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University of Barishal
Department of Computer Science and Engineering
Course Title: Computer Networks
Course Code: CSE-3105
3rd Year 1st Semester (B.Sc.) Final Examination
Admission Session: 2021-2022

Time: 03 Hours

Marks: 60

N.B.: Answer any **FIVE** questions out of the followings. All parts of each question must be answered consecutively. Right side of the question shows the maximum marks.

1.a) Identify and explain the five components of a data communications system and describe the three criteria required for a network to operate effectively and efficiently.   5

b) For each of the following four networks, discuss the consequences if a connection fails.   4

    i) Four devices arranged in a mesh topology
    ii) Four devices arranged in a star topology (not counting the hub)
    iii) Four devices arranged in a bus topology
    iv) Four devices arranged in a ring topology

c) If you call a neighbor using a regular home phone, what type of network—circuit-switched or packet-switched—does the call use?   3

2.a) The Presentation layer is often called the "translator" of the OSI model. Explain why and identify two tasks performed at this layer.   4

b) Illustrate how the Application layer interacts with lower layers in the OSI model by giving an example of a real-world network service and describing the flow of data.   4

c) Explain the functions of the Data Link layer in the OSI model and describe how it ensures reliable node-to-node communication.   4

3.a) Compare TCP and UDP in terms of reliability, connection setup, congestion control, and typical applications. Provide examples of when each should be used.   5

b) Explain the role of ARP in the TCP/IP protocol suite. Describe a scenario where ARP is used to enable communication between two devices on the same LAN.   4

c) A remote server is unreachable. Describe how tools and protocols such as ICMP, ping, and traceroute can be used to diagnose the problem using the TCP/IP model.   3

0 127 255

26

4.a) Define subnetting. A university is given the network 192.168.40.0/22 and needs to divide it into 6 subnets for different departments.

2^6=T6=x0   Authentication
. Consistency
   i) Determine the new subnet mask.
   ii) Calculate the number of hosts per subnet.   Accuracy
   iii) Write the network address, broadcast address, and first and last usable IPs for Subnet 4.   127
   iv) Discuss one advantage and one limitation of subnetting.   24−22=

b) A company uses NAT with private IPs in the range 10.0.0.0/8.   4
   i) Explain the purpose of NAT and why private addresses cannot be routed on the Internet.
   ii) Differentiate Static NAT, Dynamic NAT

c) Why is VLSM useful in hierarchical network design? Give one example of a network scenario where VLSM would be preferred.   3

192.168.40.0

255.255.255.2

0000 0|

5.a) A packet arrives at a router with the following IPv4 header information: **5**
Version: 4, HL: 5
TTL: 3
Protocol: 6 (TCP)
Total Length: 1500 bytes

   i) Draw the IPv4 header and label the fields.
   ii) Explain the significance of the TTL and Protocol fields.
   iii) What will happen to this packet after the TTL reaches zero?

b) A router needs to forward a **2000-byte IP packet** over a network with a **Maximum**   **4**
Transmission Unit (MTU) of 800 bytes.

   i) Explain why fragmentation is needed.
   ii) Determine how many fragments will be created.
   iii) Determine the size of each fragment and the Fragment Offset values in the IPv4 header

c) A company uses **IPv6 over IPv4 tunneling** to connect two branch offices.   **3**

   i) Explain the concept of IP tunneling.
   ii) Describe step-by-step how an IPv6 packet is transmitted through the IPv4 network.
   iii) State one advantage and one disadvantage of tunneling.

6.a) What is Link State Routing? Use link state routing algorithm to construct routing table for node   **5**
E in the following figure.
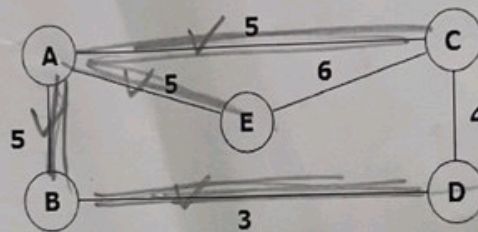
b) Describe the operation of a network switch.   **4**

   Required:
   i) How the switch uses a MAC address table
   ii) The difference between store-and-forward and cut-through switching
   iii) How switches reduce network collisions in a LAN

c) Compare unicast and multicast routing, highlighting their key differences.   **3**

7.a) Define network congestion and explain its primary causes.   **3**

b) Explain the difference between congestion control and flow control in computer networks.   **4**

c) A company network experiences frequent slowdowns during peak hours.   **5**

   i) Identify potential symptoms of network congestion.
   ii) Suggest network design or protocol changes to mitigate congestion.
   iii) Explain how monitoring tools can help detect congestion before it becomes critical.

8.a) What is Digital Signature? How it can be implemented to provide authentication?   **4**

b) How message authentication code (MAC) works? Explain. Does it provide message integrity?   **5**

c) Alice and Bob exchange confidential messages. They share a very large number as the   **3**
encryption and decryption key in both directions. Is this an example of symmetric-key or
asymmetric-key cryptography? Explain.