

**UNIVERSITY OF BOLTON**

**SCHOOL OF BUSINESS AND  
CREATIVE TECHNOLOGIES**

**MULTIMEDIA AND WEBSITE DEVELOPMENT**

**SEMESTER 2 EXAMINATION 2010/2011**

**COMPUTER NETWORKS**

**MODULE NO: MWD1014**

Date: Wednesday 1<sup>st</sup> June 2011

Time: 10:00 – 12:00

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**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.

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**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. Explain how the following devices make forwarding decisions:
- |     |        |  |
|-----|--------|--|
| i.  | Switch |  |
| ii. | Router |  |
- (4 marks)**
- c. Name and describe the purpose of four types of internal memory of the Cisco 2950 router.
- (4 marks)**
- d. With the aid of a sketch, describe how a laptop can be connected to a router for the purpose of configuring the router. Give details of the type of cable, its connectors, the required software and its setup parameters.
- (6 marks)**
- e. By giving details of the router's command line interface prompts and commands, show how a router interface can be configured to have an IP address and subnet mask. State any assumptions made.
- (6 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**