WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF MANAGEMENT AND ENTREPRENEURIAL SCIENCES

BSc HONOURS DEGREE IN INFORMATION SYSTEMS

MAIN PAPER

IS 125:   COMPUTER NETWORKS AND TELECOMS

INTAKE 26:   FIRST YEAR SECOND SEMESTER

TIME: 2 HOURS AFTERNOON

INSTRUCTIONS TO CANDIDATES

Answer **Question 1** and any other **three** questions.

Question 1

a) Given the following scenarios, indicate the recommended type of network medium, Layer 2 technologies and maximum transmission rates.

    i.   A purpose-built office building with large open plan floors suitable for 500 fixed seating positions to accommodate both data and voice connections. [4]

    ii.   A large research-based organisation involved into particle physics research with large data sets in needs to send between test sites in the same country but several hundred kilometres apart.   [4]

    iii.   A student house accommodating 6 students with their own laptops, desktops, tablets and phones which are used throughout the house. A conventional POTS connection is available at the property.   [4]

b) A university is reviewing the security of its network.

    i.   Explain recommendations for setting and managing passwords that would support the security of the network.   [4]

    ii.   Describe how data encryption would protect data on the network.   [3]

c) As an IT Technician, explain how you would use the following:

    i.   Traceroute   [2]

    ii.   DNS lookup   [2]

d) When you issue the ping command, what protocol are you using?   [2]

Question 2

a) Describe the services and support offered by an ISP.   [8]

b) Discuss FTP and why a company may provide FTP access for employees.   [7]

c) Explain the steps that should be taken in the event of a malware outbreak on a local network.   [6]

d) How do routers operate differently from switches?   [4]

Question 3

a) The process of establishing a shared secret key between two remote entities is particularly vulnerable to a Man-in-the-Middle (MitM) attack. Describe how an MitM attack may be mounted during the process when a shared secret key is being established between two remote entities, and propose a countermeasure to thwart the attack.   [6]

b) Name and explain four security properties for ensuring the security of messages in-transit.

        [4]

c) Explain the ways in which a firewall improves network security. [10]

d) Define the Simple Network Management Protocol and state two common devices that use it. [5]

Question 4

a) Arriving at your college room, you plug into the wired Ethernet jack for the first time. The network admin has a record of your MAC address and your machine can join the network without further action on your part.

Assume: Your laptop's Ethernet address is 0a:0b:0c:0d:0e:0f, DHCP server address is 131.111.7.3, your IPv4 address will be 131.111.7.121, the gateway's IP address is 131.111.7.1, and Ethernet address is 00:01:02:03:04:05, the network netmask is 255.255.255.0

Write the series of protocol/packet exchanges that occur on the wired Ethernet link, up until you can send a single packet to 128.232.0.20. You do not need to describe packets after this packet has left the link. Include ARP and DHCP packets, stating the IP and Ethernet addresses of the packets where possible. [10]

b) Consider two neighbours, Alice and Bob. Each has wireless IPv4 routers with integrated NAT. Each neighbour connects their laptop to their own wireless router, and each uses appropriate utilities to examine the IP address of each laptop. They realise the laptops have the same IP address.

   i. How is that possible? [3]

   ii. Justify one reason that wide-spread deployment of IPv6 would remove the need for the NAT devices. [2]

c) Compared to wired networks, explain reasons why CSMA/CD is not appropriate in the context of wireless networks. [6]

d) The Internet is often described as being a "best effort network". Briefly explain what is meant by the term "best effort network". [4]

Question 5

a) A receiver receives the bit pattern 01101011. If the system is using even parity, is the pattern in error? Explain your answer. [4]

b) One of the most common error-detecting codes is Cyclic Redundancy Check. Briefly describes how CRC performs error-detecting. [6]

3

c) i. Briefly explain the behaviour of the class of routing protocols normally described as distance vector protocols. [4]

ii. In what ways are link-state protocols often considered to be superior to distance-vector routing protocols? [6]

iii. Briefly describe the routing protocol known as EIGRP and explain how it copes with routing inside a large and complex autonomous system. [5]

Question 6

a) Beatrice's Restaurant Supply offers a line of specialty food products to institutional customers and restaurant chains. The firm prides itself on using only the finest ingredients and preparation methods. The owner, Beatrice Megan, hired you as an IT consultant to help her plan the system architecture for a new WLAN that will connect employee computers to the wired network.

   i.   What wireless standards could be implemented in the new system? What are the pros and cons of each standard? [10]

   ii. ii. Choose a wireless standard to implement in Beatrice's Restaurant Supply, and explain your choice. [3]

   iii. iii. Suppose that microwave ovens and cordless telephones are used extensively in some parts of the facility. Would that affect your IEEE 802.11 amendment choice? What standards would not be a good choice in this type of environment? [5]

b) Telecommunication companies that provide global network services, define the services they offer to customers in a SLA. Explain the purpose of an SLA and give examples of what it might contain. [7]

END