BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SYSTEMS ANALYSIS & DESIGN

Monday 26th September 2016 – 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.

Calculators are **NOT** allowed in this examination

Case Study for both sections A and B

Smith's Second Hand Bookshop

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 rare books which he loans to local people. He has to keep a careful record of each loan and return. 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 rarity.

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 potential 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 scenario 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 scenario again.

(8 marks)

A2

This question is based on the required new system for the case study above.

a) Produce a system use case description for the normal scenario of the use case 'Offer a book for sale' which can be used by a potential seller.

(10 marks)

b) Explain what an 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.

(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 rare books which were on loan.

Book code:	Book title:	Book details:	Seller name:	Seller tel. no.:
S127	Origin of Species	Oxford Press, 1899	A Brown	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)

[Turn over]

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 loans: long loans (for books to be taken out) and short loans (for books to be read on premises in a small reading room). The following data should be stored about each long loan: Loan code, Borrower no., Loan date, Return date, Book condition on return. The attributes of each short loan are: Loan code, Borrower No, Loan date, Loan time, Return time, Book condition on return.

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) Aggregation or Composition, and

iii) Generalisation/Inheritance.

The examples should show relevant fragments of a class diagram.

(15 marks)

b) Discuss 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 'Return 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 retrieves the relevant loan and updates all affected objects. Next the librarian enters the book's Condition on return and if the condition has got worse then the corresponding book record is updated and a fine is recorded against the loan. Otherwise the loan is deleted."

(13 marks)