**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS

BCS Level 5 Diploma in IT

Thursday 31st March 2016 - Afternoon

# COMPUTER NETWORKS

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 part of the question is about broadband Internet access.

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

i. Why is it called asymmetric? **(4 marks)**

ii. Briefly describe how ADSL is able to transmit both data and telephone calls over the same twisted pair cable connecting a house to a local exchange, without the two signals interfering with each other. **(8 marks)**

This part of the question is about local area networks and the technology usually known as WiFi (IEEE802.11)

b) Briefly explain the difference between the terms infrastructure and ad-hoc when used to describe the operational modes of a WiFi. **(8 marks)**

c) In what circumstances is it appropriate to use ad-hoc mode, and why? **(5 marks)**

A2. This question is about virtual circuits and the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

a) Define the concept of virtual circuit. **(4 marks)**

b) Explain the three-way handshake process used by TCP to establish a virtual circuit. **(9 marks)**

c) Explain how the TCP protocol would be able to detect errors and data loss, and how it would ensure that the lost data is re-transmitted, whilst transmitting data over a TCP virtual circuit. **(8 marks)**

d) In contrast to TCP, UDP is described as a connectionless protocol. Briefly explain how data is transmitted between two computers using the UDP protocol. **(4 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 in a Service Level Agreement (SLA). Explain the purpose of an 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. This question is about routing tables and the way routers maintain them.

a) Describe three different sources a router can use to put/maintain the information contained in the routing table. **(6 marks)**

b) Indicate three main differences between link-state and distance-vector routing protocols. **(6 marks)**

c) Indicate the type of routing protocol (distance-vector or link-state) and the metric used by each of the following protocols:

i. RIPv1
ii. EIGRP
iii. OSPF

**(2 marks each)**

d) Briefly describe the link-state protocol known as OSPF and explain how it copes with routing inside a large and complex autonomous system. **(7 marks)**

B5. This question concerns the Quality of Service (QoS) provided by 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 video-based application. **(8 marks)**

d) Briefly describe the RSVP approach to controlling QoS. **(7 marks)**

B6. This question is about error detection and correction including Hamming codes and cyclic redundancy checks.

a) Explain the difference between single-bit errors and burst errors in data transmission. **(4 marks)**

b) What is meant by a parity check? What sort of errors can parity check detect? **(4 marks)**

c) Explain the terms *transverse parity check* and *longitudinal parity check*. How can they be combined to provide an error correction capability? **(6 marks)**

d) In coding theory, what is meant by:

i. the Hamming distance between two bit strings of equal length? **(3 marks)**

ii. the minimum Hamming distance of a code? **(3 marks)**

e) How does the minimum Hamming distance of a code relate to its error detection and correction capability? **(5 marks)**