Strathmore
UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF BUSINESS INFORMATION TECHNOLOGY
END OF SEMESTER EXAMINATION
BBT 3107: NETWORK ROUTING PROTOCOLS

DATE: July 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]**

**Figure Q.1a** below is a partial representation of Smart Solution's Company's (SSC) Network topology. Examine it and use it to answer various questions that follow.

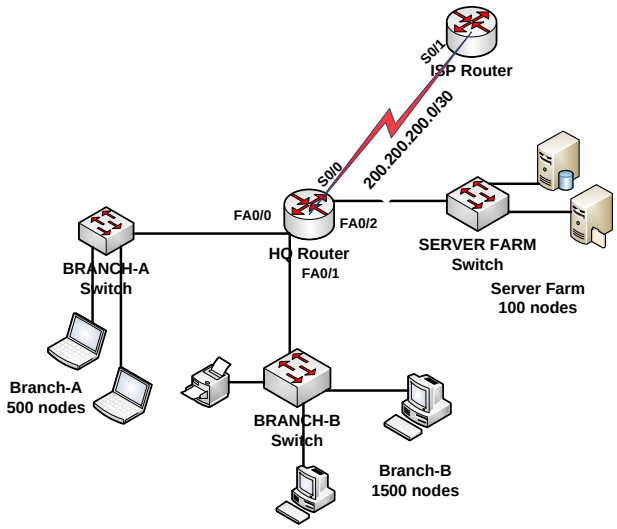


**Figure Q.1a**

a. You are a network administrator at SCC. Assume that you have chosen the IP address 172.30.0.0/16 for your host addressing for Branch-A, Branch-B and the Server Farm.
   i. Subnet the chosen address using VLSM and place your results in a subnet chart. *Ensure that you show your working. The required subnet chart column headings are shown below.* **[9 marks]**

| Branch/Server Farm | Subnet Address | Usable Host Addresses | Broadcast Address | Prefix |
|---|---|---|---|---|
| | | | | |

   ii. **Refer to Figure Q.1a.** Indicate the IP settings that you would configure on serial0/0 of the ISP router. That is; IP address and subnet mask (*in decimal format*). **[2 marks]**

b. **Figure Q.1b** below is a partial representation of Smart Solution's Company's (SSC) Network topology. Examine it and use it to answer various questions that follow.

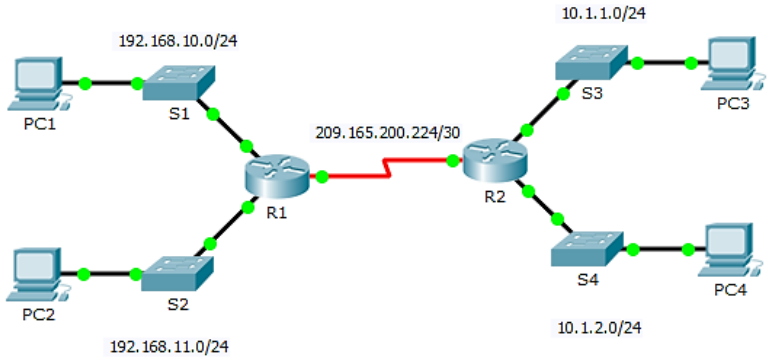


**Figure Q.1b**

i. Determine the summary route of the networks on S1 and S2 **[2 marks]**
ii. Is the result of the summary in b (i) above a supernet or a regular summary address? Explain. **[1 mark]**
iii. Explain THREE benefits of route summarization. **[3 marks]**

c. 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]**

d. Examine **Figure Q.1d** and use it to answer various questions that follow.


**Figure Q.1d**

i. Describe any THREE types of static routes that can be configured on the domain shown in **Figure Q.1d** above. **[3 marks]**
ii. Explain any TWO benefits and TWO disadvantages of using static routing on a domain such as the one in **Figure Q.1da. [4 marks]**
iii. Write down the command that you would place on R1 to configure any of the remote networks found on R2. **[2 marks]**
*Hint: the command will be placed at the prompt*: `R1(config)#`

**Question Two [15 Marks]**

Aisha and Bahati are troubleshooting a routing domain. One of them enters the following command and gets the output displayed in **Figure Q.2a** below.

```
STRATHMORE#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
       i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
       * - candidate default, U - per-user static route, o - ODR
       P - periodic downloaded static route

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

     10.0.0.0/29 is subnetted, 1 subnets
C       10.0.0.0 is directly connected, FastEthernet0/0
     172.15.0.0/30 is subnetted, 1 subnets
C       172.15.15.0 is directly connected, Serial2/0
C    192.168.1.0/24 is directly connected, FastEthernet1/0
R    192.168.2.0/24 [120/1] via 10.0.0.2, 00:00:23, FastEthernet0/0
R    192.168.3.0/24 [120/1] via 10.0.0.3, 00:00:23, FastEthernet0/0
S*   0.0.0.0/0 is directly connected, Serial2/0
```

**Figure Q.2a**

a. What is the role of command displayed in **Figure Q.2a? [1 mark]**

b. Comment on the following parts of the output in **Figure Q.2a? [6 marks]**

i. `10.0.0.0/29 is subnetted, 1 subnets`

ii. `C       172.15.15.0 is directly connected, Serial2/0`

iii.
```
[120/1]
[120/1]
```

iv.
```
via 10.0.0.2,
via 10.0.0.3,
```

v. `S*   0.0.0.0/0 is directly connected, Serial2/0`

vi.
```
C

C
C
R
R
S*
```

c. Refer to **Figure Q.2a.** Sketch a possible network topology showing how the router is connected to the networks shown. On the diagram indicate the network (or subnet) address and interface addresses where it is possible to know them from the output. Do not include the 0.0.0.0/0 network in the diagram. *Note that the topology may be incomplete since you have limited information.* **[5 marks]**

d. The screenshot in **Figure Q.2d** below displays output from the Internet Control Message Protocol (ICMP). Examine it and use it to answer the questions that follow.

```
C:\corenetworkz>ping 4.2.2.2

Pinging 4.2.2.2 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 4.2.2.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

**Figure Q.2d**

i. What is the role of ICMP in networking? **[1 mark]**

ii. A user pings a node with the IP 4.2.2.2 and gets the reply shown above. Explain TWO scenarios that could lead to the result shown in **Figure Q.2. [2 marks]**

**Question Three [15 Marks]**

a. An ISP has been assigned the following IPv6 address by its Regional Internet Registry (RIR): 2001:0DB8:0000:0008:A000:0000:0000:0000/80

i. Abbreviate the assigned address *(ensure that the result is in its simplest format possible).* **[1 mark]**

ii. Assume that this customer wishes to subdivide the given address into /82 blocks (or subnets). How many /82 blocks will be created in total? **[1 mark]**

iii. Write down the ALL the /82 blocks that will be created. *Ensure that you show your working.* **[4 marks]**

b. All routing strategies used in internetworking employ a routing metric.

i. What is a routing metric? **[1 mark]**

ii. Describe any FIVE routing metrics found in IP networks. **[5 marks]**

c. Differentiate between Interior Gateway Protocols (IGPs) and Exterior Gateway Protocols (EGPs). In your answer, include ONE example of each type of protocol. **[3 marks]**

**Question Four [15 Marks]**

Examine **Figure Q.4** below. You will use it to answer various parts of Question Four and Question Five

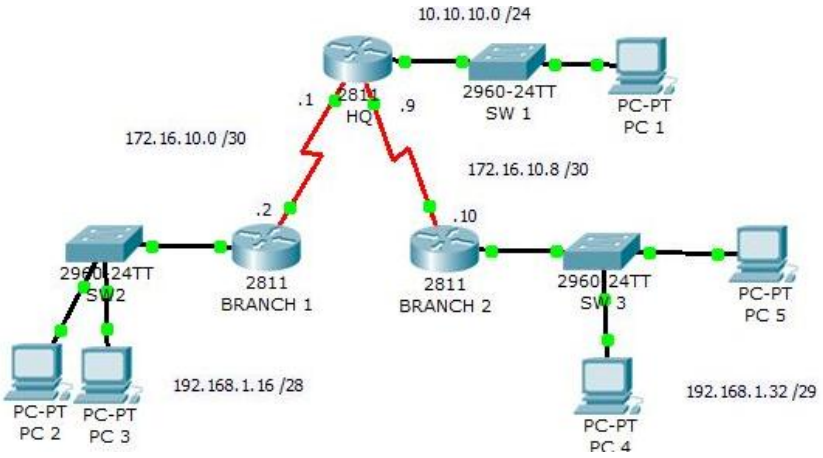


**Figure Q.4**

a. Assume that the topology in **Figure Q.4** will be configured using a dynamic routing protocol.
   i. Highlight any FOUR general considerations that you should make when selecting a routing protocol for any given domain. **[4 marks]**
   ii. Explain THREE general benefits that dynamic routing has over static routing. **[3marks]**

b. Assume that you will configure the Router Information Protocol (RIP) on the domain in **Figure Q.4**
   i. Which version of RIP will you use? Justify your choice. **[1 mark]**
   ii. Describe any THREE general features of RIP. **[3 marks]**
   iii. Write the sequence of commands that you would enter on Branch1 to enable the RIP version that you have stated in b (i) above and advertise one of the networks on Branch1. **[4 marks]**
   *Hint: The commands are entered at the prompts*

```
Branch1(config)#
Branch1(config-router)#
```

**Question Five [15 Marks]**

Refer to **Figure Q.4.** Assume that you will configure the Open Shortest Path First Protocol (OSPF) on the domain in **Figure Q.4.**

a. Determine the wildcard mask of the subnet: 192.168.0.32/29 **[2 marks]**
b. Explain the role played by the following OSPF message types in an OSPF enabled routing domain. **[4 marks]**
   i. Hello
   ii. Link State Request (LSR)
   iii. Link state Update (LSU)
   iv. Link state acknowledgement (LSAck)

c. Describe the process followed by OSPF in building the routing tables of OSPF enabled routers. **[6 marks]**
d. Describe any THREE characterises of OSPF. **[3 marks]**