

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Monday 24th April 2023 - 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

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.

Only **non-programmable** calculators allowed in this examination.

Section A
Answer Section A questions in Answer Book A

A1.

- a) An international organisation has regional offices on all 7 major continents throughout the world in hard-to-reach locations. When designing a high-speed WAN for this organisation, compare and contrast different WAN solutions that would be appropriate for implementing a solution considering geographic coverage, transmission speeds and suitability.

(9 marks)

- b) Compare and contrast the advantages and disadvantages of following WAN topologies:

- i) Bus;
- ii) Full or Partial Mesh;
- iii) Star/Hub & Spoke;
- iv) Ring.

(8 marks)

- c) Explain the difference between connection orientated and connectionless networks with practical examples.

(8 marks)

A2.

Please see Figure 1 below which is an outline of an IP Header.

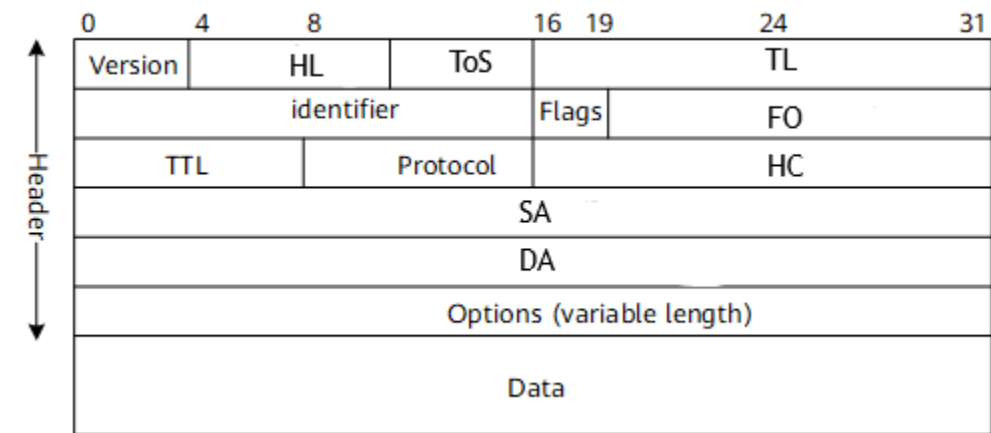


Figure 1. IP Header

a) Expand and explain the following pairs of acronyms in the TCP Header.

- i) SA and DA.

(5 marks)

b) Expand and explain the following acronyms in the TCP Header:

- i) HL;
- ii) FO;
- iii) HC;
- iv) TL.

(8 marks)

c) Describe what the following header functions can be used for:

- i) ToS;
- ii) TTL;
- iii) Protocol.

(12 marks)

A3.

a) When an organisation wants to provide network resilience to end devices connecting to the wider network within its own TCPIP based network (with only one physical connection per workstation), discuss **THREE** protocols they could implement to offer a solution.

(12 marks)

b) How is resilience managed in Layer 2 Ethernet campus-based networks? What issues have to be considered in such configurations?

(6 marks)

c) How is resilience managed in IP Layer 3 based Wide Area Networks? Provide examples.

(7 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

- a) A software development company is designing the communication modules of a multi-functional teleconferencing application to be utilised in working from home scenarios.

As part of the requirements documentation, voice and text-based communication is permitted amongst users and has the following QoS characteristics:

Communication	Loss	Bandwidth	Time Sensitive
Text-based	No loss	Elastic	No
Voice-based	Loss tolerant	Audio: 5kbps	Yes

- i) Which transport layer service, TCP or UDP would be appropriate for text messaging? Justify your decision.
- ii) Which transport layer service, TCP or UDP would be appropriate for voice-based communication. Justify your decision.

(8 marks)

- b) Explain which QoS model uses DSCP bits to mark packets and explain how many possible classes of service are available.

(4 marks)

- c) Explain what QoS technique retains excess packets in a separate queue for transmission later.

(4 marks)

- d) What QoS technology can provide congestion avoidance by permitting TCP traffic to be throttled back before buffers fill up and tail drops occur? Explain your answer with the use of diagrams.

(9 marks)

B5.

In Local Area Networks, Ethernet is used as the most common wired digital communication technology.

- a) Explain why Ethernet utilises Manchester encoding in its digital transmission.

(9 marks)

- b) What would be transmitted if the bit stream was 10100111001? Justify your answer.

(12 marks)

- c) What are **TWO** types of signal distortion?

(4 marks)

B6.

- a) Identify which layer (of the OSI 7 Layer Model, TCP/IP Reference Model or both) these technologies, protocols and standards operate at and what they are used for:

- i) ICMP;
- ii) X500;
- iii) ARP;
- iv) HTTP;
- v) IS-IS;
- vi) IEEE 802.11;
- vii) EIA232;
- viii) X400.

(16 marks)

- b) At what layer(s) is data compression and encryption achieved in the OSI 7 layer model? Explain your answer.

(4 marks)

- c) Explain the process by which data is formatted and exchanged between each layer of the OSI 7 layer model.

(5 marks)

END OF EXAMINATION