**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

**COMPUTER NETWORKS**

Thursday 29th September 2011 - Afternoon
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) Many people now access the Internet from home using a broadband connection. The most common form of broadband connection is that based upon the Asymmetrical Digital Subscriber Line (ADSL) technology. How does ADSL ensure that both data and telephone calls can be carried over the same twisted pair cable which connects a house to a local exchange?

**(8 marks)**

b) Imagine that you are browsing the web using a laptop computer at home which is connected to the Internet via a WiFi network in your house and an ADSL router connection to the Internet. When accessing a website you feel that the response of the site is very slow. By considering the whole network from your laptop to the server that is hosting the website you are accessing, explain how the following may be contributing to the problem:

i) your laptop and local WiFi network
ii) the ADSL network
iii) the Internet
iv) the website you are accessing

**(12 marks = 4 x 3 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 (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 virtual circuits and TCP/UDP.

a) What is meant by the term *virtual circuit*?

**(2 marks)**

b) What is the difference between a *connection orientated* and a *connectionless protocol*?

**(8 marks)**

c) Explain how a connection orientated virtual circuit is established by the Transmission Control Protocol (TCP).

**(10 marks)**

d) In contrast to TCP, the User Datagram Protocol (UDP) is a connectionless data transfer protocol. What function is provided by port numbers within a UDP protocol datagram?

**(5 marks)**

A3. This question is about global network services.

a) International companies require a global data communications network to interconnect IT systems in their offices around the world. This in turn, requires data links between sites and ideally, these links should provide a guaranteed bandwidth. What are the problems with using the Internet to provide such connectivity?

**(6 marks)**

b) Many global telecommunication companies now provide data connections using multiprotocol label switching (MPLS) technology. Briefly describe the basic principles of MPLS and explain the advantages it offers over using the Internet.

**(12 marks)**

c) Organisations who manage their own global data network wish to ensure that data being transmitted over the network is secure. Explain how a Virtual Private Network (VPN) could provide secure communications.

**(7 marks)**

## Section B

Answer Section B questions in Answer Book B

B4. This question is about error control in communications systems.

a) Explain the circumstances under which the use of parity bits is appropriate for error control.

**(3 marks)**

b) Explain how the combination of longitudinal parity and horizontal parity can be used as an error correction technique in some circumstances.

**(7 marks)**

c) Outline how the cyclic redundancy count (CRC) method functions.

**(12 marks)**

d) Under what circumstances is the use of cyclic redundancy counts (CRC) an appropriate error control technique?

**(3 marks)**

B5. This question is concerned with multicast IP.

a) Briefly discuss the meaning of the term ***multicast transmission*** and how this differs from both unicast and broadcast transmission.

**(9 marks)**

b) What types of application gain benefit from using multicast as opposed to unicast transmission?

**(6 marks)**

c) Explain the way that the protocol Internet Group Management Protocol (IGMP) is used within a LAN to control multicast traffic. Discuss the difference in features between IGMPv1, IGMPv2 and IGMPv3 as part of your answer.

**(10 marks)**

B6. This question is about wireless LANs using the IEEE 802.11 family of standards.

a) Briefly explain the meaning of each of the technical terms
   i) Access Point
   ii) Basic Service Set
   iii) Coordination Function

**(9 marks = 3 x 3 marks)**

b) Explain the role of the Request to Send (RTS) and Clear to Send (CTS) frames within an 802.11 WLAN.

**(6 marks)**

c) WLANs can have higher bit error rates than wired networks.
   i) Explain why this can be true?
   ii) Explain what the MAC does to frames to help reduce this problem.

**(10 marks = 2 x 5 marks)**