

**UNIVERSITY OF BOLTON**  
**SCHOOL OF GAMES COMPUTING & CREATIVE**  
**TECHNOLOGIES**  
**MULTIMEDIA AND WEBSITE DEVELOPMENT**  
**SEMESTER 2 EXAMINATION 2008/2009**  
**COMPUTER NETWORKS**  
**MODULE NO: MWD1014**

Date: Wednesday 27<sup>th</sup> May 2009

Time: 2.00 pm – 4.00 pm

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**INSTRUCTIONS TO CANDIDATES:**

There are SIX questions.

Answer any 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**

a. Define the following network related terms:

- i. Physical address
- ii. Bandwidth
- iii. Data rate
- iv. Half-duplex
- v. Full-duplex
- vi. Ethernet
- vii. CSMA/CD
- viii. Physical topology
- xi. Logical topology
- x. Client-server

(10 marks)

b. Using sketches, describe the ideal location of the following types of server within a company's network infrastructure:

- i. Workgroup servers
- ii. Enterprise servers

(4 marks)

c. Describe the function of the following types of servers:

- i. DNS
- ii. DHCP
- iii. HTTP
- iv. Proxy
- v. Database

(5 marks)

d. What is a protocol and what is the difference between the following types of protocols:

- i. routing protocols
- ii. routed protocols

(6 marks)

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**Question 2**

- a. By referring to the binary format of 32-bit IPv4 IP addresses, describe what is meant by class A, B and C networks. (9 marks)

- b. Referring to the network address 192.168.1.0/24, write down the following: (5 marks)
- i. The class letter of the network
  - ii. The network broadcast address
  - iii. The address of the first host on the network
  - iv. The address of the last possible host on the network
  - v. The address of the router interface that the host PCs use as their gateway address.

- c. Draw a sketch showing how the following networks can be interconnected by a single router having four Fast Ethernet ports, one to connect to each of the networks.
- i. 172.16.0.0/16
  - ii. 172.17.0.0/16
  - iii. 172.18.0.0/16
  - iv. 172.19.0.0/16

On the sketch, show two PCs per network, one representing the first host and one representing the last possible host. Label the equipment to show IP addresses, default gateways, subnet masks and the type of cable used to interconnect the networking devices.

(11 marks)

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### Question 3

By using a suitable choice of subnet mask, show how the class C network 192.168.1.0 can be subnetted to create 8 subnets. In your solution give details of:

- i. Your choice of subnet mask (4 marks)
  
- ii. A table of IP addresses, showing the following for EACH subnet:
  - The subnet address
  - The IP address of the first host
  - The IP address of the last host used
  - The IP address of the last possible host
  - The IP address applied to the default gateway
  - The subnet broadcast address(16 marks)
  
- iii. A sketch of the network in which two PCs are shown in each subnet, one representing the first and one representing the last possible. The sketch should also show IP addresses, subnet masks and default gateway addresses. (5 marks)

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**Question 4**

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. With the aid of a sketch, describe the operation of a vlan scenario comprising of 2 switches and one router. Each switch has 3 vlans defined on it; vlan1, vlan2 and vlan3. Trunk links are used to connect the two switches and between one of the switches and the router.

Each of the two switches has two PCs connected to ports in vlan2 and two in PCs connected to ports in vlan3 resulting in 4 PCs in vlan2 and 4 PCs in vlan3 across both switches. There are no PCs connected to ports in vlan1.

Label the networking devices and PCs with appropriate IP addresses and subnet masks. Assume the use of class C network addresses using the default subnet mask.

(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)

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**Question 5**

a. Using sketches, briefly describe the operation of the following network devices...

- i. Repeater
- ii. Hub
- iii. Switch
- iv. Router

(8 marks)

b. The serial port of a laptop has been connected to the console port of a Cisco 2651 router using a console cable for the purpose of configuring the router. The laptop operating system is Microsoft XP and the terminal emulation software HyperTerminal has been configured to establish communications with the router. The router's user executive mode prompt is now visible in the HyperTerminal window on the laptop.

Working on the laptop at the router's prompt, using the appropriate command line interface (CLI) commands, configure the router to use the RIPv1 routing protocol and to assign the following IP addresses to the two Fast Ethernet ports 192.168.246.254/24 and 192.168.247.254/24. State any assumptions made.

(11 marks)

c. Describe the purpose of Access Control Lists (ACLs) and give an example of how a standard ACL is defined and used.

(6 marks)

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**Question 6**

- a. What is the Open Systems Interconnection (OSI) initiative? (2 marks)
- b. The Open Systems Interconnection Reference is an abstract description for layered communications and computer network protocol design. Sketch the model and give a simple description of each of its layers. (7 marks)
- c. Describe what a protocol data unit (PDU) is, and name the PDUs of each of the bottom four layers of the model. (4 marks)
- d. With reference to the OSI model, describe what is meant by the terms 'encapsulation' and 'decapsulation'. (4 marks)
- e. Draw the structure of the layer 2 PDU, giving details of the name, purpose and size (in bytes) of each of its component fields. (8 marks)

**END OF QUESTIONS**