BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Friday 20th September 2019 - 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
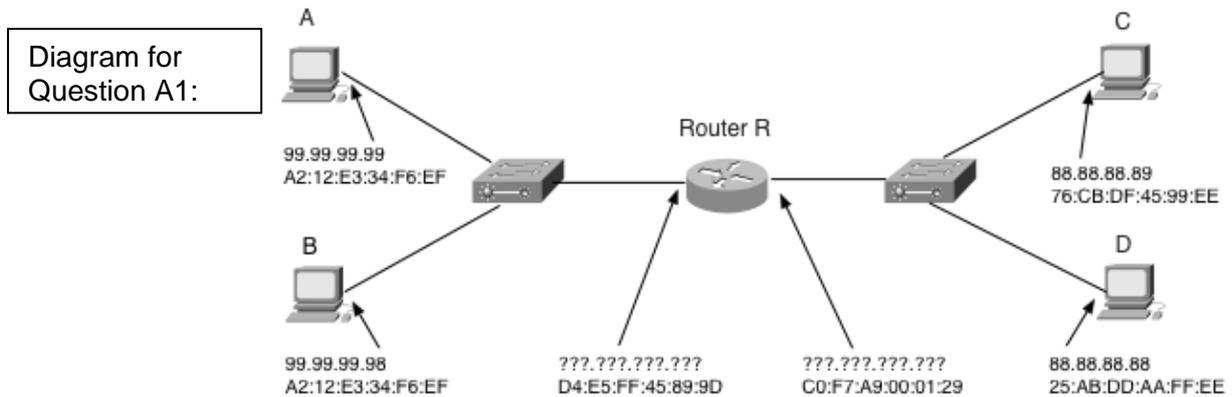**Answer any Section B questions you attempt in Answer Book B**

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

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

[Turn Over]

A1. Considering the information provided in the image below, respond to each of the following questions.

Diagram for Question A1:

a) Given that the subnet mask used in the scenario is /24:

    i. Explain which IP addresses cannot be assigned to each interface of R and indicate why. **(6 marks)**

    ii. Assign IP addresses to the left and right interfaces interface of the router R. **(2 marks)**

b) Suppose computer A wants to send an IP datagram to computer B and knows B's IP address. Does computer A need to know computer B's MAC address to send the datagram to computer B? If yes, explain the operation used by A to obtain B's MAC address. If no, explain why not and what information would be used for the datagram to arrive to computer B. **(6 marks)**

c) Suppose computer A wants to send an IP datagram to computer C and knows C's IP address. Does computer A also need to know C's MAC address to send the datagram to computer C? If yes, explain the operation used by A to obtain C's MAC address. If no, explain why not and what information would be used for the datagram to arrive to computer C. **(6 marks)**

d) Suppose that R has a datagram (that was originally sent by A) to send to C. Specify:

    i. The MAC addresses on the frame that is sent from R to C. **(3 marks)**

    ii. The IP addresses in the IP datagram encapsulated within this frame. **(2 marks)**

[Turn Over]

A2.

a) With the aid of a diagram show, in the correct order, the layers of the TCP/IP protocol stack that are implemented on the following network components:

  i. End system (host);
  ii. Router;
  iii. Switch.

(3 marks)

b) State the primary differences between the link state and distance vector routing algorithms. **(6 marks)**

c) Briefly explain, with the use of an appropriate diagram:

  i. The implementation of the Domain Name Service (DNS). **(2 marks)**

  ii. How DNS queries are resolved in the DNS system with recursive and iterative queries. **(8 marks)**

d) Indicate in which layer of the TCP/IP Reference model would Internet Control Message Protocol (ICMP) be found. Explain what ICMP is used for, indicating its key areas of functionality with suitable examples. **(6 marks)**

A3.

a) Describe and illustrate the different types of datagram fragmentation in IPv4 when communicating over the internet. Discuss why fragmentation is not a problem in IPv6. **(8 marks)**

b) With the gradual transition from IPv4 to IPv6, discuss the techniques ISP's could use to make this transition easier and achieve interworking between the two. Recommend one solution and justify your choice. **(8 marks)**

c) Describe how Port Address Translation (PAT – a form of Network Address Translation) works for connecting RFC1918 based private networks to the public Internet. Indicate the data structure required to maintain mapping between the internal private addresses and the public address, illustrating with diagrams where necessary. **(9 marks)**

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.

    a) For each of the wireless network classifications: WAN, MAN, LAN and PAN, indicate:

        i. Meaning of the acronym.
        ii. Typical operational distances.
        iii. Typical speed.
        iv. Example of a standard.

(16 marks)

    b) Compare and contrast the features of simplex, half-duplex and full duplex modes of network communication in terms of mode/direction of communication performance and provide examples of each. **(9 marks)**

B5.

    a) Define the two types of errors that occur in data communication. **(4 marks)**

    b) In order to address errors in data communication it is first necessary to be able to detect them. Indicate the main error detection technique used in data communications and identify 4 different types of this technique with a brief explanation of how they operate. **(14 marks)**

    c) Explain how Hamming codes can be used for error correction once an error has been detected. **(7 marks)**

B6.

    a) Explain the differences between the two main Transport Layer protocols, TCP and UDP, of the TCP/IP Reference Model. **(6 marks)**

    b) Compare the TCP and UDP headers by detailing the fields that are missing from the UDP header when compared to the TCP header. **(8 marks)**

    c) Consider the TCP connection mechanism.

        i. What technique is used to set up a TCP connection?
        ii. Why is the technique needed?
        iii. Outline how this technique works.

(6 marks)

    d) Explain what is meant by flow control and how it is implemented in TCP.

(5 marks)

End of Exam