BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Tuesday 11th May 2021 – Afternoon

Answer **any** FOUR questions out of SIX. All questions carry equal marks.

Time: TWO hours

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

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.

Section A
Answer Section A questions in Answer Book A

A1.
This question is about the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

  a) Describe **TWO** main differences between TCP and UDP.

  (6 marks)

  b) Describe **TWO** main similarities between TCP and UDP.

  (6 marks)

  c) Explain **FOUR** characteristics of the TCP windowing concept.

  (8 marks)

  d) For **EACH** of the following five applications, state whether you would use TCP or UDP as transport protocol:

   i)   File transfer;
   ii) An audio conference;
   iii) Video streaming;
   iv) Webserver traffic;
   v)   Email traffic.

  (5 marks)

A2.
This question is about the ISO Reference Model.

  a) The ISO Reference Model defines seven protocol layers, each of which is responsible for a specific range of functions. By considering this model, explain the main functions performed by a protocol operating at:

   i)   The data link layer;
   ii) The network layer.

  (6 marks)

  b) Using a diagram, indicate the relation between the OSI Reference Model and TCP/IP.

  (8 marks)

  c) Describe **FOUR** benefits of using a layered model, such as the OSI Reference Model.

  (8 marks)

  d) Provide an example of a protocol or device that operates on **EACH** of the following layers of the OSI Reference Model:

   i)   Network layer;
   ii) Transport layer;
   iii) Physical layer.

  (3 marks)

A3.
This question is about physical layer transmission systems.

    a) Using a diagram, show how a logic 1 and a logic 0 are represented using Manchester encoding.

                                                           (4 marks)

    b) Using a diagram, show how the bit sequence 01110010 would be transmitted using Manchester encoding.

                                                           (8 marks)

    c) A transmission system uses a data coding scheme that defines a symbol as a voltage that can have one of **EIGHT** possible values. If the system operates at a transmission rate of 200 symbols per second, determine the data rate measured in:

        i) Baud;
        ii) Bits per second.

                                                            (8 marks)

    d) Wide Area Networks (WAN) are based on the High Level Data Link Control (HDLC). Indicate:

        i) The purpose of the unique flag sequence 01111110;
        ii) The purpose of the process known as zero bit insertion, or bit stuffing.

                                                          (5 marks)

Section B
Answer Section B questions in Answer Book B

B4.
This question is about dynamic routing protocols.

a) Dynamic routing protocols can be classified as link-state or distance-vector routing protocols. Indicate **TWO** advantages and **TWO** disadvantages of one against the other.

(4 marks)

b) Given the following dynamic routing protocols indicate the class they belong to, i.e. link-state or distance-vector:

    i) OSPF;
    ii) EIGRP;
    iii) RIP.

(6 marks)

c) Explain the concept of Autonomous System and its importance within routing protocols on the Internet.

(4 marks)

d) Link-state routing protocols use **THREE** distinctive tables, indicate the purpose of each of them:

    i) Neighbour table;
    ii) Topology table;
    iii) Routing table.

(6 marks)

e) Briefly describe the operation of the OSPF routing protocol in terms of neighbour discovery, best path selection and route maintenance.

(5 marks)

B5.
This question is about IPv4 addressing.

a) In classful addressing, the IP address space is divided into five classes. Give examples of an IP address within each of the classes A, B, C and D and explain why they belong to that class.

(12 marks)

b) A host was given the IP address 10.1.1.3/27. Consider this address and indicate:

    i) The network address to which the host belongs;
    ii) The network broadcast address to which the host belongs;
    iii) The total number of hosts available in the network.

(6 marks)

c) Explain the main difference between a MAC address and an IP address and indicate how both are used to achieve communication between two devices.

(7 marks)

B6.
This question is about the concept of Quality of Service (QoS).

a) QoS is a collection of technologies that allows applications to request and receive predictable service levels in terms of bandwidth, latency variations (jitter), and delay. Briefly explain the terms bandwidth, jitter and delay.

(6 marks)

b) The Internet Engineering Task Force (IETF) defines the following **TWO** architectures for QoS: Integrated Services (IntServ) and Differentiated Services (DiffServ).

Briefly describe the main behaviour of **EACH** of those architectures.

(8 marks)

c) Briefly explain how IPv4 and IPv6 provide support for Layer 3 QoS.

(6 marks)

d) Explain the purpose of a Service Level Agreement (SLA) and its relation to QoS.

(5 marks)

END OF EXAMINATION