BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SYSTEMS ANALYSIS AND DESIGN

Monday 26th March 2012 - Morning
Answer FOUR questions out of SIX. All questions carry equal marks

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.*

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

Case Study for both sections A and B

John Smith owns a second hand book shop on the High Street of a busy town. The book shop buys and sells second hand books, but also has a small private library of books now out of publication which he loans to local people. 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 if all the borrowed books have been returned in good condition.

When someone offers a book for sale John searches his catalogue of books to see if he already has a copy either in the library or for sale. If so he checks how much he paid for the copy or copies he already has. If he has several copies of the book already he may decline to buy the book, or offer a reduced price. If John doesn't already have a copy of the book he will offer to buy it, paying a reasonable price depending on its condition and how rare it is.

John has realised that the supply of second hand books locally has diminished and has decided to set up a web site where people can offer their books to John to buy. He 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. John will send a cheque to the seller when the book is received. If the application could not calculate a price John would like an e-mail notification so he can value the book himself.

A1. a) Produce a top level data flow diagram for the **current** system of the case study above.

(17 marks)

b) Compare the use of a data flow model with an activity diagram for modelling business processes. Your comparison should include an explanation of both notations. There is no need to model the case study again.

(8 marks)

A2. a) A requirement of the book shop's new website is that members of the public can offer a book for sale to John. This requirement has been documented as the use case 'Offer a book for sale'. Produce a system use case description for the normal scenario of this use case.

(10 marks)

b) Explain what a use case alternative scenario is, and why it may occur.

(5 marks)

c) Write the alternative scenarios for the use case description in part (a)

(10 marks)

A3. a) Explain when in the system development life cycle a requirements document would be produced, and describe the contents of a requirements document.

(18 marks)

b) Explain the difference between a functional and non functional requirement. Identify **three** types of non functional requirement.

(7 marks)

B4. This question refers to the case study described above. John Smith owns a second hand book shop and a small private library of rare books. The table below shows an example of a list of out of print books which have been on loan.

Book code: S127	Book title: Origin of Species	Book details: Oxford Press, 1899	Seller name: A Brown	Seller tel. no.: 02087654321
	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	Seller name: G Holmes	Seller tel no: 02071234567
	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	Seller name: A Blake	Seller tel .no: 02085674321
	Loan code: L2011/5	Loan details: 1 week	Borrower name: S Short	Borrower address: 11 Eton Square, SW1
	......	....	....	.....

a) 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)

B5. a) Consider the following extra information about the book shop and the small library owned by John Smith described above:

"John Smith plans to introduce two types of borrowers: individual borrowers and organisations. The following data should be stored about each individual borrower: *Borrower No, First name, Surname, Address, Tel. no.* The attributes of each organisation are: *Borrower No, Organisation name, Address, Tel. no., Email address.*

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

Explain the following relationships between classes using examples from John Smith's system to illustrate your answers:

i) Association,

ii) Composition

iii) Generalisation/Inheritance.

The examples should show relevant fragments of a class diagram.

(15 marks)

b) Provide a brief explanation of the following characteristics/attributes of a good software design: Efficient, Flexible, General, Usable.

Which characteristic is particularly important for web applications design? Explain why.

(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 above. 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)