BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Friday 28th September 2012 - 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 broadband Internet access.

a) A common method for providing broadband Internet access over existing telephone lines is Asymmetrical Digital Subscriber Line (ADSL).

i) Why is it Asymmetrical?

(4 marks)

ii) 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 without the two signals interfering with each other?

(8 marks)

b) A typical ADSL network for domestic (home) users would offer a service based upon a contention ratio of 50:1. What is meant by the contention ratio and how does it affect the download speeds that users experience when accessing the Internet?

(8 marks)

c) 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)

A2. This question is about Asynchronous Transfer Mode (ATM) networks.

a) Show by means of a diagram, the cell format using within an ATM network.
(5 marks)

b) What is the difference between a Virtual Path and a Virtual Channel?
(5 marks)

c) Explain the purpose and function of the ATM Adaptation Layer (AAL) protocol.
(9 marks)

d) Within the context of an ATM network, explain what the different is between constant bit rate (CBR) and available bit rate (ABR) traffic.
(6 marks)

A3. This question is about providing global network services.

a) Telecommunication companies (Telcos) that provide global network services, define the services they offer to customers within a Service Level Agreement (SLA). What is the purpose of a SLA and give examples of what it might contain.
(7 marks)

b) Companies that have offices in several countries around the globe need to create a private corporate network that is able to connect these sites together and transport traffic of different types between them. An increasingly popular way of providing such a network is to use Multiprotocol Label Switching (MPLS) data services. Briefly explain how MPLS works and how it is able to support different traffic types.
(12 marks)

c) An alternative to MPLS might be to consider using the Internet. What are the main disadvantages of the Internet that mean it would offer a worse solution than MPLS?
(6 marks)

Section B

Answer Section B questions in Answer Book B

B4. The two main functions of an Internet Protocol router are the forwarding of individual packets ("switching") and the maintenance of routing tables ("routing"). This question considers router behaviour and routing protocols such as OSPF.

a) This first part of this question concerns the forwarding of individual packets ("switching").

i) What are the main demands on the internal resources of a router when it is taking forwarding decisions for individual packets?

(4 marks)

ii) To what extent are other routers involved in the internal forwarding decisions and actions of a router when it processes an individual packet?

(4 marks)

b) This second part of this question concerns the maintenance of routing tables ("routing").

i) Briefly explain the behaviour of the class of routing protocols normally described as link-state protocols.

(4 marks)

ii) In what ways are link-state protocols often considered to be superior to distance-vector routing protocols?

(4 marks)

iii) Briefly describe the link-state protocol known as OSPF and explain how it copes with routing inside a large and complex autonomous system.

(9 marks)

B5. This question concerns the provision of "quality of service" (QoS) within networks that use the Internet Protocol (IP).

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

(4 marks)

b) Identify, and briefly describe, three QoS parameters that are often measured to characterise the behaviour of a network or network connection.

(6 marks)

c) Discuss the quality of service requirements of a Voice-over-IP (VoIP) application and how they differ from those of a file transfer application.

(8 marks)

d) Briefly describe the Diff-Serv approach to the provision of QoS.

(7 marks)

B6. This question concerns codes to assist in the checking and correcting of communications errors including the use of Hamming codes.

a) What is meant by:

i) the Hamming Distance between two binary numbers?

(3 marks)

ii) the minimum Hamming Distance of a code?

(3 marks)

b) Imagine you have been asked to design a Hamming Code to transmit information where the original data consists of k-bit binary values and you have decided to use n-bit codes.

i) Using this code as an example, what is meant by the redundancy of a Hamming Code?

(3 marks)

ii) Using this code as an example, what is meant by the code rate of a Hamming Code?

(3 marks)

c) What must be the minimum Hamming distance of a code if you need to be able to:

i) detect (but not correct) all errors where t bits have been corrupted?

(3 marks)

ii) correct all errors where t bits have been corrupted?

(3 marks)

d) Design a simple Hamming code to be used to transmit 2-bit data such that all single bit errors can be detected and corrected.

(7 marks)