Strathmore
UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY
BACHELOR OF SCIENCE IN INFORMATICS AND COMPUTER SCIENCE
CONTINUOUS ASSESSMENT TEST 2
ICS 2203-Advanced Networking-<mark>MARKING GUIDE-(CORRECTED)</mark>

DATE: 17th October 2019   Time: 1 hr.

Instructions: Attempt ALL questions

Note that the parts in **yellow highlight** had errors which have been corrected in this version of the marking guide
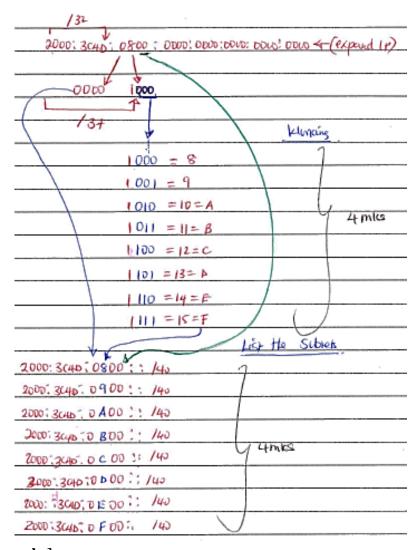
Question One [9 marks]

A company has been allocated the following IPv6 address block: 2000:3C4D:800::/37. Assume that the company's administrator will create /40 subnets from the allocated block.

   a. How many subnets will he/she create? **[1 mark]**
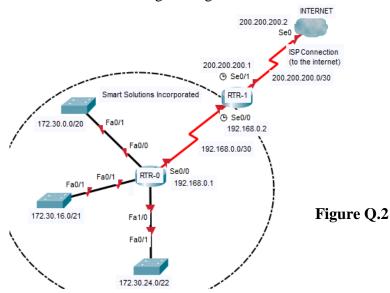
   Award 1 mark for the correct answer
   - **Borrowed bits = n**
   - **n= 40-27 = 3 bits**
   - 2^3=**8 subnets**

   b. Write down all the /40 subnets that will be derived from this address? *Ensure that you show all your working* **[8 marks]**

   Award 4 marks for working and 4 marks for the list of subnets <mark>(Corrected Solution)</mark>

/32
2000: 3C4D: 0800 : 0000: 0000:0000: 0000: 0000 ← (expand IP)

0000   1000

/37

1000 = 8
1001 = 9
1010 = 10 = A
1011 = 11 = B
1100 = 12 = C
1101 = 13 = D
1110 = 14 = E
1111 = 15 = F

Klumping

4 mks

List the Subnets

2000: 3C4D: 0800 :: /40
2000: 3C4D: 0900 :: /40
2000: 3C4D: 0A00 :: /40
2000: 3C4D: 0B00 :: /40
2000: 3C4D: 0C00 :: /40
2000: 3C4D: 0D00 :: /40
2000: 3C4D: 0E00 :: /40
2000: 3C4D: 0F00 :: /40

4mks

Question Two [13 marks]

Figure Q.2 below is a partial topology of Smart Solutions Incorporated (SSI). SSI is a growing medium sized company with its three branches connected to RTR-0 and the headquarters on RTR-1. RTR-1 connects to the internet through a single Internet Service Provider (ISP).

Figure Q.2

a. Aggregate ALL the network addresses of the LANs in the topology in **Figure Q.2** above. *Ensure that you show your working*. **[3 marks]**

Award 2 marks for the working and 1 mark for the final answer

172.30.0.0	**-**	**101011000. 00011110.00000000.00000000**
172.30.16.0	**-**	**101011000. 00011110.00010000.00000000**
172.30.24.0	**-**	**101011000. 00011110.00011000.00000000**

101011000. 00011110.00000000.00000000

172 . 30 . 0. 0 /19

b. Is the result in (a) above a regular summary or a supernet route? Explain. **[1 mark]**
Award ½ a mark for identifying the type of summary route and ½ a mark for the explanation

- **It is a regular summary route**
- **The prefix of the summary is not smaller than the default of the class of the IP address** *(the IP 172 is a class B whose default prefix is /16)*

c. Write down the command that you would use to configure the aggregate route that you determined in (a) above to allow RTR-1 to reach the LANs. *Assume that on the entire domain all interfaces are configured and that the directly connected networks are present in the routing tables.* **Hint**: *Your command should be placed at the router prompt shown below:*

```
RTR-1(config) #
```
[2 marks]

Award 2 marks for any of the following answers (the syntax must be correct)

```
RTR-1(config) #    ip route 172.30.0.0 255.255.224.0 serial 0/0
                                 Or
RTR-1(config) #    ip route 172.30.0.0 255.255.224.0 192.168.0.1
                                 Or
RTR-1(config) #    ip route 172.30.0.0 255.255.224.0 192.168.0.1 serial 0/0
```

d. Identify and describe the type of static route you have configured in (c) above. **[1 mark]**
Award ½ a mark for identifying the type of static route and ½ a mark for the explanation

- **Identify: Summary static route**
- **Description: It identifies an aggregation of multiple networks (or gateways) which can be represented by a single summary address**

e. Identify and describe the other TWO types of static routes that you could configure on the topology in **Figure Q.2 [3 marks]**
Award ½ a mark for identifying the type of static route and 1 mark for a good explanation

- **Default static route**
    - **It is a route that matches all packets. It has all zeros in the network address and all zeros in the subnet mask**
    - **It could be configures on RTR-1 to connect to the internet**
- **Standard static route**
    - **Consists of the destination network address and network mask, and the IP address of the next-hop gateway or exit interface.**

- It could be configured on RTR-1 in place for the summary static route i.e. instead of representing the three 172.30.x.x networks as one summary address each of the summarized networks could be individually configured. This would configuration would represent a summary static route.
- **Floating static route** (*note: this is not a good answer unless it is backed up with a convincing explanation*)
  - A route used to provide a backup path to a primary static or dynamic route, in the event of a link failure
  - It is configured with a higher administrative distance than the primary route so that it is not the preferred route but the one the router will resort to if when the preferred route is unavailable
  - In this topology it can only be used in case the dynamic route (or routing protocol fails) as opposed to link failure since there are no alternative paths

f. Explain THREE disadvantages of using static routing on a domain such as SSI's topology in **Figure Q.2 [3 marks]**

Award 1 mark for each correct point

- **Initial configuration and maintenance is time-consuming**
- **Configuration is error-prone, especially in large networks**
- **Administrator intervention is required to maintain changing route information**
- **Does not scale well with growing networks; maintenance becomes cumbersome**
- **Requires complete knowledge of the whole network for proper implementation**

Question Three [<mark>9 marks</mark>]

Refer to **Figure Q.2**. The administrator of the given topology has chosen to use a dynamic routing protocol for SSI's network.

a. Explain any THREE benefits that dynamic routing protocols have over statically configured routes. **[3 marks]**

Award 1 mark for each correct point

- **Less time-consuming and labor-intensive compared to configuring static routes especially in large domains**
- **Dynamic routing uses adaptive algorithms to adapt to network changes making routing tables quickly have current information**
- **Scale better compared to static routing protocols**
- **Dynamic routing may not necessarily require complete knowledge of the whole network for proper implementation**

b. Assume that the topology in **Figure Q.2** above is an autonomous system
  i. Define an autonomous system. **[1 mark]**
     Award 1 mark for the correct answer

- **An autonomous System is a group of routers under the control of a single authority that is, the authority sets up policies to govern and control access to the network(s) bundled by these routers**
- **In the topology, RTR-1 and RTR-0 are both controlled by the same entity (i.e. SSI)**
- **The ISP is also a different entity from SSI hence can be considered an autonomous system**

ii. Where would you recommend an Interior Gateway Protocol (IGP) on the topology in **Figure Q.2** and why? [~~2 marks~~] **[1 mark]**

Award 1 mark for each correct recommendation

- **There's are two autonomous systems: SSI's network and the ISP network. The two are separate and unique entities that would each other hence:**
  - **Configure an IGP within SSI's network i.e. on RTR-1 and RTR-0**
  - **Configure and IGP within the ISP network**

iii. Would you recommend a classful or a classless routing protocol for the topology in **Figure Q.2**? Giving TWO reasons justify your choice. **[3 marks]**

Award 1 mark for the correct recommendation and 1 mark for each justification

- **Recommendation: Classless protocol. It propagates routing updates with accompanying subnet masks**
- **Justification:**
  - **The 172.30.x.x networks are implemented using VLSM**
  - **In a case the topology changes to include discontigous subnets, a classless protocol would still work**
  - **In case the topology is ever configured with supernets the classeless protocol would work**

TOTAL SCORE: 31 MARKS

ALL THE BEST!!!