BCS THE CHARTERED INSTITUTE FOR IT

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

NETWORK INFORMATION SYSTEMS

Friday 1st April 2016 - 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) Describe the sources of latency (delay) in a packet switched network.

(7 marks)

b) Explain which of these sources of latency are reduced or eliminated in circuit switched networks.

(4 marks)

c) Explain what is meant by network capacity and how this is related to a network's bandwidth.

(4 marks)

d) Trivial File Transfer Protocol (TFTP) is a simple file transfer protocol that can be used to transfer data over Internet Protocol networks using User Datagram Protocol (UDP). TFTP files are transferred one packet at a time and each packet must be acknowledged by the receiver before the next packet of the transfer is sent.

Explain why use of TFTP would be sub-optimal for large file transfers and over Wide Area Networks. In view of your answer, why would TFTP be used at all?

(10 marks)

A2. A university is running TCP/IP over a network which consists of wired Ethernet segments and WiFi connected spaces. The university is also connected to the Internet. With reference to this context:

a) Describe the functionality of a bridge and identify at what layer of the ISO Open System Interconnection (OSI) network model it operates. In your answer you should explain how it handles broadcasts and what level of packet filtering may occur.

(8 marks)

b) Describe the functionality of a router, identifying at what layer of the OSI network model it operates, what filtering can be performed to make routing decisions and how it handles broadcasts.

(8 marks)

c) Explain the need for routing protocols and describe the main differences between RIP and OSPF in terms of protocol type, ease of configuration and convergence speed. Your answer should also explain what is meant by convergence.

(9 marks)

A3. Transport Layer Security (TLS), also known as Secure Sockets Layer (SSL), uses Public Key Encryption algorithms and Symmetric Encryption algorithms to achieve a secure layer of encryption over an insecure transport layer.

For each of the following and with reference to TLS/SSL, describe how the technique is used. In each case you should also identify any security weaknesses:

a) Public key (asymmetric) and symmetric encryption.

(6 marks)

b) Message digest.

(6 marks)

c) Digital signature.

(6 marks)

d) Digital server certificate.

(7 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) Define the term “distributed system” and explain the most important aspects of the definition.

(5 marks)

b) List and explain distributed systems transparencies with regard to Access, Migration, Location, Relocation, Replication, Concurrency and Failure.

(14 marks)

c) In the figure below, each of the computers labelled a, b, c and d has a stored numerical value which it needs to relay to the computer marked Server to enable the Server to compute the sum of all values.

i) With the aid of a diagram, explain the message passing necessary to accomplish this task.

(3 marks)

ii) Show one mechanism where the same task can be accomplished with fewer messages.

(3 marks)

B5.

a) Define the Simple Network Management Protocol (SNMP) and state two common devices that use it.

(4 marks)

b) Define a Network Management System (NMS) and explain four of its key functions.

(11 marks)

c) List and outline the most important performance indicators which a NMS should be able to measure and evaluate.

(5 marks)

d) Explain the significance of the term “round-trip time” and describe one method by which its value can be obtained.

(5 marks)