BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Friday 2nd October 2015 – Morning
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 features and operation of Asynchronous Transfer Mode (ATM) which has seen widespread adoption within the Universal Mobile Telecommunication System, 3rd generation mobile phone networks.

   a) Show by means of a diagram, the cell format using within an ATM network.
(5 marks)

   b) What is the difference between a Virtual Path and a Virtual Channel? **(5 marks)**

   c) When a connection is established over an ATM network a process called *Connection Admission Control* is used to ensure that the network is able to provide the required quality of service. Briefly explain how this process works and explain how a quality of service requirement is specified using a *traffic contract*. **(6 marks)**

   d) Explain the purpose and function of the ATM Adaptation Layer type 5 (AAL5) protocol. **(9 marks)**

A2. This question is about physical layer transmission systems.

   a) A transmission system uses a data coding scheme that defines a symbol as a voltage that can have one of sixteen possible values. If the system operates at a transmission rate of 400 symbols per second, determine the data rate measured in:

      i) baud; **(2 marks)**

      ii) bits per second. **(4 marks)**

b) Show by means of a diagram how a logic 1 and a logic 0 is represented by using Manchester encoding. **(4 marks)**

c) Show by means of a diagram how the bit sequence, 10001101 would be transmitted using Manchester encoding. **(4 marks)**

d) Wide Area Network (WAN) encapsulation protocols are used when connecting a router to an externally provided WAN service. These protocols are based on the High Level Data Link Control (HDLC) in which each message starts and ends with the unique flag sequence of 01111110. In order to prevent this flag sequence from occurring at other parts of the message, a process known as zero bit insertion, or bit stuffing is used. By considering the transmission of the following 5 message data bytes show by means of a diagram how zero bit insertion is used when transmitting this message.

00110011   11110101   01111110   01001101   11111100

(9 marks)

e) When transmitting the data sequence shown in part (d), how many bits in total have to be sent? **(2 marks)**

A3. This question is about the Transmission Control Protocol (TCP) and User Datagram Protocol (UDP).

a) Both the TCP and UDP protocols use port numbers. What are these port numbers used for and what is meant by the term <u>well known port</u>? **(6 marks)**

b) For each of the following applications determine whether you would use TCP or UDP and explain the reasons for your choice.

  i. File transfer

  ii. Watching a real time streamed video

  iii. Web browsing

  iv. A Voice over IP (VoIP) telephone conversation   **(4 x 3 = 12 marks)**

b) By considering the operation of the TCP protocol, briefly explain how it is able to overcome errors in the transmission and ensure that data is transferred reliably over a network. **(7 marks)**

Section B

Answer Section B questions in Answer Book B

B4. This question is about IPv4 addressing.

a) In classful addressing, the IP address space is divided into 5 classes. Indicate the classes of each of the following address expressed in binary. Indicate how the class was identified.

- 00000001 00001011 00001011 11101111

- 11000001 10000011 00011011 11111111

- 10100111 11011011 10001011 01101111

- 11110011 10011011 11111011 00001111

(4x2=8 marks)

b) A host was given the IP addresses 192.168.3.219 /27. Consider this address and indicate:

- The network address to which the host belongs.

- The network broadcast address to which the host belongs.

- The total number of hosts available in the network   **(3x2=6 marks)**

c) Describe the concept of classless addressing, indicating the reason why it was proposed and providing an example of a classless IP address.   **(5 marks)**

d) Considering IPv4 classless addressing, an organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets as shown below:

- One subblock of 120 addresses.
- One subblock of 60 addresses.
- One subblock of 10 addresses.

Indicate the network IP address and the subnet mask for each of the subblocks.
(3x2 =6 marks)

B5. This question concerns wireless local area networks (WLAN) technology and IEEE802.11 standards.

a) The data link layer in the IEEE standard is divided into two sublayers: LLC and MAC. Indicate the functions performed by each sublayer.   **(5 marks)**

b) Draw the flow diagram of the Carrier Sense Multiple Access/Collision Avoidance mechanism used by 802.11 (CSMA/CA).   **(6 marks)**

c) Explain why CSMA/CD cannot be implemented by Wireless LANs.   **(6 marks)**

d) The IEEE 802.11 addressing mechanism specifies four cases, defined by the value of the two flags in the FC field, *ToDS* and *FromDS*. Explain the values those flags could take and the values the different addresses should take. Use the following table: Table 1, to provide your answer: **(8 marks)**

ToDS	FromDS	Address 1	Address 2	Address 3	Address 4
0	0				
0	1				
1	0				
1	1				

Table 1

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

a) Identify the four types of characteristics which are usually attributed to a flow in a network and briefly explain each with particular reference to their relationship to QoS. **(8 marks)**

b) Briefly explain the concept of RSVP and the three reservation styles defined by RSVP. **(8 marks)**

c) Identify and describe two problems associated with Integrated Services. **(4 marks)**

d) Briefly explain the concept of Differentiated Services and one of the per-hop behaviours specified by it. **(5 marks)**