UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING
FIRST SEMESTER EXAMINATIONS, 2012/2013
CPEN 305 : COMPUTER NETWORKS (3 Credits)

TIME : **2 hours and 30 minutes**
Answer **All** Questions

SECTION A - 35 MARKS

1. Referring to Fig 1, how many collision domain(s) and broadcast domain(s) exist? Justify for your answers. [3 marks]

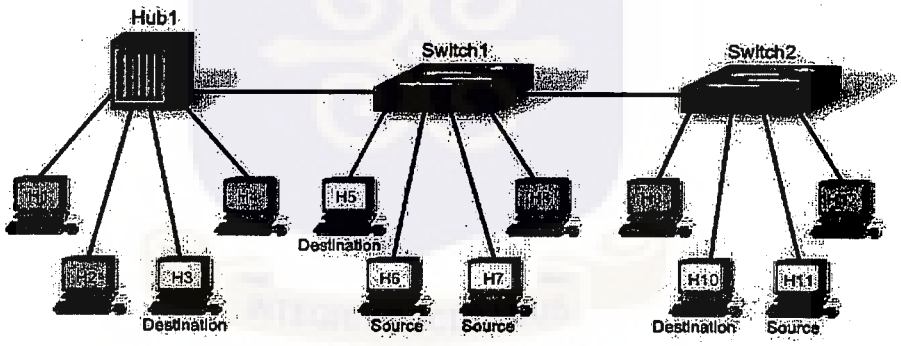

Figure 1: *Switched Network*

2. Calculate the range of IP addresses that would allow hosts that are connected to the router Ethernet interface (192.168.1.97 /27) to receive/send packets from/to outside networks. [2 marks]

3. A network technician is setting up a peer-to-peer network involving **two (2)** computers. What cable must he use? [1 mark]

4. State the layer of the TCP/IP model where **SMTP** operates. [1 mark]

Examiner : **Steven Armoo**

5. State the Linux OS command which displays information about the computer including IP Address, subnet mask, default gateway, MAC address and additional details about DHCP and DNS. [1 mark]

6. Differentiate between possible host IP addresses and usable host IP addresses on a network. [2 marks]

7. Host A needs to learn the MAC address of Host B, which is on the same LAN segment. A message has been sent to all the hosts on the segment asking for the MAC address of Host B. Host B responds with its MAC address and all other hosts disregard the request. What protocol was used in this scenario? [1 mark]

8. Which router command is used to move from the privileged exec mode to the user exec mode? [1 mark]

9. Which layer of the OSI model is used for logical addressing and also for selecting the best path? [1 mark]

10. Briefly explain any **two (2)** messages used in the Dynamic Host Configuration Protocol process. [2 marks]

11. An integrated router normally performs the functions of **two (2)** network devices. Name these devices. [1 mark]

12. In the implementation of VLSM techniques on a network using a single Class C IP address, find the subnet mask which is most efficient for point-to-point serial links. [2 marks]

13. Calculate the network and broadcast addresses of the packet with IP address 172.32.65.13 and a default mask. [2 marks]

14. What is the destination Media Access Control, **MAC** address in a broadcast Ethernet frame? [1 mark]

15. Briefly explain Network Address Translation, **NAT**. [2 marks]

16. What is the function of the **FCS** field in an Ethernet frame? [1 mark]

17. (a) Which networking device separates a broadcast domain? [1 mark]

    (b) Briefly explain how the device in 17a above operates. [4 marks]

Examiner : **Steven Armoo**

18. Which term is used to describe the process of placing one message format into another format so that the message can be delivered across the appropriate medium? [1 mark]

19. List any **four (4)** parameters of a communication protocol. [2 marks]

20. Briefly explain how a switch builds its MAC Address table. [3 marks]

SECTION B - 65 MARKS

1. (a) Explain the construction of a copper crossover cable using the colour coding. Give an example connection. [4 marks]

   (b) Briefly explain subnetting and distinguish between the two forms of subnetting. [2 marks]

   (c) A technician has received the IP address 10.0.0.0 /8. He wants to create 5 subnets. Design an appropriate addressing scheme for the network. For all the possible networks, state the broadcast address and also the useable range. [10 marks]

   (d) For the network shown in Figure 2, calculate :

      i. the route summarization for $R2$, $R3$ and $R4$ [3 marks]

      ii. the total summarization so that Router $R1$ can pass a smaller routing table [2 marks]

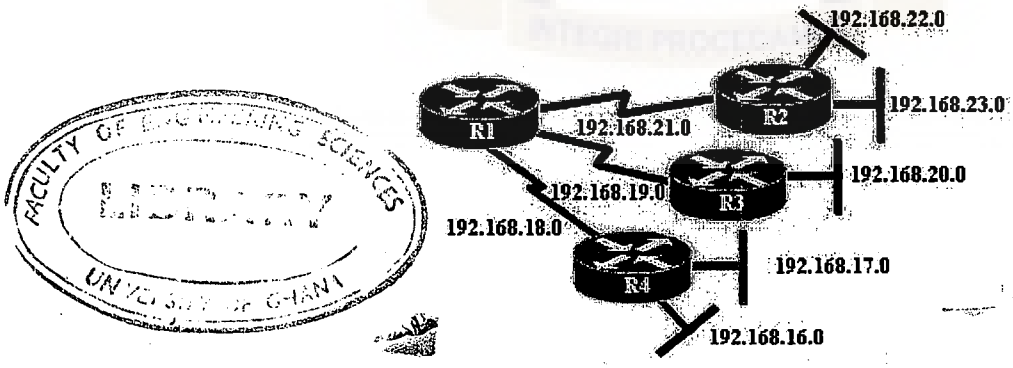

Figure 2: Route Summarization

2. (a) State any 4 components of a router. [2 marks]

   (b) Briefly explain the 3 stages of the router bootup process. [6 marks]

 Examiner : **Steven Armoo**

(c) State **two (2)** advantages and **two (2)** disadvantages of Link State routing protocols. [2 marks]

(d) Refer to Fig 3. The network administrator would like the routers to share routing information using OSPF. The point-to-point connection between the routers uses a subnet mask that that does not waste any IP addresses. List the router configuration commands to accomplish this? Explain your commands. [10 marks]

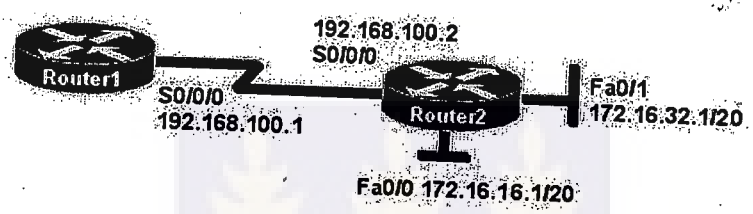

Figure 3: *OSPF network*

3. (a) A network administrator has created a redundant network with multiple switches to ensure an "always on" connectivity to his clients.

i. state any **two** problems that can arise [2 marks]

ii. state any remedy for the problem in 3(a)i above [1 mark]

iii. briefly explain your remedy in 3(a)ii above [4 marks]

(b) Briefly explain Virtual Local Area Network **(VLAN)** and state **two (2)** advantages of creating VLANs. [4 marks]

(c) Host, **H1**, with IP address 192.168.1.2 /24 and default gateway 192.168.1.1 /24 is connected to port 5 of a switch. Another host, **H2**, with IP address 192.168.2.2 /24 and default gateway 192.168.2.1/24 is connected to port 9 of the same switch. The switch with IP address, 192.168.3.250 /28 is to be configured with two VLANS, VLAN20 [ports 2, 5 and 6] and VLAN30 [ports 3, 4 and 9]. A router is also connected to the switch.

i. draw and document the network [2 marks]

ii. what is the significance of connecting the router? [1 mark]

iii. configure, with explanations, the networking devices to allow traffic flow between VLAN20 and VLAN30. [10 marks]

Examiner : **Steven Armoo**