BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

COMPUTER NETWORKS

Thursday 24th April 2025 - Afternoon

Answer <u>**any**</u> 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 allowed in this examination.

Section A
Answer Section A questions in Answer Book A

A1.
Theoretical frameworks help to layer and explain the functionality of how data is processed between computer systems across a network.

a) Identify and explain the functions which occupy the upper three layers of the OSI 7-layer model but are represented by a single layer of the TCP/IP reference model,

(9 marks)

b) The four lower layers of the OSI 7-layer Model exchange data between hosts at the same layer in a recognised format called a PDU.

Explain what is meant by a PDU.

(4 marks)

c) For **each** of the four lower layers of the OSI 7-layer model, explain what the PDU unit for each layer consists of, along with typical attributes such as addressing.

(12 marks)

A2.
Radio or electromagnetic communication has been at the heart of historic and modern communications.

a) Explain the key differences between these fundamental data transmission concepts:

   i.   Analog and digital electromagnetic signals.
   ii. Guided and unguided media.

(8 marks)

b) Compare and contrast what is meant by the following concepts when applied to radio waves as a transmission media.

   i.   Refraction.
   ii.   Diffraction.
   iii. Scattering.

(9 marks)

c) Determine **two** key features of antennas used for radio communication and distinguish between the two different types of antennae.

(8 marks)

A3.

In modern computer networks where real time communication and streaming are critical business uses, QoS has a vital role to play.

a) Explain the difference between elastic and inelastic traffic with regards to quality of service and network performance characteristics. Support your answer with typical applications in each category.

(10 marks)

b) From a TCP/IP internetwork perspective, what are the **three** main approaches to achieve QoS and how do they differ.

(15 marks)

[Turn Over]

Section B
Answer Section B questions in Answer Book B

B4.
Wide Area Networks (WAN) have evolved from humble beginnings as Public Switched Telephony Networks (PSTN).

a) Describe what the **four** basic architectural components of a public communications network are.

(8 marks)

b) Historically, public communication networks relied on circuit switching technology, but other technologies are more efficient.

Discuss **four** advantages of modern networks utilising packet switching technology over circuit-switching.

(12 marks)

c) In packet switching networks, differentiate between what is meant by datagrams and virtual circuit operations.

(5 marks)

B5.
The fundamentals of communication require the exchange of data between a sender and a receiver and the ability to tell if any data exchanged has been corrupted.

a) Explain what is meant by synchronisation in serial communication and what the key characteristics of both asynchronous and synchronous transmission.

(7 marks)

b) Differentiate between the use of a parity bit and CRC for error correction. Explain why CRC would detect more errors than just the use of a parity bit.

(8 marks)

c) Using a CRC error-detecting scheme, choose $P(x) = x^4 + x + 1$ and encode the following bit stream 10010011011 (please show your working).

(10 marks)

B6.
Wireless LANs are vital to delivering digital transformation within domestic and business environments.

a) With the aid of a diagram, explain the key components of an IEEE 802.11 architecture.

(13 marks)

b) The IEEE 802.11 standard defines two categories of services for wireless local area networks (WLANs): station services and distribution services. List and briefly indicate where IEEE 802.11 services reside in the Architectural Model.

(12 marks)

END OF EXAMINATION