UNIVERSITY OF ESWATINI

Faculty of Science and Engineering

Department of Computer Science

MAIN EXAMINATION - APRIL 2021

<u>Title of Paper:</u> COMPUTER NETWORKS I

<u>Course Number:</u> CSC431

<u>Time Allowed:</u> 3 hours

<u>Instructions to candidates:</u>
*This question paper consists of FIVE (5) questions. Answer **Question 1** and any other 3 questions of your choice from the 4 remaining questions*
Marks are indicated in square brackets.
All questions carry equal marks (25 Marks Each).

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QUESTION 1 (Compulsory: Multiple choice)

1. What two ICMPv6 message types must be permitted through IPv6 access control lists to allow resolution of Layer 3 addresses to Layer 2 MAC addresses? (Choose two.)

    A. neighbor solicitations
    B. echo requests
    C. neighbor advertisements
    D. echo replies
    E. router solicitations
    F. router advertisements

2. Which range of link-local addresses can be assigned to an IPv6-enabled interface?

    A. FEC0::/10
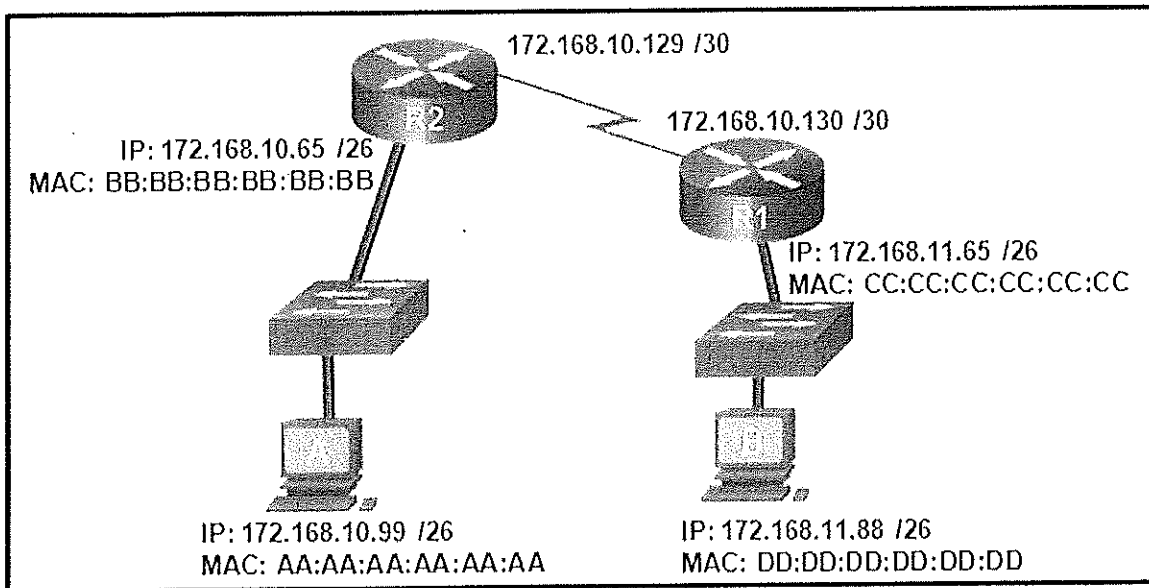   B. FDEE::/7
    C. FE80::/10
    D. FF00::/8

3. What would be the interface ID of an IPv6 enabled interface with a MAC address of 1C-6F-65-C2-BD-F8 when the interface ID is generated by using the EUI-64 process?

    A. 0C6F:65FF:FEC2:BDF8
    B. 1E6F:65FF:FEC2:BDF8
    C. C16F:65FF:FEC2:BDF8
    D. 106F:65FF:FEC2:BDF8

4. An organization is assigned an IPv6 address block of 2001:db8:0:ca00::/56. How many subnets can be created without using bits in the interface ID space?

    A. 256
    B. 512
    C. 1024
    D. 4096

5. Refer to the exhibit. If host A sends an IP packet to host B, what will the destination address be in the frame when it leaves host A?

```
                              172.168.10.129 /30

                                          172.168.10.130 /30
        IP: 172.168.10.65 /26
    MAC: BB:BB:BB:BB:BB:BB
                                            IP: 172.168.11.65 /26
                                            MAC: CC:CC:CC:CC:CC:CC




        IP: 172.168.10.99 /26           IP: 172.168.11.88 /26
        MAC: AA:AA:AA:AA:AA:AA          MAC: DD:DD:DD:DD:DD:DD
```

A. DD:DD:DD:DD:DD:DD
B. 172.168.10.99
C. CC:CC:CC:CC:CC:CC
D. 172.168.10.65
E. BB:BB:BB:BB:BB:BB
F. AA:AA:AA:AA:AA:AA

6. When a switch configuration includes a user-defined error threshold on a per-port basis, to which switching method will the switch revert when the error threshold is reached?

A. cut-through
B. store-and-forward
C. fast-forward
D. fragment-free

7. Which two statements are correct about MAC and IP addresses during data transmission if NAT is not involved? (Choose two.)

A. Destination IP addresses in a packet header remain constant along the entire path to a target host.
B. Destination MAC addresses will never change in a frame that goes across seven routers.
C. Every time a frame is encapsulated with a new destination MAC address, a new destination IP address is needed.
D. Destination and source MAC addresses have local significance and change every time a frame goes from one LAN to another.
E. A packet that has crossed four routers has changed the destination IP address four times.

8. What is one main characteristic of the data link layer?

A. It generates the electrical or optical signals that represent the 1 and 0 on the media.
B. It converts a stream of data bits into a predefined code.
C. It shields the upper layer protocol from being aware of the physical medium to be used in the communication.
D. It accepts Layer 3 packets and decides the path by which to forward the packet to a remote network.

9. What are three characteristics of the CSMA/CD process? (Choose three.)

A. The device with the electronic token is the only one that can transmit after a collision.
B. A device listens and waits until the media is not busy before transmitting.
C. After detecting a collision, hosts can attempt to resume transmission after a random time delay has expired.
D. All of the devices on a segment see data that passes on the network medium.
E. A jam signal indicates that the collision has cleared and the media is not busy.
F. Devices can be configured with a higher transmission priority.

10. What are two primary responsibilities of the Ethernet MAC sublayer? (Choose two.)

A. error detection
B. frame delimiting
C. accessing the media
D. data encapsulation
E. logical addressing

11. Which two commands can be used on a Windows host to display the routing table? (Choose two.)

A. netstat -s
B. route print
C. show ip route
D. netstat -r
E. tracert

12. What are two functions that are provided by the network layer? (Choose two.)

A. directing data packets to destination hosts on other networks
B. placing data on the network medium
C. carrying data between processes that are running on source and destination hosts
D. providing dedicated end-to-end connections
E. providing end devices with a unique network identifier

13. Which two statements describe features of an IPv4 routing table on a router? (Choose two.)

A. Directly connected interfaces will have two route source codes in the routing table: C and S.
B. If there are two or more possible routes to the same destination, the route associated with the higher metric value is included in the routing table.
C. The netstat -r command can be used to display the routing table of a router.
D. The routing table lists the MAC addresses of each active interface.
E. It stores information about routes derived from the active router interfaces.
F. If a default static route is configured in the router, an entry will be included in the routing table with source code S.

14. How does the service password-encryption command enhance password security on Cisco routers and switches?

A. It requires encrypted passwords to be used when connecting remotely to a router or switch with Telnet.
B. It encrypts passwords that are stored in router or switch configuration files.
C. It requires that a user type encrypted password to gain console access to a router or switch.
D. It encrypts passwords as they are sent across the network.

15. Why would a Layer 2 switch need an IP address?

A. to enable the switch to send broadcast frames to attached PCs
B. to enable the switch to function as a default gateway
C. to enable the switch to be managed remotely
D. to enable the switch to receive frames from attached PCs

16. What characteristic describes identity theft?

A. the use of stolen credentials to access private data
B. software on a router that filters traffic based on IP addresses or applications
C. software that identifies fast-spreading threats
D. a tunneling protocol that provides remote users with secure access into the network of an organization

18. A user sends an HTTP request to a web server on a remote network. During encapsulation for this request, what information is added to the address field of a frame to indicate the destination?

A. the network domain of the destination host
B. the IP address of the default gateway
C. the MAC address of the destination host
D. the MAC address of the default gateway

19. Data is being sent from a source PC to a destination server. Which three statements correctly describe the function of TCP or UDP in this situation? (Choose three.)

A. The source port field identifies the running application or service that will handle data returning to the PC.
B. The TCP process running on the PC randomly selects the destination port when establishing a session with the server.
C. UDP segments are encapsulated within IP packets for transport across the network.
D. The UDP destination port number identifies the application or service on the server which will handle the data.
E. TCP is the preferred protocol when a function requires lower network overhead.
F. The TCP source port number identifies the sending host on the network.

QUESTION 2

A. Illustrate the basic structure of an IP address. In what way does this structure vary between address classes A, B, C, D and E? [5]

B. Give a detailed explanation of the operation of ARP. [4]

C. Convert the following IP address into binary; 192.168.34.26. [2]

D. Convert the following IP address decimal 11001100.10010111.00101010.01011111. [2]

E. Describe the fields of an IPv4 packet header. [5]

F. A TCP entity transmits 10,000 bytes of data in 2,000bytes segments (thus, including the TCP header, there will be 2,020 bytes of IP data for each segment). The IP entity is operating with a Maximum Transmission Unit (MTU) of 1024 bytes. Calculate how many packets the IP entity will transmit and justify your answer. (You may ignore errors and assume that IP headers are 20 bytes). [7]
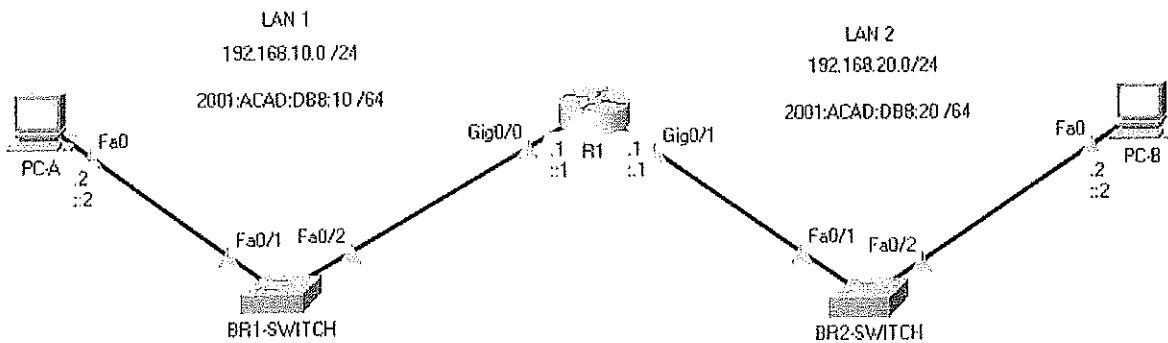
QUESTION 3

A. What is the Cisco IOS? [2]

B. Explain 3 operational modes of the Cisco CLI. [5]

C. Given the following network topology, explain encapsulation, de-encapsulation and re-encapsulation. In your answer explain how your headers will change at each hop when PC-A sends a message to PC-B. [8]

D. Using the same topology, write a sequence of commands that you will enter for each device (indicating the prompts). The commands for setting the following; [10]

- Hostnames
- Banner ("**Unauthorised Access is Prohibited!!!!!**")
- Priviledged Exec mode password – **cisco**
- Console password – **ciscocon**
- Telnet password – **ciscotel**
- Interface descriptions
- IP addresses (both ipv4 and ipv6)

QUESTION 4

A. What is the role of the transport layer in the 5-layer TCP/IP protocol stack? [3]

B. What is a socket in TCP/IP? [2]

C. Explain the difference between HTTP and HTTPs. [3]

D. Describe how email works. In your description you should include how an end user gets to read the email using the appropriate client. [6]

E. What is DHCP? What is it used for? [3]

F. Briefly explain how the Domain Name Service (DNS) is implemented and how DNS queries are resolved in the DNS system. [5]

G. What is ICMP? Briefly explain the key areas of functionality for ICMP giving an example. [3]

QUESTION 5

A. What is VLSM ? [2]

B. Consider host IP 172.40.0.0/16 to design a network in a new office building where the following requirements must be supported and met;

Department 1 (235 hosts)
Department 2 (920 hosts)
Department 3 (128 hosts)
Department 4 (250 hosts)

Calculate the following for each department: [12]
i. Number of Sub-Net Bits
ii. Number of Host Bits
iii. Total Network Bits
iv. Maximum possible Networks
v. Maximum Valid Hosts/Network
vi. Default Gateway
Also write the *Network address*, *Host IP address range* and *Broadcast address* for every department.

C. Consider a subnet with prefix 101.101.101.160/28. Given an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. [3]

D. Suppose an ISP owns the block of addresses of the form 101.101.128/17. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? [8]

End of Question Paper