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: 28th July 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 [30 marks]

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

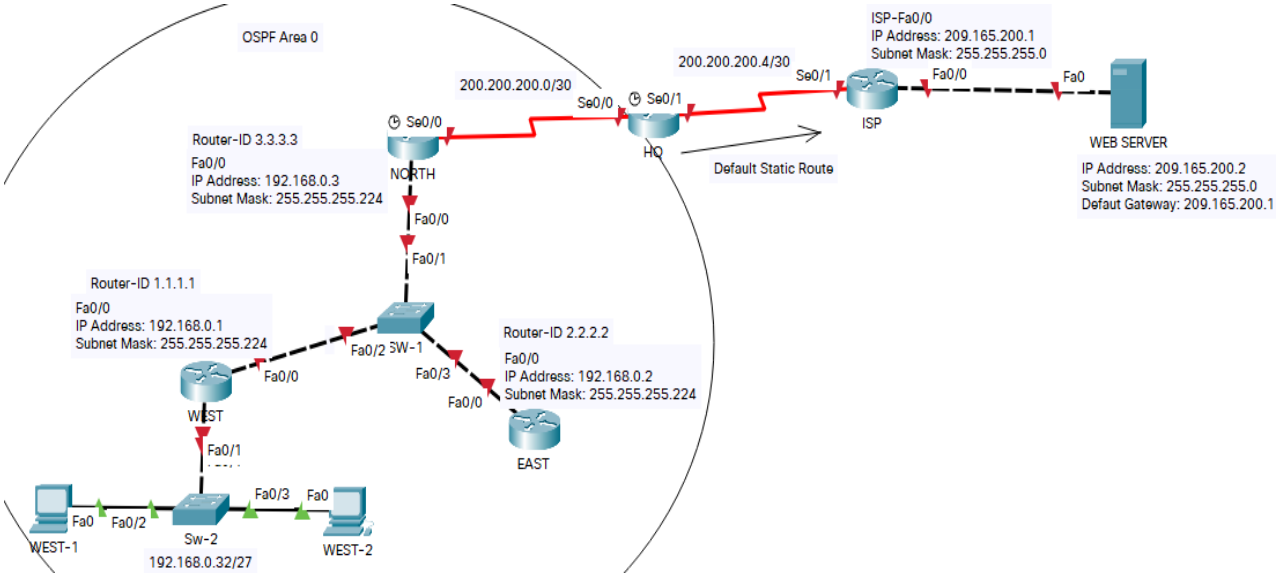

Figure Q.1

Note: OSPF = Open Shortest Path First

Table Q.1(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.1(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.1**, **Table Q.1(a)** and **Table Q.1(b)** above:

a) In packet tracer connect the devices as in the diagram **[2 marks]**
b) Configure router names **[2 marks]**
c) 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 in 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 conected interfaces* **[2 marks]**
    iii. Configure IP addresses on the FastEthernet ports of all the routers *(refer to the topology in **Figure Q.1).*** **[2 marks]**

d) Refer to **Figure Q.1** and **Table Q.1(b).** Configure IP settings on the PCs and Web server**.** *Ensure you test for connectivity between these devices and their gateways.* **[3 marks]**
e) Examine the topology in **Figure Q.1** again.
    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.1***
    Note that the HQ-ISP connection should not be part of your OSPF process.
    iv. Examine your routing tables to check for routing table convergence among the OSPF enabled routers.

    [7 marks]
f) On HQ, configure a default static route to connect to the ISP. **[1 mark]**
g) On HQ, configure the OSPF protocol to propagate the default route configured in (f) above. *Examine your routing tables to confirm that the static default route was propagated among the OSPF enabled routers.* ***Note that it may take some time for OSPF to share the default route with the other routers*****[1 mark]**
h) 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]**
i) On ISP, configure the summarised network determined in (h) above as a summary static r*oute. **Note**: This static route will be used to reach the devices in OSPF network from the ISP* **[1 mark]**
j) Test for connectivity. *All devices should be able to ping each other***. [1 mark]**
k) On West, configure an ACL that will only allow West-1 telnet access to the West router. *Note that you need to also configure a console and telnet (vty) line passwords on WEST in order to test your ACL.* **[3 marks]**

l) Test the ACL in k above. **[1 mark]**
m) In a textbox in your packet tracer interface indicate the telnet and console line passwords that you configured. Also include your admission number in the same text box.
n) Save the file using your admission number and upload your work on the Strathmore Lewa platform for marking. (https://lewa.strathmore.edu/)

Question Two [15 marks]

a) From your configured topology in **Figure Q.1,** Question one, 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**. [2 marks]**

c) Highlight THREE similarities and THREE differences between the Router Information Protocol version 2 (RIPv2) and OSPFv2. **[6 marks]**

Question Three [15 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]**
Note. *The discussion of each implementation is worth 3 ½ marks*

iii. Although ACLs are good for providing come 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.* **[5 marks]**

Question Four [15 marks]

Troubleshooting is an inevitable activity for any network administrator.

a) What is troubleshooting? **[1 mark]**

b) Explain the SEVEN general steps to follow when troubleshooting a network. **[9 marks]**

c) Explain role of the following commands used in network troubleshooting.

i. ping [**1 mark]**

ii. tracert/traceroute **[1 mark]**

iii. ipconfig **[1 mark]**

iv. nslookup **[1 mark]**

v. netstat **[1 mark]**

Question Five [15 marks]

a) The three main cloud computing services defined by the National Institute of Standards and Technology (NIST) in their Special Publication 800-145 are: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). Briefly describe each of these services. **[3 marks]**

b) Briefly describe the following cloud models

i. Public clouds **[1 mark]**

ii. Private clouds **[1 mark]**

iii. Hybrid clouds **[1 mark]**

iv. Community clouds **[1 mark]**

c) Explain any FOUR advantages of virtualization **[4 marks]**

d) Explain any FOUR benefits of automation **[4 marks]**