1:11:34:52:18:11 and B2:22:F4:59:83:AB respectively (3)

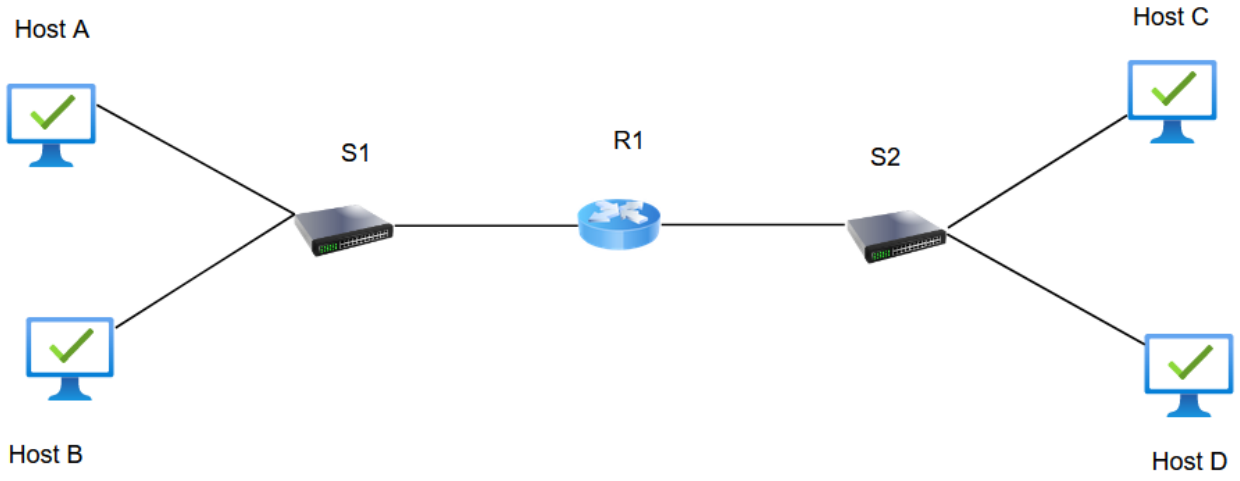

Figure 5B. Network with router and switches.

C) Differentiate between fully qualified domain name and partially qualified domain name. (2)

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