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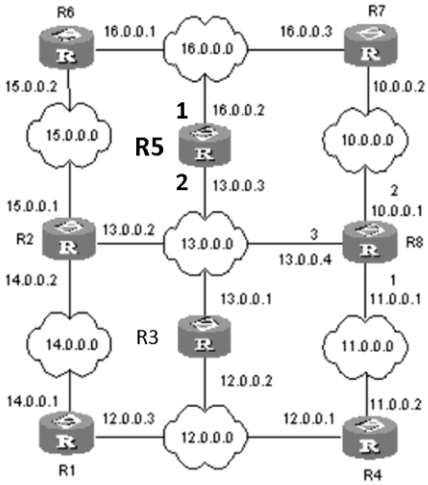
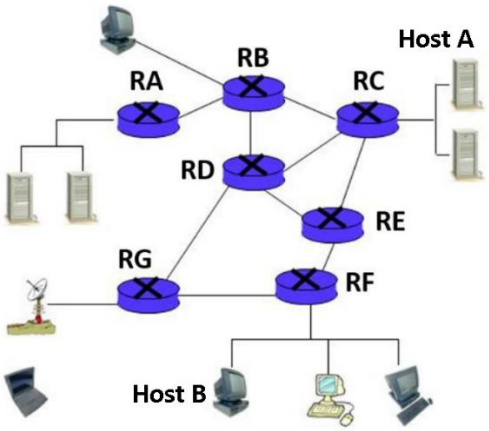
School of Computer Science and Engineering
B.Tech (Hons.)
RETEST Question Paper
Academic Year 2024-2025

Course: Network Security		**Course Code: CS3403**	**Semester: VI**
Time: 9:30 am to 11:00 am	**Duration: 90 minutes**	**Date: 23rd Apr 25**	**Max Marks**: 25

Part – A (9 x 2 marks = 18 marks + 1 mark)

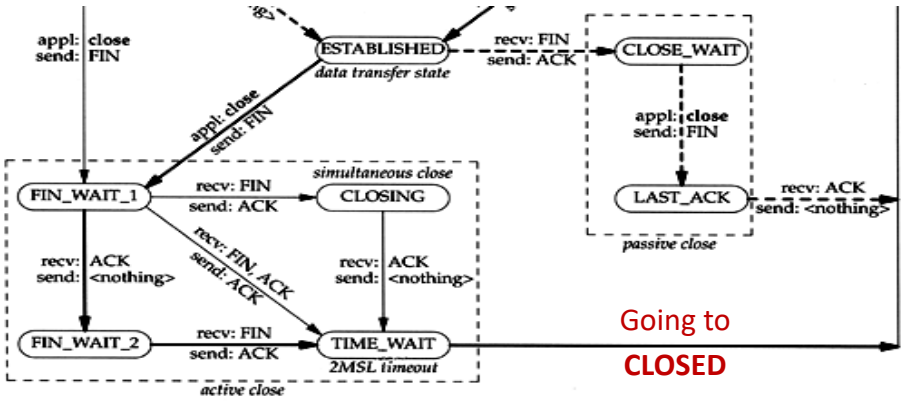
Sl. No.	Questions	Marks	L1-L6	CO
1.	Elaborate on the shortcomings of static approach in finding shortest path.	2	L4	CO2
2.	Differentiate Distance Vector Routing with Link State Routing in terms of how they function.	2	L3	CO2
3.	Explain how routing protocols that use hop count as their primary metric determine the best or preferred path.	2	L2	CO2
4.	Describe how a client device requests an IP address from a DHCP server.	2	L4	CO2
5.	Enlist how a router handles a packet when it doesn't have a matching entry in its routing table.	2	L3	CO2
6.	Describe the significance of the **URG flag** in TCP,	2	L2	CO1
7.	What does the below function do? What is the significance of the parameter 512? **data = socket.recv(512)**	2	L3	CO1
8.	Fill in the routing table of **R3** in the network below. Choose the directly connected **lower Router ID** when there **are two paths with the same distance** are available. Show both **directly connected (C)** entries and **Static (S)** entries and **interface number** in the Routing table.  **Routing Table of R5** | Type | Dest NW | Next Hop | Interface |	2	L2	CO1

L1- Remember, L2- Understand, L3 – Apply, L4- Analyse, L5 – Evaluate, L6 – Create

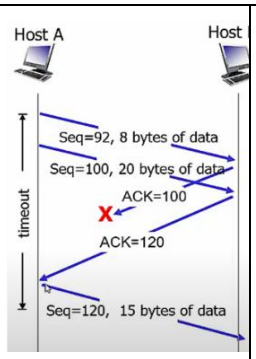
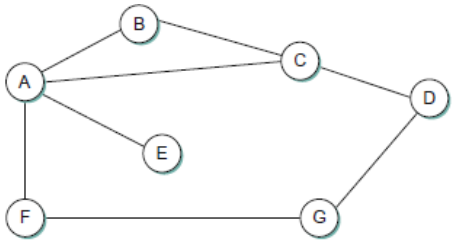
9.	Assume a Distance Vector Algorithm is running in the network below. What is the **hop distance after the convergence between Host A** and **Host B** in the network? Give the **list of routers** the traffic pass through**.** 	2		
10	Briefly explain how "**split horizon**" avoids routing loops.	1	L2	CO2

Part – B (2 x 3 marks = 6 marks)

Instructions: Answer any two questions. The best two answers will be considered for evaluation.

Sl. No.	Questions	Marks	L1-L6	CO
11.	Assume a TCP connection on a host is transitioning into different states as given below. **ESTABLISHED → FIN_WAIT_1 → TIME_WAIT → CLOSED** Give the possible **triggers/events/messages** that could make these **transitions happen**. 	3	L4	CO1

L1- Remember, L2- Understand, L3 – Apply, L4- Analyse, L5 – Evaluate, L6 – Create

12.	Based on the TCP message exchanges between two hosts shown, during the middle of an established connection, answer the following: a) What is the total **length of data exchanged successfully by Host A to Host B?** b) Are there any data being exchanged by Host B to Host A? Justify. c) If the **Host A** sends **another byte of data** to **Host B**, what would be the **sequence number** associated with it? 	3	L4	CO1
13.	Assume **both the links** between **A and C**, also **C and D** have **failed**. Assume the **DVA** is running on this network and it has converged after the failures of both the links. Assume the **cost of each link** is set to **2**. Give the **RT** at **node F**. 	3	L4	CO2

Course Outcomes

1. Analyze the working principles and characteristics of TCP and its role in providing reliable networking applications.
2. Analyze the implementation details of RIP and OSPF routing protocols adapted by large enterprise networks.
3. Explain various multimedia transport protocols and the need for QoS in networks
4. Describe the working principles and the purpose of cryptographic algorithms used to provide secure communication
5. Apply IP security and Web security concepts in real-life scenarios for creating secure networks

Marks Distribution										
L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4	CO5
0	5	10	10	0	0	9	16	0	0	0

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L1- Remember, L2- Understand, L3 – Apply, L4- Analyse, L5 – Evaluate, L6 – Create

Answers

Part -A

1. **Elaborate on the shortcomings of static approach in finding shortest path.**
   - It does not deal with node or link failures.
   - It does not consider the addition of new nodes or links.
   - It implies that edge costs cannot change, even though we might reasonably wish to have link costs change over time.

2. **Differentiate Distance Vector Routing with Link State Routing in terms of how they function.**

   Distance Vector Routing- Routers send their entire routing table to direct neighbors. Routers calculate paths based on information from neighboring routers. It is simpler and requires less memory. Can suffer from issues like count-to-infinity and slow convergence.

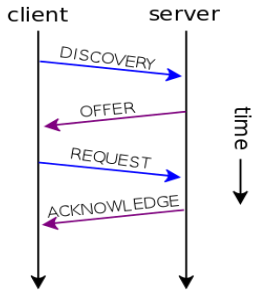
   Whereas Link State Routing-Routers send information about their direct connections (links) to all routers in the network, creating a complete map of the network. Each router calculates the shortest path based on the entire network's topology using algorithms like Dijkstra's. More complex and requires more memory and processing power. Converges faster and can handle network changes better.

3. **Explain how routing protocols that use hop count as their primary metric determine the best or preferred path.**

   Routing protocols that use hop count as their primary metric determine the best or preferred path by selecting the route with the fewest number of hops between the source and destination. In these protocols, each router counts the number of intermediate routers (or hops) a packet must pass through to reach the destination. The path with the least number of hops is considered the optimal or preferred route.

4. **Describe how a client device requests an IP address from a DHCP server.**

   When a client device requests an IP address from a DHCP server, the process follows these steps:
   - DHCP Discover: The client device sends a DHCP Discover message to the network using a broadcast.
   - DHCP Offer: The DHCP server receives the Discover message and responds with a DHCP Offer message. This message includes an available IP address, subnet mask, lease duration, and the DHCP server's IP address.
   - DHCP Request: The client device receives the Offer and responds with a DHCP Request message, indicating that it accepts the offered IP address. The message is sent as a broadcast to let other DHCP servers know the client has chosen a particular offer.
   - DHCP Acknowledgment: Finally, the DHCP server sends a DHCP Acknowledgment (ACK) message to the client. This confirms the IP address assignment and the lease duration.



5. **Analyze how a router handles a packet when it doesn't have a matching entry in its forwarding table.**

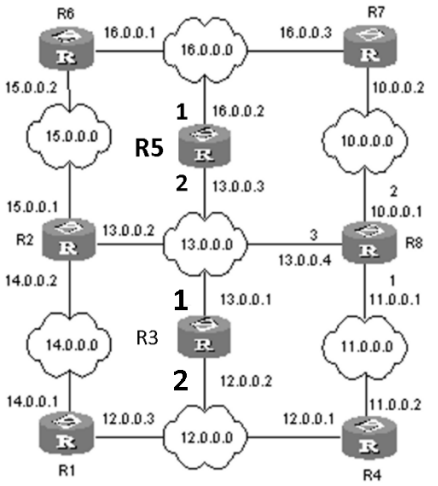
When a router receives a packet and does not have a matching entry in its forwarding table (also known as the routing table), it typically follows these steps:

- Check Default Route:The packet is forwarded to the next hop specified by the default route.
- Send ICMP Destination Unreachable Message: If there is no default route or any other matching entry in the forwarding table, the router will drop the packet and send an ICMP Destination Unreachable message back to the source device.
- Possibly Update Routing Information: The router may attempt to discover an alternate route.

6. The **URG (Urgent)** flag in TCP is used to indicate that the data in the segment is urgent and should be prioritized for immediate processing. It works in conjunction with the Urgent Pointer, which specifies the last byte of urgent data in the segment, allowing it to bypass normal data processing and be delivered immediately to the application layer. The sender will not wait for the entire byte stream to be transmitted which is ahead of the urgent data. It is also called, out-of-band data.

7. **socket.recv(512)** is a blocking call to receive any data coming from the other end of the socket connection. 512 significs the maximum Rx buffer size reserved for receiving the data.
The socket.recv(512) call in Python attempts to read up to 512 bytes of data from the socket's receive buffer. If the socket is in blocking mode, the call will wait until at least some data is available before returning; if no data is available and the connection is closed, it returns an empty bytes object. The number 512 specifies the maximum amount of data (in bytes) to retrieve in one call, but the actual amount received may be less than 512 bytes

8. Reduce 0.25 marks for every wrong entry and round it off to the nearest 0.5 marks.
Note: For the directly connected entries mention the IP address of the interface which is on the destination network, but the packets will be directly delivered to the host on the network.



Routing Table of R3

Type	Dest NW	Next Hop	Interface
S	10.0.0.0	13.0.0.4	1
S	11.0.0.0	12.0.0.1	2
S	12.0.0.0	12.0.0.2	2
C	13.0.0.0	13.0.0.1	1
S	14.0.0.0	12.0.0.3	2
S	15.0.0.0	13.0.0.2	1
C	16.0.0.0	13.0.0.3	1

9. The **hop distance** after the **convergence** between **Host A** and **Host B** is **two**. The routers in the path are **RC, RE and RF**.

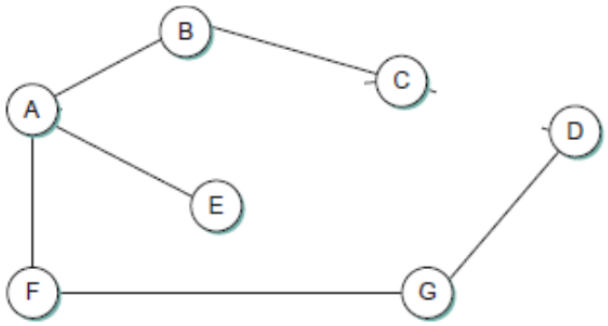
10. **Split Horizon:** **Split horizon prevents information being sent back in the direction from which that information was received. When a change occurs in the network, routers only advertise that change in one direction.**

PART - B

11. **ESTABLISHED → FIN_WAIT_1 → TIME_WAIT → CLOSED**
When the application running on the host decided to close the connection, the protocol stack generates a **FIN** message to the other end and waits for the **ACK** from the other end, in the **FIN_WAIT_1** state.
While this host is waiting on **FIN_WAIT_1**, the other end also decides to close the connection just after receiving this FIN from this host, thus sends an ACK for the FIN received along with its own FIN. Then on receiving the FIN message from the other end and ACK for its own FIN, this host sends an ACK for the received FIN and moves directly to the **TIME_WAIT** state to wait for 2MSL period before moving to the **CLOSED** state.

12. a) The total length of data exchanged by **Host A to Host B** is **8 + 20 = 28 bytes.**
b) There is **no data being exchanged by Host B to Host A**, because of absence of any Sequence number being shown or increased from the Host B side.
c) If **Host A sends another byte of data** its **sequence number** would be **135. (not 120)**

13. After the links between **A and C, C and D** have failed the converged **RT at Node F** would be:
The **Routing Table at the Router F** after the network has converged is given below.
If the student has not taken care of the cost of each link as 2 and all other entries are correct except the entries of the costs which are given as half of the correct answers, then overall reduce 1 mark.



Destination	Cost	Next Hop
A	2	A
B	4	A
C	6	A
D	4	G
E	4	A
G	2	G

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