

UNIVERSITY OF BOLTON – RAS AL KHAIMAH

**SCHOOL OF BUSINESS AND
CREATIVE TECHNOLOGIES**

MULTIMEDIA AND WEBSITE DEVELOPMENT

SEMESTER 2 EXAMINATION 2010/2011

COMPUTER NETWORKS

MODULE NO: MWD1014

Date: Wednesday 1st June 2011

Time: 13:00 – 15:00

INSTRUCTIONS TO CANDIDATES:

There are **SIX** questions.

Answer **FOUR** questions.

All questions carry equal marks.

Marks for parts of questions are shown in brackets.

Electronic calculators may be used provided that data and program storage memory is cleared prior to the examination.

Question 1 – Local Area Network (LAN) devices

- a. Briefly describe the function of the following network devices:
- i. Network interface card **(1 mark)**
 - ii. Repeater **(1 mark)**
 - iii. Hub **(1 mark)**
 - iv. Switch **(1 mark)**
 - v. Router **(1 mark)**
- b. A Cisco Catalyst 2950 switch has PCs connected to its ports as shown below:

PC host name	PC MAC address	Switch port number
BCT-01	00-19-B9-26-8D-D9	Fa0/1
BCT-02	00-19-B9-29-78-E7	Fa0/2
BCT-03	00-19-B9-89-9D-AB	Fa0/3
BCT-04	00-19-B9-F4-6C-45	Fa0/4

With reference to the above table, describe how the switch builds up a forwarding table and how that information is used to make forwarding decisions. **(5 marks)**

- c. A Cisco 2951 router has 4 Fast Ethernet interfaces as shown in the following table:

Router Interface Id	IP Address	Subnet mask
Fa0/0	192.168.239.254	255.255.255.0
Fa0/1	192.168.240.254	255.255.255.0
Fa1/0	192.168.241.254	255.255.255.0
Fa1/1	192.168.242.254	255.255.255.0

Give details of the CLI commands to carry out the following:

- i. set the router's hostname to R1 **(2 marks)**
 - ii. configure the interfaces to have the IP and subnet settings **(4 marks)**
 - iii. configure the router to use the routing protocol RIPv2 **(2 marks)**
- d. With reference to part c, show the contents of the router's routing table and explain how the router uses this information when making a forwarding decision relating to a packet arriving on port fa0/0 and heading for network 192.168.242.0. **(7 marks)**

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Question 2 – Internet Protocol Addressing

- a. Referring to the host IP address 192.168.66.40/24, write down the following:
- i. the class letter of the network
 - ii. the network address
 - iii. the network broadcast address
 - iv. the address of the first computer on the network
 - v. the address of the last possible computer on the network
 - vi. the address of the router interface that the host uses as its gateway
- (6 marks)**
- b. Using a sketch, show how a single router can be used to interconnect the following networks. The sketch should show any other pieces of internetworking equipment and detail the type of cabling used. IP addresses, subnet masks and gateway addresses should be shown where appropriate. Include 2 PCs on each network, one representing the first and the other representing the last possible.
- i. 192.168.66.0/24
 - ii. 192.168.67.0/24
 - iii. 192.168.68.0/24
 - iii. 192.168.68.0/24
- (8 marks)**
- c. For each of the following IP addresses, show how bitwise operations are used to determine the network address and the host ID number.
- i. 192.168.1.66/24
 - ii. 192.168.1.66/27

(11 marks)

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Question 3 - Subnetting

- a. Using a class C network address of 192.168.70.0, give details of how to calculate the number of subnetworks and the number of hosts per subnetwork for each of the /26, /27 and /28 subnet masks. **(9 marks)**
- b. Referring to the /26 subnet scenario of part 'a', sketch a network diagram showing 2 PCs per subnet, one representing the first and the other representing the last possible for each subnet. Label all PC and router interfaces with their IP address and subnet mask. Also label the PCs to show their gateway addresses. **(10 marks)**
- c. What are the subnet addresses and the subnet broadcast addresses of the first 4 subnets of 192.168.70.0/28? **(6 marks)**

Question 4 – The OSI model and related protocols

- a. Sketch and label the layers of the 7-layer OSI model and name the protocol data units for each of the four lower layers. **(8 marks)**
- b. Describe the process of encapsulation as a layer 4 protocol data unit moves down the model to layer1. **(8 marks)**
- c. Describe the principle of operation of the TCP transport layer protocol in terms of:
i. how a connection between the source and destination hosts is established.
ii. how data flow between the two hosts is controlled
iii. how the protocol data units are reordered at the destination. **(6 marks)**
- d. What is the difference between TCP and UDP? **(3 marks)**

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Question 5 – Wireless Networking

- a. What are the ISM radio bands used for and which of the bands is allocated to the 802.11g wireless standard?

(4 marks)

- b. The ISM band allocated to the 802.11g standard can be referred to as a number of overlapping channels. Sketch a graph showing frequency along the x-axis to describe what a channel is and what overlapping means.

(6 marks)

- c. What domestic appliances can cause interference with 802.11g networking equipment and why?

(4 marks)

- d. Draw a network topology that is part wired and part wireless and describe how the wireless hosts communicate with the wired system. Assume the network has a single router which interconnects the following networks. State any assumptions made and give details of any configuration settings on the wireless devices.

192.168.1.0/24 (Wired)
192.168.2.0/24 (Wired)
192.168.3.0/24 (Wireless)

(11 marks)

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Question 6 – Virtual Local Area Networks (VLANs)

a. Using sketches, describe the following types of networks:

- i. 'traditional' local area networks
- ii. 'virtual' local area networks (VLANs).

and explain why VLANs are preferred by many organisations.

(8 marks)

b. A VLAN scenario consists of two switches and one router with trunk links to connect the two switches and to connect one of the switches to the router.

Each switch has been configured to have 3 VLANs: vlan1, 2 and 3. On each switch there are two PCs connected to ports in vlan2 and two PCs connected to ports in vlan3. This results in 4 PCs in vlan2 and 4 PCs in vlan3 across both switches. There are no PCs connected to ports in vlan1.

Sketch the network showing all the network devices, PCs and cables. Using the network address of 192.168.1.0 with a /26 subnet mask, label equipment where appropriate with IP address and subnet mask information.

(12 marks)

c. With reference to the scenario in part b, describe how a single physical interface on the router can be used to interconnect 3 vlans.

(5 marks)

END OF QUESTIONS