



Strathmore  
UNIVERSITY

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: 10<sup>th</sup> December 2024

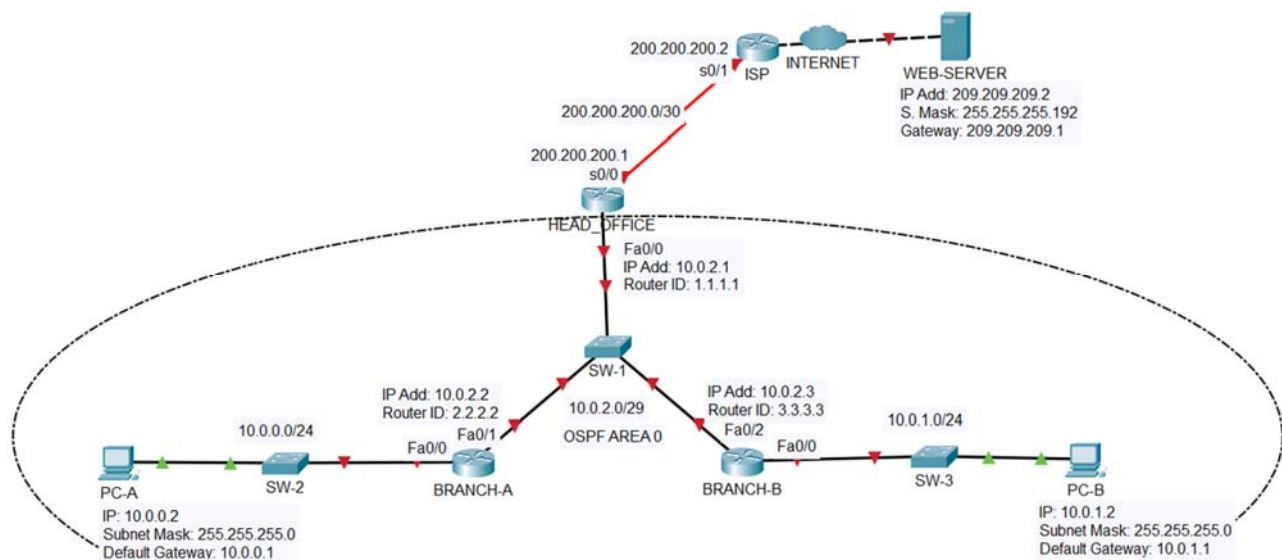
Time: 08:00-10:00 hrs.

**Instructions**

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

**Question One [30 marks]**

Examine the topology in **Figure Q.1** below. You will use it to answer several questions in this exam.



**Figure Q.1**

- a) Static Routing is one of the methods of routing that could be used on various network. Assume that you will use only static routing on **Figure Q.1** above.
- i. Examine the topology in **Figure Q.1**. Identify briefly describe any **THREE** types of static routes that could be configured on this topology. You may state the assumptions that you have made if any. **[3 marks]**
  - ii. Provide a static route command that will allow the Branch-B to access any device over the internet. You will need the following router prompt:  
Branch-B (config)#  
Assume that all interfaces are configured to have an IP address, subnet mask and are switched on. i.e. only write the required static route commands **[2 marks]**

- b) The routing information protocol (RIP) was one of the earliest routing protocols to be used in IP networks.
- i. Examine the topology in **Figure Q.1** and recommend an appropriate RIP version for the topology. **[1 mark]**
  - ii. Giving TWO reasons justify your choice in (b)i above **[2 marks]**
  - iii. Giving THREE reasons explain why RIP is not used much in today's networks. **[3 marks]**
  - iv. Identify and briefly the metric used in RIP for path computation. **[1 mark]**
- c) Assume that you will configure OSPFv2 on the topology in **Figure Q.1** above.
- i. Provide the list of commands that you would use to enable this OSPF version on Branches and Head-Office. You will need the following router prompts:  

```
Head_Office (config)#
Head_Office (config-router)#

Branch-A (config)#
Branch -A (config-router)#

Branch -B (config)#
Branch -B (config-router)#
```

*Assume that all interfaces are configured to have an IP address, subnet mask and are switched on. i.e. only write the required OSPF commands* **[6 marks]**
  - ii. Examine the topology in **Figure Q.1** again. Identify and briefly describe the OSPF network type in **Figure Q.1**. As part of your answer point out where this network types exists on the topology above. **[2 marks]**
- d) The router-ID is an important parameter in the OSPF process.
- i. What is an OSPF router-ID? **[1 mark]**
  - ii. Explain TWO roles of the router-ID in OSPF enabled networks. **[2 marks]**
  - iii. In order of preference, explain how the OSPF router ID is chosen by OSPF enabled routers. **[3 marks]**
  - iv. From the topology in **Figure Q.1**, identify the OSPF router-IDs of the Head\_Office and Branch-A routers. **[1 mark]**
- e) There are two methods of authentication that are defined for OSPFv2. Identify and briefly describe these two methods. **[3 marks]**

### Question Two [15 marks]

Examine the topology in **Figure Q.1**. You will use it to answer the following questions.

Assume that the Head-Office Router will be configured for network address translation (NAT).

*You may state assumptions that you have made of any.*

- a) Define the following and NAT addresses and use the topology in **Figure Q.1** to provide one example of each type of address
  - i. Inside Local **[1 ½ marks]**

- ii. Inside Global [1 ½ marks]
  - iii. Outside Global [1 ½ marks]
  - iv. Outside Local [1 ½ marks]
- b) Identify and briefly describe any THREE ways of implementing NAT. [9 marks]

**Question Three [15 marks]**

Based on the level of complexity or simplicity, Access Control Lists (ACLs) can be classified as: standard (basic) and extended (complex).

- a) Briefly describe these two categories of ACLs. [3 marks]
- b) Differentiate between numbered and named ACLs [2 marks]
- c) Explain any FOUR benefits of ACLs. [4 marks]
- d) Examine **Figure Q.1** and use it to answer the questions below. *In each case assume that all router the router interfaces already configured with IP settings and are up and that routing is already enabled.*

- i. Write ACL statements that you would place on the topology to prevent only PC-A from sending traffic to the internet. Ensure that PC-A's traffic can be delivered to all other parts of the topology apart from the internet. All other devices should be able to route their traffic to the internet and to the other networks on the topology.

**Hint:** Write your commands starting with the router prompt: Router(config)#  
 In your answer replace the router name in the prompt with the appropriate router name as per the topology. Note that you will need to determine which router to place this ACL on; to be able to replace the router name correctly. All the ACL statements should be placed on a single router. [3 marks]

- ii. Write the list of commands that will assign the ACL in (d)i. above on the appropriate interface for execution.

**Hint:** you will need the two prompts below. Change the router name to reflect the correct name as in (d)i. above. Include the appropriate router prompts as part of your answer.

Router (config)#  
 Router config-if)# [1 mark]

- iii. Write a basic ACL statement that would allow only PC-B to telnet into the Head-Office router. Start your commands from the router prompts below and include the prompts as part of your answer.

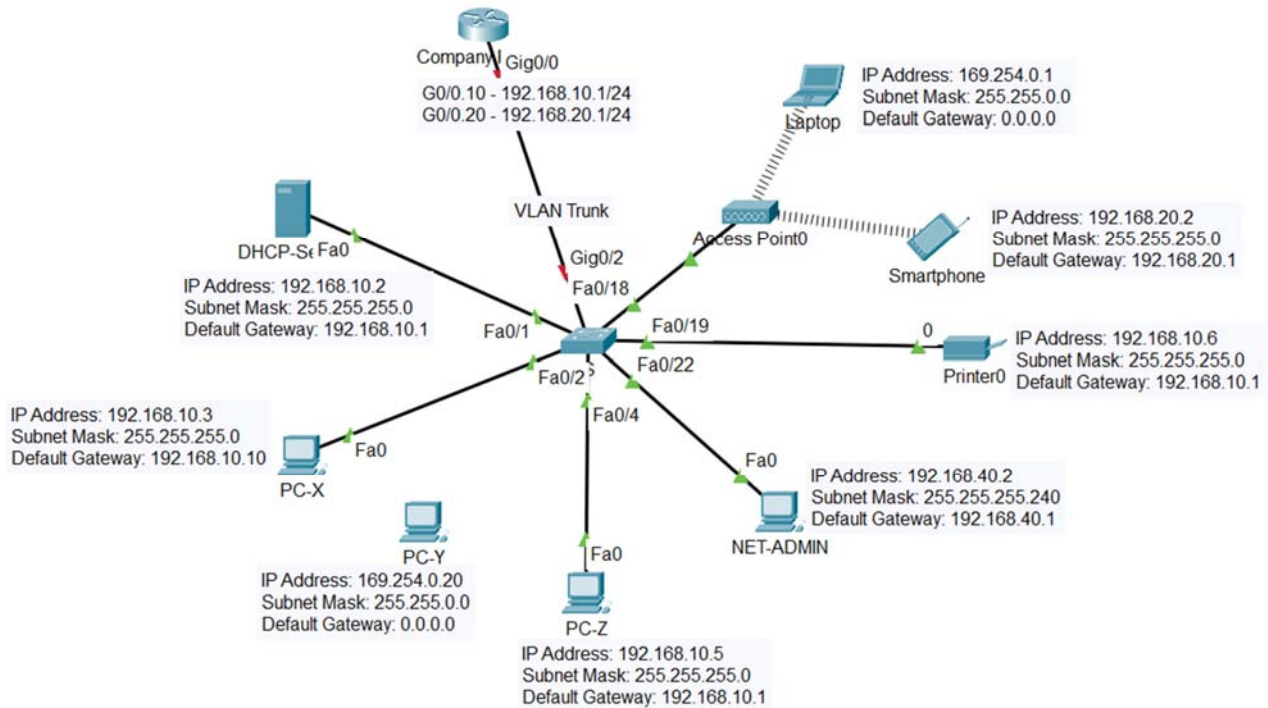
Head-Office(config)# [1 mark]

- iv. Write the list of commands that will assign the ACL in (d)iii. above to the appropriate interface for execution. Start your commands from the router prompts below and include the prompts as part of your answer.

Head-Office(config)#  
 Head-Office (config-line)# [1 mark]

### Question Four [15 marks]

Examine the topology in **Figure Q.4** below and the tables below it. You will use it to answer several parts of question 4.



**Figure Q.4**

**Table Q.4. The VLANs**

VLANs	VLAN-Interface Association	VLAN Assignment	IP Address Range
VLAN 10	Fa0/1 – Fa0/15	Wired LAN	192.168.10.0/24
VLAN 20	Fa0/18 – Fa0/21	Wireless LAN	192.168.20.0/24
VLAN 40	Fa0/22 - Fa0/24	Management VLAN	192.168.40.0/28

Assume:

- The following devices' IP address information is manually configured by the administrator: the router sub-interfaces, the printer, the DHCP server and the network admin PC
- All the other devices' IP address information is dynamically assigned via DHCP service
- The switch interface g0/2 and the router interface g0/0 are VLAN trunks

#### Required:

You have been tasked to troubleshoot the network in **Figure Q.4** above. Here are some of the issues that have been identified:

- PC-Y cannot ping any device on the topology
- PC-X can successfully ping PC-Z and the DHCP server but cannot successfully ping outside its VLAN
- None of the user devices can successfully send print jobs to the printer
- The Net-Admin PC cannot telnet into the router
- The user on the laptop cannot access the internet neither can he/she send messages to other devices within the company network

For each issue listed above, identify the probable cause(s) and explain how you would resolve the problem.

*Note: Refer to **Figure Q.4** and **Table Q.4** to be able to provide a good answer. Where the information is limited you may speculate. Ensure that you state any assumptions that you have made in your speculation.* **[15 marks]**

**Question Five [15 marks]**

- a) Network automation enables efficiency in network management.
- i. Identify and briefly describe the three types of network automation. **[6 marks]**
  - ii. Explain THREE network automation challenges. **[3 marks]**
- b) The terms “cloud computing” and “virtualization” are often used interchangeably; however, they mean different things.
- i. Define the term network virtualization **[1 mark]**
  - ii. Explain the difference between the two terms: “cloud computing” and “virtualization” **[2 marks]**
  - iii. Explain any THREE challenges/drawbacks of network virtualization **[3 marks]**