BCS THE CHARTERED INSTITUTE FOR IT

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

NETWORK INFORMATION SYSTEMS

Thursday 16th April 2026 – Morning

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

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.

This question tests your knowledge of security and data integrity in network information systems.

a) Explain the terms encryption and decryption in the context of cyber security.
(4 marks)

b) The CIA stands for confidentiality, integrity and availability in cybersecurity. Explain the significance of the CIA and give details of its **three** components.
(10 marks)

c) Explain the difference between symmetric and asymmetric encryption. When is it beneficial to have symmetric encryption and when is it beneficial to have asymmetric encryption?
(6 marks)

d) Explain the steps for securing a connection when using asymmetric encryption.
(5 marks)

A2.

This question tests your knowledge of Simple Network Management Protocol (SNMP) and understanding the need for and concept of traffic modelling.

a) Explain what SNMP is and indicate its purpose.
(4 marks)

b) The SNMP runtime components are:

i. SNMP-managed devices and resources.

ii. SNMP agent.

iii. SNMP manager.

iv. Management Information Base (MIB).

Briefly explain their meaning and functionality.
(16 marks)

c) What are SNMP limitations in terms of security, scalability and performance?
(5 marks)

A3.

a) Describe, with the aid of diagrams if necessary, how the Transmission Control Protocol (TCP) manages congestion using the slow start congestion control mechanism.

(8 marks)

b) In the context of TCP congestion control, what is fast retransmit and recovery? Describe the algorithm used to implement this, explaining what both fast retransmit and fast recovery mean.

(8 marks)

c) What assumptions does slow start make to recognise congestion events? How, in some cases, might these lead to poor performance, particularly in specific modern networks?

(3 marks)

d) The HTTP 1.1 protocol changed the default behaviour of web servers to prefer persistent connections between web requests. Whereas if the server had closed the TCP connection after each request, the connections would now be kept alive in anticipation of follow-up requests and all would be handled on one connection.

How would this improve performance for web services and what other benefits and potential drawbacks might it introduce?

(6 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

a) IMAP and POP3 are protocols that may be used as message access agents to access electronic mail. Describe the principal differences in approach between these protocols.

(8 marks)

b) The Domain Name System (DNS) maps domain names to IP addresses. What record type does the DNS offer to support the identification of a site's mail server(s)?

(3 marks)

c) A home internet user connects through their ISP (generalisp.com), which provides DNS and mail and sendmail services to its users. This user writes an email to someone at a university: F.Smith@bigtownuniversity.ac.uk.

i. Describe, with the aid of diagrams if necessary, the servers this message passes through before being delivered to the recipient's email client. There is no need to identify the specific software used on each server.

ii. For each server identified, describe what record(s) would need to be looked up in the domain name system, indicating the resource record type that would be requested so that the email will be correctly delivered to the recipient.

(14 marks)

B5.

a) Describe the sources of network latency (delay) in a packet switch.

(8 marks)

b) Which of these sources of latency are reduced or eliminated in circuit-switched networks and why?

(4 marks)

c) What is meant by network capacity and how is this 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). In TFTP, files are transferred one packet at a time and the receiver must acknowledge each packet before sending the next packet of the transfer. Explain why the 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?

(9 marks)

END OF EXAMINATION