



**SCHOOL OF COMPUTING AND ENGINEERING SCIENCES
BACHELOR OF SCIENCE IN COMPUTER NETWORKS AND CYBER SECURITY
CNS 2203: DATA NETWORK DESIGN AND MANAGEMENT II
END OF SEMESTER EXAMINATION**

DATE: 2nd December 2022

Time: 2 ½ hrs.

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

Question One [20 Marks]

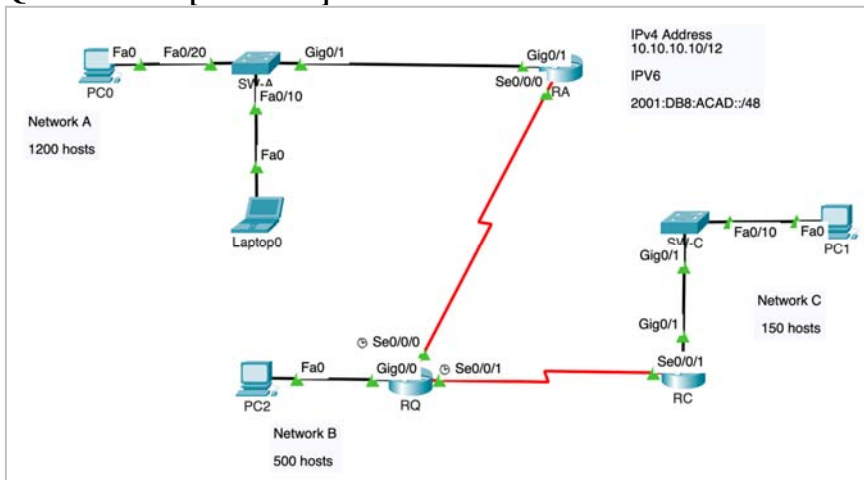


Figure Q 1. Network Topology 1

Device	Device Model	Device	Device Model
Router	2911	Layer 2 switch	2960
PCs	PC/Laptop		

Table Q1 1

Submission Note:

- * Name your Packet Tracer file using the format <admission number-name>
- * Upload the file on **Google Classroom** under the name **CNS2203-EXAM**
- * Indicate all the commands on txt file and upload that together with the Packet Tracer file
- * Use class or DNDM as the passwords for all configs requiring passwords

Required:

- a. Connect your devices as in the given topology. Refer to **Table Q1** for the correct device models. **[1 mark]**
- b. Configure the banner, hostname, passwords, and encryption on RA. Replicate this on all the network devices **[2 marks]**
- c. Topology Q1 represents the addressing requirements for company X.

- i Given the IPv4 address 10.10.10.10/12, subnet the address as per the requirements and populate Table Q1 2 [5 marks]

Dept	Network ID	Usable Range	Subnet mask
Network A 1200 hosts			
Network A 500 hosts			
Network A 150 hosts			
WAN Link 1			
WAN Link 2			

Table Q1 2: IPv4 Addressing

- ii Given the IPv6 address 2001:DB0:ACAD::/48, subnet the address and assign the first 5 subnets to the departments in Table Q1 3 [5 marks]

Dept	IPv6 Range	Prefix Length
Network A 1200 hosts		
Network A 500 hosts		
Network A 150 hosts		
WAN Link 1		
WAN Link 2		

Table Q1 3: IPv6 Addressing

- d. Assign the IPv4 addresses as follows:
- i. Assign the first usable IPv4 address of each network to the router interface on that network and the DCE side of a router-router connection [3 marks]
 - ii. Assign the 10th usable IPv4 addresses to the end user devices [2 marks]
 - iii. Assign the 5th usable addresses to the switches and configure the default gateway [2 marks]

Question Two [20 marks]

- a. Replicate the Topology Figure Q1 and name it Topology Q2, configure the following:
 - i. Configure RIPv2 on the 3 routers [6 marks]
 - ii. Define interfaces that should not receive RIP updates [1.5 marks]
 - iii. Configure a default route on Routers RA and RC such that all traffic is channeled to RQ [2 marks]
 - iv. Allow RIP updates to contain any default routes [1.5 marks]
 - v. Define a floating static route between router RA and RQ [1 mark]
 - vi. Test connectivity between Network A and B and discuss the output [1 mark]
- b. Assign the 1st and 10th IPv6 addresses to the router interfaces and end devices respectively [3marks]
- c. Configure RIPv6 on the 3 routers [3 marks]
- d. Test IPV6 connectivity between network A and C [1 marks]

Question Three [20 marks]

Examine the topology in **Figure Q.3**. You will use it to answer several questions in this exam.

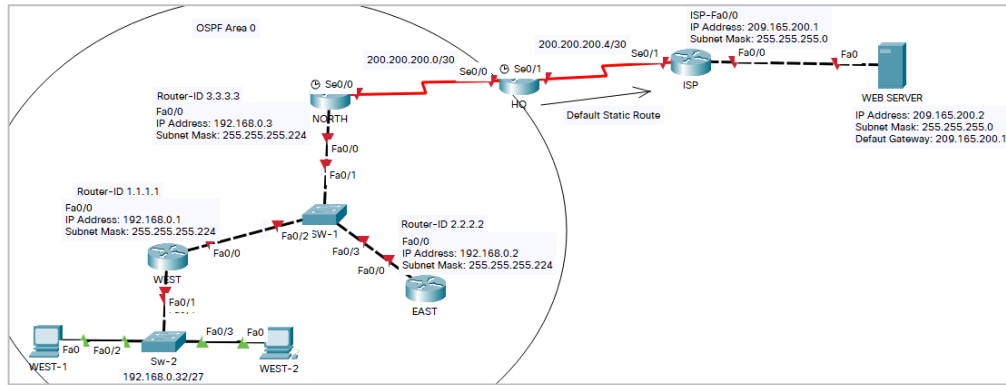


Figure Q.3

Note: OSPF = Open Shortest Path First

Table Q.3(a): Device Models

Devices	Location	Model
Routers	Miscellaneous Folder	2621XM
Switches	Switches	2960
Server	End Devices	Server-PT
PCs	End Devices	PC-PT

Table Q.3(b): Interface Addresses

Device	IP Address	Subnet Mask	Default Gateway
WEST-1	192.168.0.34	255.255.255.224	192.168.0.33
WEST-2	192.168.0.62	255.255.255.224	192.168.0.33

Refer for the topology in **Figure Q.3**, **Table Q.3(a)** and **Table Q.3(b)** above:

- a) In packet tracer connect the devices and name them as shown in the diagram [2 marks]
- b) For North, HQ and ISP routers (refer to the topology in **Figure Q.1**)
 - i. Determine the IP addresses and subnet masks to configure on the following serial interfaces [2 marks]
 - ii. Using the information in (c) i, above, configure IP settings on the routers' serial interfaces including clock rates of 128000 on the appropriate interfaces. Ensure to test for connectivity between the directly connected interfaces [2 marks]
 - iii. Configure IP addresses on the FastEthernet ports of all the routers (refer to the topology in **Figure Q.3**). [2 marks]
- c) Refer to **Figure Q.3** and **Table Q.3(b)**. Configure IP settings on the PCs and Web server. Ensure you test for connectivity between these devices and their gateways. [2 marks]
- d) Examine the topology in **Figure Q.3** again. [5 marks]
 - i. Identify the routers that should be OSPF enabled and which of their interfaces will participate in the OSPF process.
 - ii. Examine the routing tables of the routers identified in e (i) above.
 - iii. Using the information in e (ii) above, configure OSPFv2. Include Router-IDs on the appropriate router as per the topology in **Figure Q.3**.
 - iv. Examine your routing tables to check for routing table convergence among the OSPF enabled routers.

- e) On HQ, configure a default static route pointing to the ISP and configure your OSPF protocol to propagate the default route configured. *Examine your routing tables to confirm that the static default route was propagated among the OSPF enabled routers.* **[1 mark]**
- f) Examine the routing tables of the following routers: West, East, North and HQ. List the 192.168.0.x networks that you can see in the routing tables. Summarise/ aggregate the listed networks. *Ensure that you show your working.* **[2 marks]**
- g) On ISP, configure the summarised network determined in (h) above as a summary static route. *Note: This static route will be used to reach the devices in OSPF network from the ISP* **[1 mark]**
- h) Test for connectivity. *All devices should be able to ping each other.* **[1 mark]**

Question Four [20 marks]

- a) From your configured topology in **Figure Q.3**, Question three, go to the North-Router and examine the OSPF neighbor table
 - i. Write down your output. **[1 mark]**
 - ii. From your output in (i) above, explain the meaning of the output of the fields in columns 1, 2, 3, 4 and 6 **[5 marks]**
 - iii. Based on your output in (i) above, what parameter was used to select the Designated Router (DR). **[1 mark]**
- b) OSPFv2 supports both plain text and cryptographic authentication (MD-5 and HMAC-SHA) but it is not enabled by default. Giving TWO reasons explain why the network administrator of the network in **Figure Q.1** should consider configuring cryptographic authentication. **[4 marks]**
- c) Troubleshooting is an inevitable activity for any network administrator.
 - i. What is network troubleshooting? **[1 mark]**
 - ii. Explain the 6 general steps to follow when troubleshooting a network. **[6 marks]**
- d) Explain role of the following commands used in network troubleshooting.
 - i. ping **[1 mark]**
 - ii. tracert/traceroute **[1 mark]**

Question Five [20 marks]

- a) Network Address Translation (NAT) is one of the many IP services that may be required in private networks connecting to external networks.
 - i. Explain the motivation behind the creation of NAT **[1 mark]**
 - ii. Identify and briefly discuss any TWO NAT implementations. **[7 marks]**
 - iii. Although ACLs are good for providing some level of network security, they have some drawbacks. Explain any general TWO drawbacks of using ACLs **[2 marks]**
- b) Access Control Lists (ACLs) are a good way to filter traffic getting into or out an enterprise network. Explain the general process followed by ACLs when filtering network traffic. *Include a flow chart diagram as part of your answer.* **[4 marks]**
- c) Explain any 3 advantages of Network Function virtualization **[3 marks]**
- d) Explain any 3 benefits of automation **[3 marks]**