



**Strathmore**  
UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY  
BACHELOR OF SCIENCE IN INFORMATICS AND COMPUTER SCIENCE  
END OF SEMESTER EXAMINATION  
ICS 2203: ADVANCED NETWORKING

DATE: November 2018

Time: 2 hrs.

**Instructions:**

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

**Question One [30 marks]**

- a) You are the network administrator at Smart Solution's Company's (SSC). The organization has THREE branches in three regions of Africa: East, West and Central. SCC has been growing rapidly over the past few years and requires an upgrade of some of its devices and an overhaul of addressing to take care of the anticipated growth. The table below shows SCC's current position and anticipated growth.

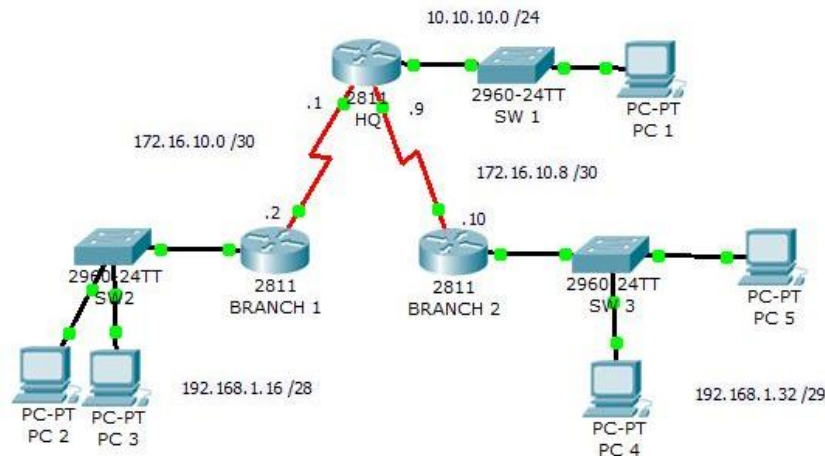
Region	No. of Hosts	Anticipated Growth
East	1000	30%
West	3000	20%
Central	500	10%

**Table Q.1a**

Assume that your Regional Internet Registry (RIR) has allocated you the address 40.40.0.0/16.

- i. Applying variable length subnet masks, subnet the allocated address and represent your addressing scheme in a subnet chart with the headings shown below:  
*Region / Subnet Address / Usable Host Addresses / Broadcast Address / Prefix*  
*Ensure that you show your working. [9 marks]*
- ii. Sketch a simple diagram showing how you would connect the devices in the West Region. Assume that you will need only one router, one switch and a single end device to represent the devices in the West local area network. On the sketch indicate the IP settings that you would configure on your interfaces. *Ensure you label the devices to make the diagram easy to interpret. [4 marks]*

- b) Examine the topology in **Figure Q.1b** below. You will use it to answer various questions that follow.



**Figure Q.1b**

Assume that you will configure static routes on the domain in **Figure Q.1b**.

- Explain THREE challenges that you are likely to encounter. [3 marks]
- Describe any THREE types of static routes that you could configure on the domain in **Figure Q.1b** above. [3 marks]
- Refer to **Figure Q1.b**. Write down the sequence of static route commands that you could use to enable Branch 1 reach its remote networks. Assume that on the entire domain all interfaces are configured and that the directly connected networks are present in the routing tables.

**Hint:** The router prompt is: BRANCH\_1 (config) # [3 marks]

- c) Router Information Protocol (RIP) is one of the earliest versions of open protocols used over the internet.

- What version of RIP would you recommend for the domain in **Figure Q.1b**? Giving THREE reasons justify your choice. [2 marks]
- Write down the sequence of commands that you could use to enable the appropriate RIP version on Branch 2. Ensure that the Ethernet interface is passive. Assume that on the entire domain all interfaces are configured and that the directly connected networks are present in the routing tables. The Ethernet interface is numbered g0/0. **Hint:** The router prompts are:

BRANCH\_2 (config) #

BRANCH\_2 (config-router) # [3 marks]

- Discuss THREE general characteristics of RIP [3 marks]

## Question Two [15 marks]

- a) An organization requires 4000 addresses for the devices on its network. Assume that the Regional Internet Registry (RIR) would like to assign the organization a Classless Inter-Domain Routing (CIDR) address in the class C range.

- What is CIDR? [1 mark]

- ii. How many class C networks would the RIR need to be bundle together in the CIDR address that will be allocated? *Show your working.* [2 marks]
  - iii. Suggest a possible network address to use. Your suggestion should include an IP address and a prefix length (or specify the range) [1 mark]
  - iv. Explain THREE benefits of CIDR. [3 marks]
- b) Examine the topology in **Figure Q.2b** below. You will use it to answer various questions that follow.



**Figure Q.2b**

- i. Determine the summary address of the /64 networks on the right hand side of R2. *Ensure that you show your working.* [3 marks]
- ii. Assume that you will subnet the network on R1's g0/0 interface into /66 blocks (subnets). How many subnets will you have? [1 mark]
- iii. Write down all subnets that you will create from b. (ii) above. *Ensure that you show your working.* [4 marks]

### Question Three [15 marks]

- a) Routing protocols have THREE main components: data structures, routing algorithm and messages.
  - i. Briefly explain the role played by each of these. [3 marks]
  - ii. Give ONE example of a routing algorithm. [1 mark]
- b) Differentiate between the following:
  - i. An autonomous system and a routing metric [2 marks]
  - ii. Classful and classless routing protocols and give ONE example of each. [3 marks]
- c) Refer to **Figure Q.1b** in Question One above.
  - i. Write the commands that would enable EIGRP on the Branch 2 router. *Assume that on the entire domain all interfaces are configured and that the directly connected networks are present in the routing tables. Hint: The router prompts are:*

```
BRANCH_2 (config)#
BRANCH_2 (config-router) #
```

[3 marks]
  - ii. Discuss any THREE characteristics of EIGRP. [3 marks]

#### Question Four [15 marks]

- a) Describe the process followed by single area OSPF in building routing tables. [6 marks]
- b) Refer to the topology in **Figure Q.1b** in Question One above.
- Write the sequence of commands that you would use on Branch 1 to configure OSPF in area 0. Assume that on the entire domain all interfaces are configured and that the directly connected networks are present in the routing tables. *Hint: The router prompts are:*  
BRANCH\_1 (config)#  
BRANCH\_1 (config-router) # [3 marks]
  - Describe THREE characteristics of OSPF that would make it ideal for routing in the above domain. *Note: You may state any assumptions made.* [3 marks]
  - Explain the role of any THREE message types exchanged by OSPF enabled routers. [3 marks]

#### Question Five [15 marks]

A network administrator issues the command: **show ip route** on a Cisco router and gets the output shown in **Figure Q.5** below. Use the output to answer the questions that follow.

```
Gateway of last resort is 200.10.10.2 to network 0.0.0.0

C    10.0.0.0/8 is directly connected, FastEthernet5/0
    193.168.1.0/26 is subnetted, 3 subnets
R      193.168.1.0 [120/1] via 10.0.0.1, 00:00:11, FastEthernet5/0
R      193.168.1.64 [120/1] via 10.0.0.1, 00:00:11, FastEthernet5/0
R      193.168.1.128 [120/1] via 10.0.0.1, 00:00:11, FastEthernet5/0
C    200.10.10.0/24 is directly connected, Serial2/0
R    205.2.2.0/24 [120/1] via 200.10.10.2, 00:00:19, Serial2/0
S*   0.0.0.0/0 [1/0] via 200.10.10.2
Router#
```

**Figure Q.5**

- a) Define the following route entries found in hierarchical routing tables and give ONE example of each from the routing table output shown in Figure Q.5 above. [3 marks]
- Parent route
  - Child route
  - Ultimate route
- b) Sketch a simple topology showing a possible topology from the output in Figure Q.5 above. *Note:* The topology will be incomplete since you only are provided with a single routing table. [6 marks]
- c) A network administrator wishes to divide a school network into smaller broadcast domains using virtual LANs (VLANs). **Table Q.5** below shows the strategy that he intends to use.

User Group	VLAN ID	IP Address Range	Prefix
Teachers	VLAN 40	192.168.40.0	/24
Pupils	VLAN 50	192.168.50.0	/24

**Table Q.5**

- i. Sketch a possible topology showing how the nodes in the VLANs above will be attached. Assume that you will need just one switch. Use two end devices to represent the nodes in each VLAN. On the sketch indicate the possible IP settings (i.e. IP address, subnet mask and default gateway) that could be assigned to each of the end devices. Include the VLAN ID for the end devices **[4 marks]**
- ii. Explain TWO benefits of using VLANs. **[2 marks]**