BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SYSTEMS ANALYSIS AND DESIGN

Tuesday 15th April 2025 - 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.

Calculators are **NOT** allowed in this examination.

Case Study for both sections A and B

Consider a second-hand book shop. The book shop buys and sells second-hand books, but also has a small private library of rare books which can be borrowed. Before anyone can borrow any books they must register with the book shop and pay a deposit. The deposit is repaid when a person wishes to cease membership of the library and if all the borrowed books have been returned in good condition.

When someone offers a book for sale, the owner of the shop searches their catalogue of books to see if they already have a copy either in the library or for sale. If so, they check how much they paid for the copy or copies they already have. If they have several copies of the book already they may decline to buy the book, or offer a reduced price. If the owner of the shop doesn't already have a copy of the book, they will offer to buy it, paying a reasonable price depending on its condition and rarity.

The owner has realised that the supply of second-hand books locally has diminished and has decided to set up a website where people can offer their books for sale. The owner realises that the seller of a book would have to input the condition of a book as well as the title and publication date. The web application would have to decide what price to offer by retrieving the purchase and selling price of any previous copies of the book. If the seller agrees to the price, a transaction number would be displayed for the seller to include when sending the book. The owner would send a cheque to the seller when the book is received. If the application could not calculate a price, the owner would like an e-mail notification so they can value the book themselves.

Section A
Answer Section A questions in Answer Book A

A1.

a) Identify and briefly describe **four** essential use cases for the second-hand book shop described on page 2.

(8 marks)

b) Create a use case diagram illustrating the relationship between the identified use cases, actors and the system boundary.

(5 marks)

c) Choose **two** of the identified use cases and provide detailed descriptions for each. Include information such as the main flow of events, alternative flows, preconditions, and postconditions. Use a structured format to present your use case descriptions.

(12 marks)

A2.

a) Explain the role and position of Systems Analysis and Design (SAD) within the broader context of the System Development Life Cycle (SDLC).

(4 marks)

b) Describe the tasks involved in **each** of the following phases in the SDLC:

i. Requirements Gathering.
ii. Feasibility Study.
iii. Systems Analysis.
iv. Systems Design.

(12 marks)

c) Describe the following roles and how they relate to the SDLC:

i. Business Analysts.
ii. System Analysts.
iii. System Architects.

(9 marks)

[Turn Over]

A3.

a)

i. Describe the key principles and characteristics of Atern/ DSDM.

(5 marks)

ii. Explain how Atern/ DSDM addresses the challenges in traditional systems development methods.

(4 marks)

b)

i. Identify **five** fundamental principles of eXtreme Programming (XP).

(5 marks)

ii. Identify **five** core practices of eXtreme Programming (XP).

(5 marks)

iii. Briefly compare XP with traditional development methodologies, highlighting the main differences.

(6 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) This question refers to the case study described on page 2 (a second-hand book shop and a small private library of rare books).

The table below shows an example of a list of rare books which were on loan.

Book code: S127	Book title: Origin of Species	Book details: Oxford Press, 1899		
	Loan code: L2010/23	Loan details: 2 weeks	Borrower name: P Palmer	Borrower address: 12 Elm Rd, SW12
	Loan code: L2010/27	Loan details: 1 week	Borrower name: A Green	Borrower address: 1 Prince Rd, SE8
	.....	.....	.....	....
Book code: P287	Book title: Pride and Prejudice	Book details: Webster's , 1902		
	Loan code: L2010/12	Loan details: 2 weeks	Borrower name: P Daniels	Borrower address: 45 Elm Rd, SW12
	....	.....	....	....
Book code: A123	Book title: The Art of Italy	Book details: Pergamon Press, 1912		
	Loan code: L2011/5	Loan details: 1 week	Borrower name: S Short	Borrower address: 11 Eton Square, SW1
	.....	.....	.....	....

Normalise the table to produce a set of relations in the Third Normal Form. You must show all of your working, explaining each step.

(18 marks)

b) Draw an Entity Relationship Diagram (ERD) based on the relations produced in part a).

(7 marks)

[Turn Over]

B5.

Consider the following extra information about the book shop and the small library described on page 2 in the case study:

"The owner plans to introduce two types of borrowers: individual borrowers and companies. The following data should be stored about each individual borrower: *Borrower No., First name, Surname, Address, Tel. no*. The attributes of each company are: *Borrower No., Company name, Address, Tel. no., Email address.*

An object of class Book consists of an Introduction, a number of Chapters, an Index"

a) Explain the following relationships between classes using examples from the book shop and the small library system described above to illustrate your answers:

i. Association.
ii. Aggregation or Composition.
iii. Generalisation/ Inheritance.

The examples should show relevant fragments of a class diagram.

(15 marks)

b) Discuss at least **two** similarities and **two** differences between class diagrams and entity relationship diagrams. Your discussion must not concentrate on notation.

(10 marks)

B6.

a) Give a brief explanation of 'object interaction and collaboration' in object-oriented systems.

Discuss the similarities and differences between sequence and communication/ collaboration diagrams.

(6 marks)

b)

i. Give a brief explanation of the role sequence diagrams play in systems modelling with the emphasis on designing the interaction between the user and the system.

(6 marks)

ii. Produce a sequence diagram for the use case 'Borrow a book' in the book shop and the small library system described on page 2. A brief description of this use case is given below.

"The corresponding Book code and Borrower number are entered by a Librarian. The system checks the status of the borrower. If the status is ok, then a loan is created and the system prompts for the book to be stamped with the return date."

(13 marks)

END OF EXAMINATION