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RV University

School of Computer Science and Engineering

BTech (Hons) Degree Examination – Set- 2

Semester : VI

Course Code : CS3403

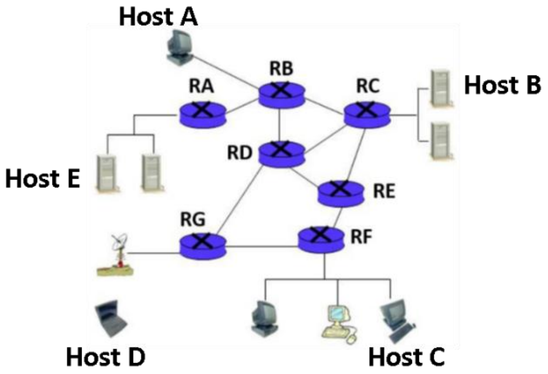
Course Title : Network Security

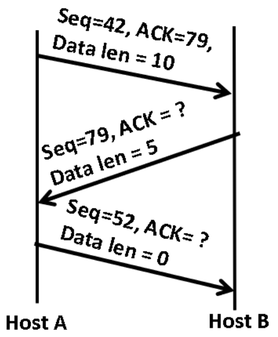
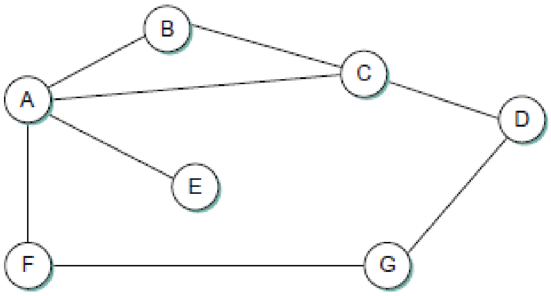
Duration : 2 hours **Max. Marks: 30**

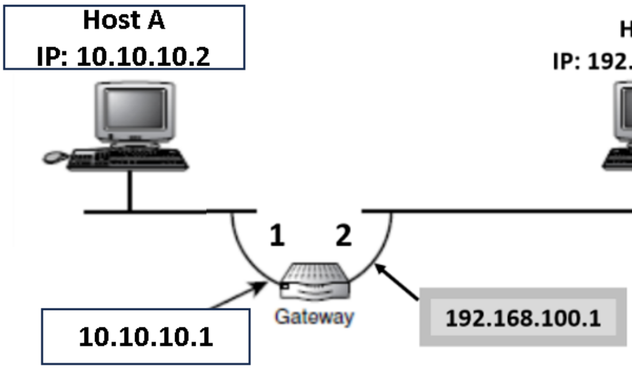
Instructions to students:

Answer all the questions in Part A. Answer any two questions in Part B.

Sl. No.	PART A (12 * 2 marks = 24 marks)	Marks	L1-L6	CO
1.	Describe how **cloud security challenges** impact the protection of sensitive data.	**2**	**L2**	**CO5**
2.	Differentiate between the **different cryptographic techniques**.	**2**	**L3**	**CO4**
3.	Describe confidentiality and explain how different **threats** can **compromise** the **confidentiality** of sensitive information.	**2**	**L2**	**CO4**
4.	Explain the importance of **QoS parameters** in maintaining network performance.	**2**	**L2**	**CO3**
5.	Apply your understanding of **RPC** and describe the steps for implementing the communication **between the client and the server** using **RPC**.	**2**	**L3**	**CO3**
6.	Highlight the protection **AH** provides in **IPSec**.	**2**	**L2**	**CO5**
7.	Explain briefly about each of the different types of **NAT** implementations.	**2**	**L2**	**CO3**
8.	Why is a new **IPv6** standard required while the IPv4 is in operation? Give three key features of IPv6.	**2**	**L3**	**CO2**
9.	Demonstrate **IGMP**’s operations with an example.	**2**	**L3**	**CO2**
10.	Explain the features of **BGP** and how does it help in routing over the Internet.	**2**	**L3**	**CO2**
11.	Describe the motivation behind moving from the traditional vertical layers to horizontal layers in providing networking solutions due to proliferation of hyperscale data centres.	**2**	**L2**	**CO2**

12.	Assume a **Distance Vector Algorithm** is running in the network below. What is the hop distance after the convergence between the **hosts B and D**. Give the path taken (list the routers) by the packets between these two hosts. **Note**: Assume that lower Router name is preferred when the distance is the same between two hosts while a path needs to be picked, i.e., RB < RC.  Host A RB RA RC Host B RD Host E RE RG RF Host D Host C	2	L3	CO3

Sl. No.	**PART B – Answer any two questions (2 * 3 marks = 6 marks)**	**Marks**	**L1-L6**	**CO**
13.	Based on the TCP message exchanges between two hosts shown, during the middle of an established connection, answer the following: a) Assuming the Host B is sending its own data along with ACK after successfully receiving the previous data from the Host A, what should the value of **ACK** coming from Host B? b) What is the **ACK** going from **Host A to Host B** at the end? c) Assuming that the **ISNs** chosen by both the hosts happen to be the **same**, in which direction more data has flown between them at the end of this current data transfer?  Seq=42, ACK=79, Data len = 10 Seq=79, ACK = ? Data len = 5 Seq=52, ACK= ? Data len = 0 Host A Host B	**3**	**L4**	**CO1**
14.	Assume **both the links** between **F and G** 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 **3**. Give the **Routing Table** at **node F.**  	**3**	**L4**	**CO3**

15.	Answer the following questions based on the network below: a) Give the **subnet mask** and **default gateway** set at **Host A**, assuming that the addresses given here are **classful**. b) When an IP packet from Host B addressed to Host A is moving from the Host B to the Gateway, MAC addresses of which are the devices will be filled into the Ethernet frame? Note: Mention the contents of both the source and destination MAC address fields. c) What is the network ID of the Host A, if the addresses given are classful?  Host A IP: 10.10.10.2 Host B IP: 192.168.100.27 1 2 Gateway 10.10.10.1 192.168.100.1	**3**	**L4**	**CO3**

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	12	12	9	0	0	3	8	14	4	4

Signature of Paper Setter **Signature of Scrutiniser**

Signature of the Dean

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BTech (Hons) Degree Examination

Set-2 Answer Keys

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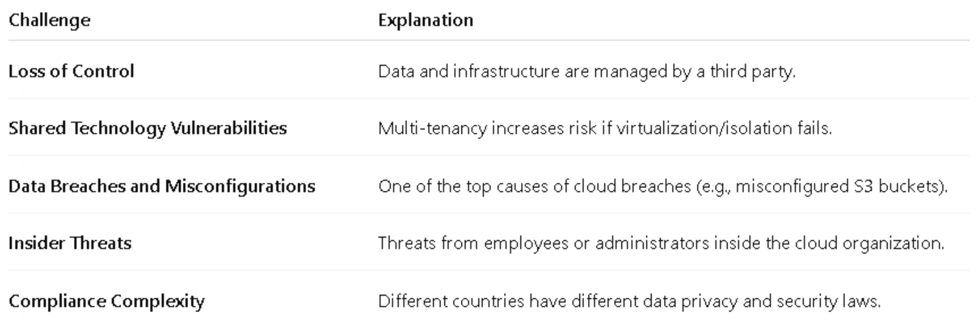
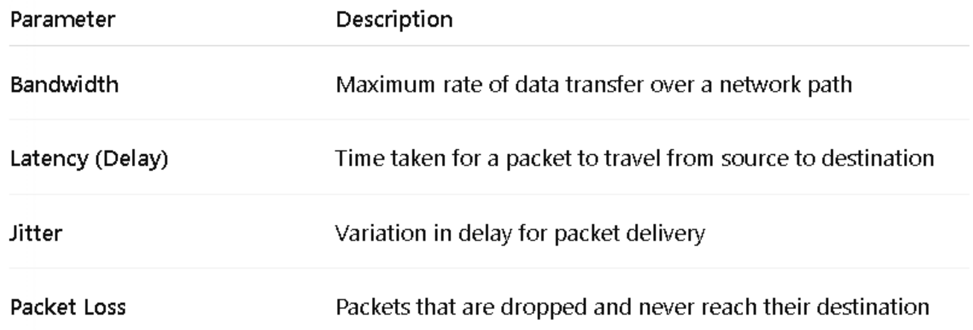
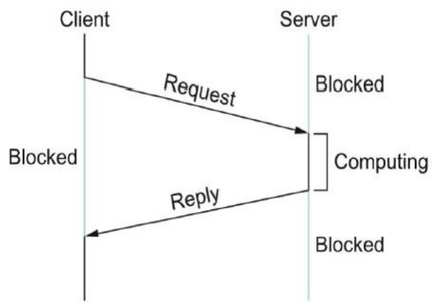
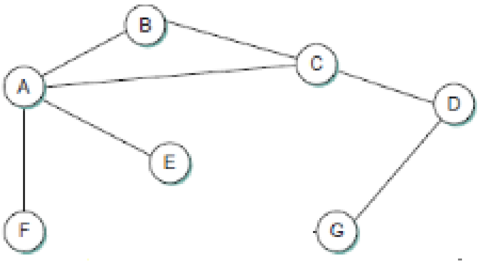
<table>
<tr><th>Sl. No.</th><th>PART A (12 * 2 marks = 24 marks)</th><th>Marks</th><th>L1-L6</th><th>CO</th></tr>
<tr><td>1.</td><td>
<table>
<tr><th>Challenge</th><th>Explanation</th></tr>
<tr><td>Loss of Control</td><td>Data and infrastructure are managed by a third party.</td></tr>
<tr><td>Shared Technology Vulnerabilities</td><td>Multi-tenancy increases risk if virtualization/isolation fails.</td></tr>
<tr><td>Data Breaches and Misconfigurations</td><td>One of the top causes of cloud breaches (e.g., misconfigured S3 buckets).</td></tr>
<tr><td>Insider Threats</td><td>Threats from employees or administrators inside the cloud organization.</td></tr>
<tr><td>Compliance Complexity</td><td>Different countries have different data privacy and security laws.</td></tr>
</table></td><td>2</td><td>L2</td><td>CO5</td></tr>
<tr><td>2.</td><td><b>Symmetric Encryption</b>
• Description: Uses the same key for both encryption and decryption.
• Example: AES (Advanced Encryption Standard), DES (Data Encryption Standard).
• Pros: Fast and efficient for large data.
• Cons: Key distribution is a challenge since the same key must be securely shared between sender and receiver.
<b>Asymmetric Encryption (Public Key Cryptography)</b>
• Description: Uses a pair of keys: a public key (for encryption) and a private key (for decryption). The public key is shared openly, while the private key is kept secret.
• Example: RSA (Rivest-Shamir-Adleman), ECC (Elliptic Curve Cryptography).
• Pros: Solves the key distribution problem. Only the public key is needed to encrypt, and the private key is used for decryption.
• Cons: Slower than symmetric encryption due to the complexity of the algorithms.</td><td>2</td><td>L3</td><td>CO4</td></tr>
<tr><td>3.</td><td>Confidentiality means protecting sensitive information from being accessed by unauthorized individuals. It ensures that only authorized people can view or use the data.
Two types of attacks threaten the confidentiality of information
Snooping refers to unauthorized access to or interception of data.</td><td>2</td><td>L2</td><td>CO4</td></tr>
</table>

<table>
<tr><td></td><td>Traffic analysis refers to obtaining some other type of information by monitoring online traffic.</td><td></td><td></td><td></td></tr>
<tr><td><b>4.</b></td><td>QoS tries to optimize these metrics according to application needs.

<table>
<tr><th>Parameter</th><th>Description</th></tr>
<tr><td>Bandwidth</td><td>Maximum rate of data transfer over a network path</td></tr>
<tr><td>Latency (Delay)</td><td>Time taken for a packet to travel from source to destination</td></tr>
<tr><td>Jitter</td><td>Variation in delay for packet delivery</td></tr>
<tr><td>Packet Loss</td><td>Packets that are dropped and never reach their destination</td></tr>
</table></td><td><b>2</b></td><td><b>L2</b></td><td><b>CO3</b></td></tr>
<tr><td><b>5.</b></td><td>RPC follows request/reply message transaction.
A client sends a request message to a server.
The server responds with a reply message.
The client blocking (suspending execution) to wait for the reply.
RPC is not a protocol; it is a mechanism for structuring distributed systems. Here, an application program makes a call into a procedure without regard for whether it is local or remote and blocks until the call returns.
When the procedures being called are actually, methods of remote objects in an object-oriented language, RPC is known as Remote Method Invocation (RMI).

</td><td><b>2</b></td><td><b>L3</b></td><td><b>CO3</b></td></tr>
<tr><td><b>6.</b></td><td><b>AH</b> is Authentication Header (<b>0.5 mark</b>), added to the IP packets to provide additional protection in terms of data integrity, origin authentication, and optional anti-replay protection for IP packets. Any two are given (<b>1 mark</b>). If the <b>below information</b> is also given – <b>full 2 marks</b>
AH calculates a cryptographic hash over the IP header fields and its payload and inserts the resulting hash into the AH header.</td><td><b>2</b></td><td><b>L2</b></td><td><b>CO5</b></td></tr>
<tr><td><b>7.</b></td><td>Static, dynamic and port based. – <b>1 mark</b>
<b>Static:</b> Maps one private IP to one public IP
<b>Dynamic</b>: Uses a pool of public IPs and maps internal private IPs dynamically
<b>Port based</b>: Also called NAT Overload. Multiple private IPs share a single public IP. Uses different port numbers for each connection</td><td><b>2</b></td><td><b>L2</b></td><td><b>CO3</b></td></tr>
<tr><td><b>8.</b></td><td>Depletion of IPv4 due to unprecedented expansion of Internet needed a new IPv6 standard with enormous address space. <b>1 mark,</b> Key features are: Address Space Expansion, simpler header format, built-in security (IPSec is default present), improved support for mobility and multicast and auto-configuration.<b>- 1 mark (for any three features)</b></td><td><b>2</b></td><td><b>L3</b></td><td><b>CO2</b></td></tr>
</table>

9.	**IGMP:** Internet Group Management Protocol – **0.5 marks**, which helps in managing the IP multicast groups and in routing – **0.5 marks**. Hosts can register for a multicast stream by joining the group and leave the group as per user needs. IGMP helps query messages to discover the registered devices and optimize usage of network bandwidth by delivering the packets efficiently . – **1 mark**	**2**	**L3**	**CO2**
10.	The Border Gateway Protocol (BGP) is the inter-domain routing protocol of the Internet. It is the protocol that connects tens of thousands of networks in the Internet to form one big interconnected network. It is the only widely used inter-domain routing protocol in the Internet and is therefore very important for the correct functioning of the Internet.	**2**	**L3**	**CO2**
11.	Due to massive hyperscale data centres the companies owning them wanted to have increased independence of managing the applications running on the networking devices and the integration of hardware and system software on the devices from different vendors, instead of having them all from the same vendor as in the traditional networking solutions. This paradigm shift moved from the vertical layers to horizontal layers of HW, OS and Apps.	**2**	**L3**	**CO2**
12.	RC→RD→RG and the distance is 3.	**2**	**L3**	**CO2**

<table>
<tr><th>Sl. No.</th><th>PART B – Answer any two questions (2 * 3 marks = 6 marks)</th><th>Marks</th><th>L1-L6</th><th>CO</th></tr>
<tr><td><b>13.</b></td><td>a) The ACK will be Seq = 42 from Host A + data len 10, thus 52.
b) The ACK is Seq = 79 from Host B + data len 5, thus 84
c) Since the Host A is acknowledging upto seq number 84 have been received, more data has flown from Host B to Host A.
<b>Note:</b> If the answer says that since nothing can be said about the wraparound of Seq Numbers. that could have happened on either end of the connection, it is not possible to conclusively say anything about the amount of data that has flown between the hosts. – <b>1 mark</b></td><td><b>3</b></td><td><b>L4</b></td><td><b>CO1</b></td></tr>
<tr><td><b>14.</b></td><td>After the links between F and G have failed the converged <b>RT at Node F</b> would be:
The <b>Routing Table at the Router F</b> after the network has converged is given below.
If the student has not taken care of the cost of each link as 3 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.
Reduce 0.25 marks for every other wrong entry. Do not reduce any marks if rows are interchanged but the values are correct.
<table>
<tr><th>Destination</th><th>Cost</th><th>Next Hop</th></tr>
<tr><td>A</td><td>3</td><td>A</td></tr>
<tr><td>B</td><td>6</td><td>A</td></tr>
<tr><td>C</td><td>6</td><td>A</td></tr>
<tr><td>D</td><td>9</td><td>A</td></tr>
<tr><td>E</td><td>6</td><td>A</td></tr>
<tr><td>G</td><td>12</td><td>A</td></tr>
</table>

</td><td><b>3</b></td><td><b>L4</b></td><td><b>CO2</b></td></tr>
</table>

15.	a) Subnet mask: 255.0.0.0 because 10.10.10.0 is a Class A address. And default Gateway: 10.10.10.1 b) Source MAC: MAC address of Host B and Destination MAC is the MAC address of the Gateway interface 2. c) 10.0.0.0 is the Network ID of the Host A.	**3**	**L4**	**CO3**

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