BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Friday 26th September 2014 - Morning

Answer **any** FOUR questions out of SIX. All questions carry equal marks
Time: TWO hours

Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

The marks given in brackets are **indicative** of the weight given to each part of the question.

Only **non-programmable** calculators are allowed in this examination.

Section A

Answer Section A questions in Answer Book A

A1. This question is about the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

a) Explain how a network connection is established between a user and a server over the Internet using the TCP protocol.

(8 marks)

b) Both the TCP and UDP protocols use port numbers. What are these port numbers used for and what is meant by the term <u>well known port</u>?

(6 marks)

c) What is the difference in the quality of service (QoS) offered to applications by the TCP and UDP protocols?

(8 marks)

d) For each of the following three applications, determine whether you would use TCP or UDP.
    i.   File transfer
    ii. Video streaming
    iii. An audio conference

(3 marks)

A2. This question is about broadband Internet access using Asymmetric Digital Subscriber Line (ADSL) technology.

a) Explain how ADSL is able to transmit both data and telephone calls over the same twisted pair cable which connects a house to a local exchange.

(8 marks)

b) If a domestic ADSL service was advertised as having a contention ratio of 50:1, what would this mean and how would it affect the download speeds that users experience when accessing the Internet?

(6 marks)

c) Two users located within the same village are using ADSL as their connection to the Internet. However, they each experience widely different download speeds. Suggest why and how the copper cables that connect these users to their local exchange may be the cause of this difference in download speeds.

(6 marks)

d) Many countries are now upgrading broadband access networks to offer customers high speed Internet access. One such technology is called fibre to the cabinet or fibre to the curb (FTTC). Briefly explain how this technology differs from ADSL and hence, is able to offer higher bandwidths than ADSL.

(5 marks)

A3. This question is about global network services and specifically, the use of Multi-Protocol Label Switching.

a) Global network services are provided by Telecommunications companies (Telcos). When a customer purchases such a service from a Telco, it will be defined in terms of a Service Level Agreement (SLA). Why are SLAs important and briefly explain what is described within them.

(7 marks)

b) Many organisations who wish to interconnect their offices around the world are doing so using Multi-Protocol Label Switching (MPLS) services. Briefly explain how MPLS works.

(9 marks)

c) An alternative to using MPLS for a global company is simply to connect each of its offices to the Internet and then to rely on the Internet itself to carry data between these offices. How does the Quality of Service (QoS) offered by the Internet in such a situation differ from that offered by an MPLS solution?

(9 marks)

Section B

Answer Section B questions in Answer Book B

B4. This question is about the behaviour of routers within the Internet and Link-State Protocols.

a) Briefly explain the difference between the two tasks of packets forwarding, and routing, which are conducted by routers.

(7 marks)

b) Routers within the networks of large organisations often learn about connectivity using link-state protocols. Describe the general behaviour of link-state protocols.

(6 marks)

c) Open Shortest Path First (OSPF) is an important link-state protocol. Explain how OSPF copes with large networks and the roles of the various types of router within such a deployment.

(12 marks)

B5. Imagine you have been appointed to design the network to be deployed in three new buildings on a new university campus. Building A contains a dedicated computer room containing 10 very high performance dedicated servers. The servers provide services to students and staff who may need to gain access from the Internet as well as from within the university's own network. Building B contains the offices of 12 lecturers and 8 administrators who only use medium power desktop computers located on fixed desks. Building C contains two lecture rooms and a lounge/coffee shop. The lecture rooms have a desktop computer at the front for use by the lecturers, but some lecturers prefer to use their own laptop or tablet computer. All the students use laptop or tablet computers to take notes and keep in touch with their friends. An underground duct exists between building A and building B which are only 30 metres apart. Building C is 30 metres from building A but no ducts exist and installing one is not possible.

a) What type of network should be deployed in the building that houses the dedicated computer room and what equipment should be installed?

(5 marks)

b) What type of network should be deployed in the second office building and what equipment should be installed?

(5 marks)

c) What type of network should be deployed in the teaching building and what equipment should be installed?

(5 marks)

d) What type of network connections should be used to link the buildings together and where and how should the university's Internet connection be made?

(10 marks)

B6. This question is concerned with multicast IP.

a) If an IP datagram has its destination address set to a multicast address, to what places will that packet be delivered?

(4 marks)

b) Briefly explain the role played by the protocol Internet Group Management Protocol (IGMP) in relation to multicast traffic.

(6 marks)

c) Explain the differences between IGMPv1, IGMPv2 and IGMPv3.

(9 marks)

d) What types of application are likely to benefit from the use of IP multicast? Justify your answer.

(6 marks)