BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Thursday 21st April 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 physical layer transmission systems.

a) A digital transmission system uses a coding scheme that defines a symbol as a voltage that can have one of eight possible values. If the system operates at a transmission rate of 800 symbols per second, determine the data transmission rate measured in:

i) Baud

(2 marks)

ii) Bits per second

(4 marks)

b) A digital transmission system uses *zero bit insertion* (*bit stuffing*) to ensure that the flag sequence 01111110 can never occur within the transmitted data. By considering the transmission of the following 5 data bytes show how zero bit insertion works.

01011010 11111001 11111010 01111110 01111000

(8 marks)

c) Identify three physical characteristics of fibre optic cable that make it more suitable for high speed digital transmission than copper cables.

(6 marks)

d) Describe what is meant by *wave division multiplexing* (WDM) and explain how it is able to deliver high rate data transmission over a fibre optic cable.

(5 marks)

A2. This question is about Asynchronous Transfer Networks (ATM).

a) Show by means of a diagram the cell format used within an Asynchronous Transfer Mode (ATM) network. Clearly show on this diagram how many bits are assigned to each field.

(7 marks)

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

(5 marks)

c) When a connection is established over an ATM network a process called *Connection Admission Control* is used to ensure that the network is able to provide the required quality of service. Within this process, what is meant by a *traffic contract* and explain how a quality of service requirement is specified within a traffic contract.

(5 marks)

d) What is the difference in quality of service offered within an ATM network when using the Available Bit Rate (ABR) and Constant Bit Rate (CBR) services?

(8 marks)

A3. This question is about protocol layers and the Open Systems Interconnection (OSI) Reference Model.

a) The OSI Reference Model defines seven protocol layers, each of which is responsible for a specific range of functions. By considering this model, explain the main functions performed by a protocol operating at:

i) The Physical layer
ii) The Network layer
iii) The Application layer

(9 marks = 3 x 3 marks)

b) Produce a diagram of the OSI seven layered model that clearly shows how data is transferred through the model's layers and that also illustrates what is meant by the term *peer to peer* protocol.

(10 marks)

c) In a small scale LAN, a computer is connected to a LAN switch, the LAN switch is then connected to a router and the router is connected to a second LAN switch. A server is then connected to this second switch. Determine which layers of the OSI Reference Model are used within:

i) The computer / server
ii) The LAN switches
iii) The router

(6 marks = 3 x 2 marks)

Section B

Answer Section B questions in Answer Book B

B4. The question is about the provision of Quality of Service (QoS) within the Internet.

a) Briefly discuss the meaning of the term QoS as it is currently used in the context of traffic being moved within the Internet.

(5 marks)

b) What types of traffic gain benefit from being transmitted using QoS and why?

(5 marks)

c) Give an overall explanation of the differentiated services approach to the provision of QoS.

(15 marks)

B5. This question is about the behaviour of routers within the Internet.

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

(7 marks)

b) Routing within large networks operated by single administrations is often performed using link-state protocols.

i) Explain the general behaviour of link-state protocols.

(6 marks)

ii) Explain how the protocol OSPF has specific features to deal with its use in large networks.

(12 marks)

B6. Imagine you have been appointed to design the network to be deployed in two new buildings. The main building contains a dedicated computer room containing 10 high performance dedicated servers. The main building also contains a large coffee room and lounge area. The furniture in the coffee room/lounge is not fixed and is often moved around. A small secondary building contains an office where 12 workers use low performance desktop computers located on fixed desks. The two buildings are about 30 metres apart.

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

(6 marks)

b) What type of network should be deployed in the coffee room/lounge and what equipment should be installed?

(6 marks)

c) What type of network should be deployed in the secondary building's office and what equipment should be installed?

(6 marks)

d) What type of network connections should be used between the rooms in the main building and what technology should be used to link from the main building to the secondary building?

(7 marks)