BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SYSTEMS ANALYSIS & DESIGN

Wednesday 26th March 2014 – Morning
Time: TWO hours

Answer **any** FOUR questions out of SIX. All questions carry equal marks

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

Wheelies Bicycle Manufacturer

Wheelies is a bicycle manufacturing company based in Holland. Wheelies buy all the parts for its bicycles from various suppliers around the world. The parts are then assembled in the factory in Holland to produce a number of different bicycle models.

Customers of Wheelies place orders for the bicycles they require, and delivery is estimated to take three weeks. Each customer order can consist of more than one model of bicycle, and the required quantity of each model is also recorded on the order.

At the end of each week a forecast is produced so the manufacturing department knows how many of each bicycle model it needs to produce in the following week. The forecast is based on the number of each model in stock and the quantity of each model ordered by customers. The forecast is also used to place purchase orders for parts from the suppliers so that all the necessary parts are available for the week's production.

Each individual bicycle that is assembled has a unique code stamped on the frame. When a customer order is ready for dispatch, the frame code of each actual bicycle allocated to that customer order is recorded so that each bicycle can be traced to a particular customer. Deliveries to customers can be arranged for complete or partial orders.

Section A

Answer Section A questions in Answer Book A

A1

You should not include invoices and payments in your answer to this question.

a) List the processes and the external entities that you would include on a top level data flow diagram of the Wheelies company. (You do not need to draw the DFD).

(8 marks)

b) Produce a Use Case diagram for a computer system to support Wheelies' business processes.

(9 marks)

c) Compare the types of information conveyed by a DFD and a use case diagram. Use your answers to parts (a) and (b) to illustrate your points. (You should not compare the notation)

(8 marks)

A2

a) The computerised system for Wheelies allows customers to place their orders over the internet. Wheelies sells to cycle shops not individuals, therefore they invoice and collect payment after delivery of the bicycles. Produce a system use case description for the normal scenario of the use case 'Place an order'.

(10 marks)

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

(5 marks)

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

(10 marks)

A3

a) What are the FOUR key principles or values of agile software development?

(12 marks)

b) Using an agile method of your choice (for example: DSDM; eXtreme programming; Scrum) describe the iterative/incremental project life cycle. You should illustrate your answer with a diagram of your chosen method's life cycle.

(13 marks)

Section B

Answer Section B questions in Answer Book B

B4

This question refers to the case study described above (i.e. Wheelies Bicycle Manufacturer). The table below shows an example of a list of bicycle parts provided by different suppliers.

Part No.: **8765**	**Part Name:** Titanium Small Frame	**Part Type Code:** FS	**Part Type Name:** Frame-Small	
	Supplier No.: S12	**Supplier Name:** BicParts	**Supplier's Part Ref No:** Frame237	**Cost Price:** 350.00
	Supplier No.: S15	**Supplier Name:** XYZBikes	**Supplier's part Ref No:** BF234X	**Cost Price:** 320.00
	.....	.....	.....	....
Part No.: **7654**	**Part Name:** Aluminium Medium Frame	**Part Type Code:** FM	**Part Type Name:** Frame-Medium	
	Supplier No.: S15	**Supplier Name:** XYZBikes	**Supplier's Part Ref No:** BF123Y	**Cost Price:** 180.00
	....	.....	....	....
Part No.: **4567**	**Part Name:** Leather Small Seat	**Part Type Code:** SS	**Part Type Name:** Seat-Small	
	Supplier No.: S10	**Supplier Name**: BikeParts4You	**Supplier's Part Ref No:** SeatSS134	**Cost price:** 39.99
	.....	.....	.....	.....
	……	…….	……..	……..

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) Provide a brief explanation of the following concepts in object orientation:

i) Class and object,

ii) Encapsulation,

iii) Message passing.

(7 marks)

Turn Over]

b) Consider the following extra information about the Wheelies Bicycle Manufacturer described above:

"There are two types of suppliers: local suppliers and foreign suppliers. The following data are stored about each local supplier: *Supplier No, Supplier name, Email address, Town.* The attributes of each foreign supplier are: *Supplier No, Supplier name, Email address, Country, Currency.* Each Bicycle Model consists of a frame, 2 wheels, a handlebar, and a seat."

Explain the following relationships between classes using examples from the Wheelies 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.

Explain also the differences between generalisation/inheritance and aggregation relationships between classes.

(18 marks)

B6

a) Discuss briefly the purpose of sequence diagrams and state machines/charts.

(4 marks)

b) Produce a sequence diagram for the use case 'Receive parts'' in the Wheelies system described above. A brief description of this use case is given below.

"A list of all current suppliers is displayed by the system. A stores clerk selects the required supplier from the list. The system responds by displaying all pending purchase orders placed by Wheelies with this supplier. The clerk selects the purchase order which has been delivered and modifies its status from pending to fulfilled. Finally the clerk enters quantities for all delivered parts and the system updates the corresponding stock levels."

(13 marks)

c) Produce a state machine/chart for the class Customer Order in the Wheelies system. You may assume that the objects of this class are affected by the following 'events' (listed below in alphabetical order):

allocate bicycles to order
cancel an order
despatch an order
fulfil an order
place an order

(8 marks)