

**BCS THE CHARTERED INSTITUTE FOR IT**

**BCS HIGHER EDUCATION QUALIFICATIONS**  
**BCS Level 5 Diploma in IT**

**COMPUTER NETWORKS**

Monday 16<sup>th</sup> November 2020 - 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**

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

Only <b>non-programmable</b> calculators are allowed in this examination.
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**Section A**  
**Answer Section A questions in Answer Book A**

**A1.** This question is on **Local Area Networks**.

- a) Describe (with supporting diagrams) the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) process.  
(8 marks)
- b) Explain why Wi-Fi uses Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) rather than CSMA/CD (using supporting diagrams).  
(8 marks)
- c) How does Wi-Fi use the mobility criteria to move between different access points on the same SSID?  
(4 marks)
- d) The so-called “hidden station” problem can arise in an 802.11x Basic Service Set. Explain how this difficulty is overcome.  
(5 marks)

**A2.** This question is on **Inter Networks**.

- a) Convert the following IPv6 addresses to their most compressed format, using the RFC 5952 standard for multiple strings of all-0s hextets:
  - i) 2010:0db8:cab0:0234:0034:0004:0000:0000
  - ii) fe80:0db8:0cab:0000:0000:0000:0001:0000
  - iii) 2001:0db8:0cab:1234:0230:1200:0034:0000
  - iv) fd00:0000:0000:0000:1234:0000:0000:0000
  - v) 2001:0db8:0000:0000:1234:0000:0000:1000(5 marks)
- b) Convert these compressed IPv6 addresses to the complete address with **THIRTY-TWO** hexadecimal digits:
  - i) 2001:db8:cab::1
  - ii) 2001:db8:0:0:234::
  - iii) fe80::1234:abcd:1:2:3:f:fff
  - iv) fd00:abcd:fcde:1:22:33::1
  - v) 2010::1:face:cad:1(5 marks)
- c) What are the prefixes for the following IPv6 addresses?
  - i) fe80::250:56ff:fe83:ecc/64
  - ii) 2001:db8:80f:f425:250:56ff:fe83:ecc/48
  - iii) 2001:db8:80f:f425::230/48
  - iv) 2001:db8:bb8a:f390::1/32(4 marks)

- d) What are the **THREE** fields in a global unicast address?  
(3 marks)
- e) Which type of address is required for a device to be IPv6-enabled?  
(2 marks)
- f) What are **THREE** characteristics of a link-local unicast address?  
(3 marks)
- g) What is the difference between IPv6 unique local addresses and IPv4 private addresses in terms of NAT?  
(3 marks)

**A3.** This question is on **Error Detection** and **Introduction**.

- a) The data link layer of the OSI seven-layer model can utilise forward error correction (FEC) or backward error correction (BEC) to reduce the effect of transmission errors. Explain the operation FEC and BEC, the differences between them and comment on their effectiveness at detecting bit errors over both unidirectional and bidirectional channels.  
(6 marks)
- b) The cyclic redundancy check (CRC) is used for backward error detection. CRC involves dividing a generator polynomial into a message to determine the remainder which subsequently provides redundant information to determine if an error has occurred. Given a standard generator polynomial of 100 and a message sequence of 11010, determine the remainder that forms that CRC.  
(9 marks)
- c) When using the CRC method of error detection, describe how the check is communicated to the receiver and explain how it is used to detect bit errors that may have occurred in transmission.  
(5 marks)
- d) Assuming a transmitted code has **TWO** codewords: 01010 and 10101. How many bit errors can be detected or corrected?  
(5 marks)

[Turn Over]

**Section B**  
**Answer Section B questions in Answer Book B**

**B4.** This question is on **Inter Networks** and **Digital Communication**.

a) For the **THREE** main types of Network Address Translation (NAT):

- i) Describe each type of NAT.
- ii) Describe how they are used.

**(9 marks)**

b) Explain, with examples, how NAT can be used with RFC1918 within IPv4 networks to save scarce IP addresses.

**(8 marks)**

c) Explain, with examples, how NAT can be used within a hybrid IPv6 and IPv4 network.

**(8 marks)**

**B5.** This question is related to **Wide Area Networks** and **Inter Networks**.

A common occurrence in some routed networks is it takes a long time for an interior routing protocol to stabilise the network.

a) Explain the primary condition that dictates that a routing protocol has stabilised, and routing tables are no longer constantly changing.

**(3 marks)**

b) If the routing protocol is a distance vector-based protocol, what is the likely cause of this delay in stabilisation?

**(5 marks)**

c) If the routing protocol is a link state protocol, why might there **NOT** be a delay in stabilisation?

**(5 marks)**

d) Discuss **TWO** additional problems that can be experienced by a network based on a distance vector-based protocol and explain how these problems are overcome?

**(8 marks)**

e) Explain what other types of routing protocol might be encountered in the WAN which are **NOT** distance vector or link state based?

**(4 marks)**

**B6.** This question is related to **Introduction** and **Digital Communications**.

- a) Briefly explain the difference between a port address, a logical address and a physical address.  
(6 marks)
- b) Explain the difference between the **TWO** packet data transfer techniques referred to as “connectionless” and “connection-orientated”.  
(6 marks)
- c) Distinguish between baseband and broadband transmission in computer networks. Give examples of where each might be used.  
(13 marks)

**End of Examination**