**BCS THE CHARTERED INSTITUTE FOR IT**

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

# SYSTEMS ANALYSIS AND DESIGN

Monday 15th April 2024 – 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**
**AtoZ Quality Builders**

AtoZ Quality Builders is a company offering house building and property improvement services to the public. The proprietor of the company employs a number of skilled workers such as bricklayers, carpenters and plumbers. The proprietor manages the building projects himself and may occasionally help with the construction work.

AtoZ Quality Builders wants to computerise the management of building work. This includes processing of estimates, job scheduling, and payments as described below in more detail.

When a customer contacts the company to ask for an estimate, the proprietor makes a note of the customer's contact details and an outline of the proposed work. He agrees a date with the customer to view the property in order to give an estimate of the cost for the work. When visiting the property on the agreed date, the proprietor adds more detail to the outline of the proposed work.

Within 3 days of visiting the property, the proprietor produces a fully detailed estimate and sends it to the customer. If the customer agrees the estimate, the proprietor schedules a date to start the job (this is based on the size of the job and other jobs that have already been scheduled).

A few days before the agreed start date of a job, the proprietor contacts the customer to confirm the start date, and then orders the required building materials from suppliers to be delivered on the date the job starts. At the end of the job the proprietor calculates the actual cost of the job to produce an invoice which is sent to the customer. The customer has 30 days to pay the invoice.

**B6.**

a) Briefly discuss the purpose of sequence diagrams and state machines/charts.

**(4 marks)**

b) Produce a sequence diagram for the use case 'Create supplier order' in the AtoZ Quality Builders system described in the case study. A brief description of this use case is given below.

> "A list of all suppliers is displayed by the system. The proprietor/manager selects one supplier and the system displays the supplier's details, creates the 'partial' supplier order, and displays the list of all building materials provided by this supplier. The manager selects materials from the list which are added to the order. Finally, the new order details are displayed".

**(13 marks)**

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

- Archive an order – to remove the specified supplier order from the system.
- Cancel an order.
- Complete an order.
- Create new order.

**(8 marks)**

**END OF EXAMINATION**



**Section A**
**Answer any Section A questions you attempt in Answer Book A**

**A1**.

a) Produce a top-level data flow diagram representing the management of building jobs in the AtoZ Quality Builders company (described in the case study).

**(20 marks)**

b) Compare the technique of Data Flow modelling with Business Activity modelling. There is no need to model the AtoZ Quality Builders company scenario again, but you should describe the notation of the Business Activity model as part of your comparison.

**(5 marks)**

**A2.**

a) Two common techniques for gathering requirements are interviews and workshops. Choose **ONE** of these techniques and describe how an analyst would prepare for it and carry it out.

**(15 marks)**

b) For the technique you have chosen in part a), discuss its advantages and disadvantages for requirements gathering.

**(10 marks)**

**A3**.

a) Explain how Graphical User Interface (GUI) design techniques may be used in different phases of the System Development Life Cycle (SDLC).

**(6 marks)**

b) Briefly describe guidelines for good GUI design.

**(19 marks)**

**[Turn Over]**

**Section B**
**Answer any Section B questions you attempt in Answer Book B**

**B4.**

This question refers to the case study (AtoZ Quality Builders). The table below shows an example of a list of jobs which have been carried out recently.

| | | | | | | |
|---|---|---|---|---|---|---|
| **Job code: G3** | **Job description:** General - internal | | | | | |
| | Material code: B2 | Material name: Bricks-standard | Quantity: 100 packs | Supplier No.: S3 | Supplier name: J Khan | Supplier address: 1 Elm Rd |
| | Material code: C3 | Material name: Cement - Portland | Quantity: 40 kg | Supplier No.: S2 | Supplier name: D Jones Ltd. | Supplier address: 3 Oak Str |
| | ..... | ..... | ..... | .... | ….. | ….. |
| **Job code: B2** | **Job description**: General - bath | | | | | |
| | Material code: T3 | Material name: Tiles-standard | Quantity: 10 packs | Supplier No.: S2 | Supplier name: D Jones Ltd. | Supplier address: 3 Oak Str |
| | .... | ..... | .... | .... | | |
| **Job code: K1** | **Job description:** Basic - kitchen | | | | | |
| | Material code: P8 | Material name: Paint –prof. | Quantity: 10 litres | Supplier No.: S3 | Supplier name: J Khan | Supplier address: 1 Elm Rd |
| | ..... | ..... | ..... | ..... | …… | …… |
| | …… | ……. | …….. | …….. | ….. | …… |

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 to obtain full marks.

**(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.

**(5 marks)**

b) Consider the following extra information about the AtoZ Quality Builders company:

"There are two types of customers: individual i.e. ordinary customers and companies. The following data are stored about each individual/ordinary customer: Customer No., Customer name, Address, Tel. No. The attributes of each company are: Customer No., Company name, Address, Tel. No., VAT registration number.

An object of class Supplier Order consists of an order header followed by order lines."

Explain the following relationships between classes using examples from the AtoZ Quality Builders 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)**

c) Explain the differences between:

i. Generalisation/inheritance and aggregation relationships between classes.
ii. Association and aggregation relationships between classes.

**(5 marks)**

**[Turn Over]**