BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 6 Professional Graduate Diploma in IT

NETWORK INFORMATION SYSTEMS

Tuesday 31st March 2015 - Afternoon
Answer **any** THREE questions out of FIVE. All questions carry equal marks.
Time: THREE hours.

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

For all questions illustrate your answers with diagrams where appropriate

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

Calculators are **NOT** allowed in this examination.

Section A

Answer Section A questions in Answer Book A

A1. A company has an office based in London with a network that houses two web servers. One of these web servers is designed for external access, the other is an intranet web server designed only to be accessible to employees of the company. The company also has another office located in Paris, which is externally connected to the London office through a virtual private network routed over the public internet. This virtual private network must always be active, and not raised on demand by individual members of staff in the Paris office.

Both offices continue to use IP version 4 addresses, but the company only has a single public IP address range of 200.10.10.0/26. They require more nodes than the 62 allowed by this range, and so all nodes in the networks are numbered with private addresses from the 10.0.0.0/8 range.

Describe, with the aid of a diagram, a network topology that will interconnect the two offices and that will also allow public access to the external facing web server. You must clearly identify all routing or switching components required, and label IP addresses and subnets for at least one node in Paris, one node in London and all other identified components. Use Classless Internet Domain Routing (CIDR) notation to label the subnets. The diagram should also indicate how the routing of private addresses to the Internet is achieved, and the function of the relevant components should be described. **(25 marks)**

A2.

a) With reference to a packet switched network describe the concepts of :-

   i) Traffic Contracts.
   Clearly identify why these contracts are necessary and what the effect would be of having no such contracts. **(6 marks)**

   ii) Traffic Shaping.
   Include a suitable traffic shaping algorithm. **(7 marks)**

   iii) Traffic Policing.
   Include in your answer how the impact of traffic policing on networks with small frames or cells, such as Asynchronous Transfer Mode, may have severe and unintended consequences when carrying TCP/IP traffic, and how this may be alleviated. **(6 marks)**

b) Discuss the extent to which traffic shaping is supported in TCP/IP, and how such shaping may be avoided in some cases. **(6 marks)**

A3.

a) Demonstrate your understanding of a Remote Procedure Call (RPC), indicating how the client/server architecture may communicate with one another. Illustrate your answer with a diagram. **(7 marks)**

b) Clearly identify the difference between idempotent and non-idempotent operations. **(4 marks)**

c) Explain the difference between synchronous and asynchronous RPC calls. **(4 marks)**

d) Explain what is meant by “at least once” and “at most once” operations in RPC semantics, and how would these relate to idempotent and non-idempotent operations. **(5 marks)**

e) Remote procedure calls can be wrapped in XML-RPC or SOAP as an alternative to traditional Open Network Computing Remote Procedure Calls. List the advantages and the disadvantages of wrapping the calls in an XML schema. **(5 marks)**

Section B

Answer Section B questions in Answer Book B

B4.

a) Briefly describe the security concepts of Confidentiality, Authentication, Data Integrity and Availability. **(4 marks)**

b) All security threats are divided into four broad classes: Disclosure, Disruption, Deception and Usurpation.
Briefly discuss these threats and give an example of each. **(8 marks)**

c) Clearly explain the digital signature concept and identify which, AND how, the security concepts listed in a) above are addressed by a digital signature. **(6 marks)**

d) Explain how the BS7799 (or ISO 17799) standard relates to computer security. Relate your answer to the Plan-Do-Check-Act (PDCA) model in Information Security Management System (ISMS). **(7 marks)**

B5. A company provides gardening services and has a number of useful web applications to enable a customer to find their nearest garden centre and then to order products and services. The company wants to modernise and move to web services.

a) By providing a clear explanation for each term, demonstrate an understanding of the following terms: XML, SOAP, WSDL, and UDDI. **(10 marks)**

b) With the help of a diagram describe and justify the mechanism of working with web services on the garden centre company web site. **(15 Marks)**