Section B
Answer Section B questions in Answer Book B

B4.

Wireless LANs (Wi-Fi) are prevalent within homes, businesses, and public spaces throughout the world but they're not without their own set of unique problems and difficulties.

a) In the context of Wi-Fi networks explain, with the aid of diagrams, what is meant by the "Hidden Station Problem"?

(12 marks)

b) Describe how the "Hidden Station Problem" can be prevented using well-established networking fundamentals.

(13 marks)

B5.

In Wide Area Networks (WAN), Virtual Private Networks (VPN) are often used to provide an overlay over existing legacy infrastructure to achieve secure communications.

a) Describe the **four** main types of VPN architecture which are typically used over WANs.

(12 marks)

b) In order for VPNs to provide secure communications over a WAN, explain what functionality they must offer and further contrast the key features of the **two** common protocols which are typically used?

(13 marks)

B6.

Often when determining QoS for a network application, the communications stream is often referred to as a "flow".

a) What is the definition of a flow?

(1 mark)

b) Identify and describe the **four** primary parameters that characterise a flow and can be used to determine the QoS that the flow requires.

(8 marks)

c) For the following applications, determine the stringency of the requirements of the quality of service for each parameter identified in part b) as either low, medium or high (presenting your answer in a table).

i. Email.
ii. Web Access.
iii. Audio on Demand.
iv. Videoconferencing.

(16 marks)

END OF EXAMINATION

BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Tuesday 8th October 2024 – Morning

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 allowed in this examination.

Section A
Answer Section A questions in Answer Book A

A1.

Consider the following scenario where communication between applications on host X and host Y is initiated using a TCP connection.

a) With the aid of a diagram explain the sequence of packets exchanged between hosts X and Y required to initiate (setup) the connection and manage the subsequent data transfer.

(5 marks)

b) For each packet identified in part a) provide an explanation for the purpose of each packet.

(6 marks)

c) For each packet exchanged in part a), identify the critical TCP header information necessary to manage that initial communication over and above the use of IP addresses.

(6 marks)

d) Explain how host X or host Y is able to differentiate between different connections and deliver the correct packets to the correct application on each host.

(8 marks)

A2.

In modern duplex-based communication systems, there is a need to both control errors and recover from them. ARQ is a typical strategy for controlling errors in transmission.

a) Explain what is meant by ARQ, its basic functional mechanism and its relationship with the ISO OSI 7-layer model.

(9 marks)

b) Identify **four** scenarios or applications where ARQ is actively used within computer networks.

(4 marks)

c) Identify the **three** main types of ARQ and describe their operation.

(12 marks)

A3.

a) Consider the following CIDR-based IPv4 network addresses that are operated by an ISP:

- ⇒ Network 1: 148.32.0.0/16
- ⇒ Network 2: 148.33.0.0/16
- ⇒ Network 3: 148.31.12.0/20
- ⇒ Network 4: 148.28.96.0/22

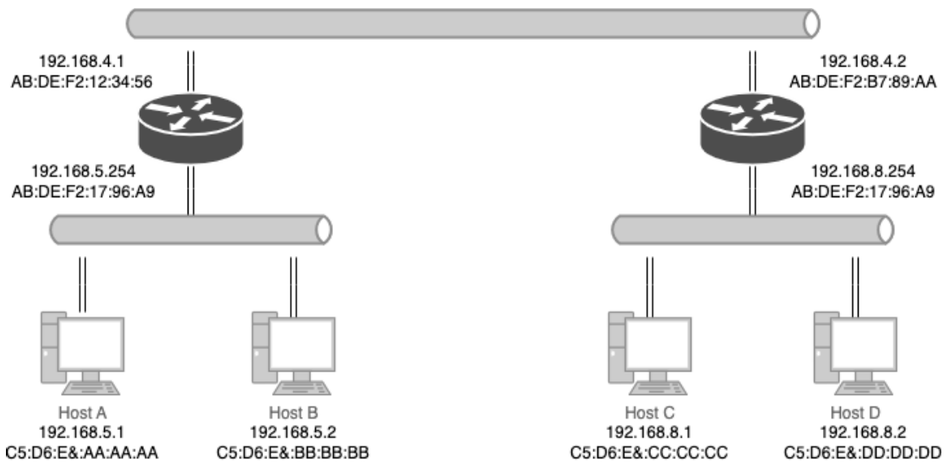
In a router's log files, the following source IP addresses are recorded:

- ⇒ Host F: 148.32.12.19
- ⇒ Host G: 149.34.12.19
- ⇒ Host H: 148.31.21.19
- ⇒ Host I: 148.28.98.111
- ⇒ Host J: 148.28.100.99
- ⇒ Host K: 184.32.34.2
- ⇒ Host M: 18.32.36.89

Identify which source network the different hosts originate from (if any) with a justification.

(14 marks)

b) Consider the figure below representing a network diagram of routing devices, host devices and their respective IP and MAC addresses.



Assuming that Host A sends an ICMP echo request to Host D and that Host D sends a valid ICMP echo reply back to Host A and ARP addresses are already in the cache. For each hop over which the message/packet travels, indicate the source and destination MAC and IP addresses that are used in link layer frames and network layer packets.

(11 marks)