

**BCS THE CHARTERED INSTITUTE FOR IT**  
**BCS HIGHER EDUCATION QUALIFICATIONS**  
**BCS Level 5 Diploma in IT**

**SYSTEMS ANALYSIS & DESIGN**

Monday 9<sup>th</sup> November 2020 - 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**

The 'Sweet Treat' company is a small, independent business that sells exotic sweets and cakes to the public. The proprietor is very keen on baking and specialises in making homemade sweets and cakes for sale in the shop. As well as making much of the confectionery sold in the shop, the proprietor also buys sweets and some cakes from suppliers to increase the range of products for sale.

At the end of each day the proprietor reviews the sales of the homemade items. He then decides how many sweets and cakes to make for the next day. This is also partly to replenish any stock that needs to be bought from suppliers and to keep track of the sales. Once a week the proprietor checks the stock to dispose of anything that is past its 'use by' date. He also checks to see if any raw ingredients for the homemade products, or any pre-made sweets and cakes need to be ordered from the suppliers.

The proprietor orders supplies on a 'Cash On Delivery' basis, so all deliveries are paid for immediately.

**Section A**  
**Answer Section A questions in Answer Book A**

**A1.**

- a) Identify the processes and data stores you would include on a top-level **Data Flow Diagram** (DFD) for the Sweet Treat Company. You do **NOT** need to draw the DFD. **(10 marks)**
- b) What is the difference between a logical DFD and a physical DFD and how are these used in structured systems development? **(10 marks)**
- c) What is pseudocode and how is it used during process modelling with DFDs? **(5 marks)**

**A2.**

- a) What is a Use Case Diagram? Illustrate your answer by developing a simple Use Case Diagram for the Sweet Treat Company. **(10 marks)**
- b) What should be included in a Use Case Description during Use Case Elaboration? Select **ONE** of the Use Cases in your diagram and explain how it would be documented in a Use Case Description. **(10 marks)**
- c) How might Use Cases be used in systems testing? **(5 marks)**

**A3.**

- a) What is the difference between horizontal and vertical prototyping?  
Illustrate your answer by referring to ways in which a system for the Sweet Treat Company might be developed. **(10 marks)**
- b) What is the difference between throwaway and evolutionary prototyping?  
Illustrate your answer by referring to the role these approaches might play in the development of a system for the Sweet Treat Company. **(9 marks)**
- c) Identify **THREE** possible disadvantages of adopting a prototyping approach to systems development. **(6 marks)**

**[Turn Over]**

**Section B**  
**Answer Section B questions in Answer Book B**

**B4.**

- a) The table below shows an example of a list of supplier orders created by the 'Sweet Treat' company described in the scenario:

| Order no:<br>C5 | Order date:          | Order total:         | Supplier no: | Supplier name: |
|-----------------|----------------------|----------------------|--------------|----------------|
|                 | <b>Product code:</b> | <b>Product name:</b> |              |                |
|                 | <b>Product code:</b> | <b>Product name:</b> |              |                |
|                 | .....                | .....                | .....        | ....           |
| Order no:<br>C8 | Order date:          | Order total:         | Supplier no: | Supplier name: |
|                 | <b>Product code:</b> | <b>Product name:</b> |              |                |
|                 | ....                 | ....                 | ....         | ....           |
| Order no:<br>C9 | Order date:          | Order total:         | Supplier no: | Supplier name: |
|                 | <b>Product code:</b> | <b>Product name:</b> |              |                |
|                 | .....                | .....                | .....        | ....           |

Normalise the table to produce a set of relations in the Third Normal Form. You must show all your working explaining each step. You may assume that each product is provided by one supplier. State any further assumptions you made.

**(18 marks)**

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

**(7 marks)**

**B5.**

a) Explain the following terms used in object-orientation:

- i) Class;
- ii) Object;
- iii) Polymorphism.

**(6 marks)**

b) Briefly discuss the similarities and differences between classes and entities.

**(4 marks)**

c) Consider a typical library system. Assume that the system stores records of books, journals, atlases, etc.

Explain the following relationships between classes using examples from the library system 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)**

**B6.**

a) Activity diagrams can be used to model different aspects of a system. Give examples of **THREE** different applications of activity diagrams in systems modelling.

**(6 marks)**

b) Give a brief explanation of state machines/state charts.

Produce a state machine/state chart for the class Supplier Order in the 'Sweet Treat' system described above. You may assume that objects of this class are affected by the following 'events' specified in alphabetical order: amend an order, archive an order, cancel an order, create an order, receive an order. Note that existing order records can be amended only once.

**(13 marks)**

c) What is software usability?

Identify the main factors contributing to software usability.

**(6 marks)**

**End of Examination**