BCS THE CHARTERED INSTITUTE FOR IT
BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT
SYSTEMS ANALYSIS & DESIGN
Monday 17th April 2023 - 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.
Marco Polo is a small travel agency based in England. They specialise in organising and booking air trips to various remote and exotic destinations. They have access to a worldwide database of airlines and the corresponding flights.

The main activities of the agency are:

a) Plan a new air trip for a specific customer. Each trip may include a number of separate flights and possible excursions between flights.

b) Book a trip. This involves reserving a seat on each flight and a place on any selected excursions. The customer must pay a deposit before the trip booking goes ahead. This booking must be confirmed within one week or cancelled.

In addition to the above, the agency needs to be able to amend the details of an air trip (including changing any reservations that have been made) or to cancel the trip if necessary.
A1.

a) List the processes, datastores and the external entities that you would include on a top level Data Flow Diagram (DFD) of the Marco Polo Travel Agency. You do not need to draw the DFD. (10 marks)

b) Explain the different roles that Data Flow Diagrams (DFDs) and Entity Relationship Diagrams (ERDs) play in Structured Systems Development. (10 marks)

c) Explain why DFDs are not normally used in Object Oriented Systems Development. (5 marks)

A2.

a) Explain the advantages and disadvantages of the following techniques for establishing user requirements:
   i) Interviews. (4 marks)
   ii) Questionnaires. (4 marks)
   iii) Workshops. (4 marks)
   iv) Document Sampling. (4 marks)

b) Explain the following terms used in Stakeholder Analysis:
   i) Primary stakeholders. (3 marks)
   ii) Secondary stakeholders. (3 marks)
   iii) Tertiary stakeholders. (3 marks)

A3.

a) Identify and briefly describe the five main stages in the Systems Development Life Cycle (SDLC). (15 marks)

b) What does it mean to say that most modern development methods are iterative and incremental? (5 marks)

c) Explain the difference between structural and behavioural diagrams as used in the Unified Modelling Language (UML). (5 marks)
Section B
Answer Section B questions in Answer Book B

B4.

a) This question refers to the case study described above – the Marco Polo system. The table below shows an example of a list of trips arranged for various customers.

<table>
<thead>
<tr>
<th>TripID</th>
<th>CustID</th>
<th>CustName</th>
<th>CustAddr</th>
<th>Start Date</th>
<th>End Date</th>
<th>FlightNo</th>
<th>SeatNo</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/22</td>
<td>10</td>
<td>SMITH A</td>
<td>LONDON</td>
<td>01/01/22</td>
<td>15/01/22</td>
<td>BA452</td>
<td>17D</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>BA661</td>
<td>12C</td>
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<td></td>
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<td>EZY201</td>
<td>10A</td>
</tr>
<tr>
<td>5/22</td>
<td>14</td>
<td>WOOD J</td>
<td>YORK</td>
<td>23/03/22</td>
<td>30/03/22</td>
<td>VS20</td>
<td>16B</td>
</tr>
<tr>
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<td></td>
<td>VS21</td>
<td>11A</td>
</tr>
<tr>
<td>11/22</td>
<td>12</td>
<td>JONES B</td>
<td>LONDON</td>
<td>11/04/22</td>
<td>24/04/22</td>
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<td></td>
<td></td>
<td></td>
<td>BA641</td>
<td>7B</td>
</tr>
</tbody>
</table>

Normalise the table to produce a set of relations in the Third Normal Form. You must show all of your workings, 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 Marco Polo system described above:

“The management of Marco Polo want to expand the system by introducing group trips in addition to individual trips. The following data should be stored about every individual trip: Trip No., Start date, End date, Total cost. Group trips should also have two additional attributes: No of people, Discount.”

Explain the following relationships between classes, using examples from the Marco Polo system to illustrate your answers:

i) Association. (5 marks)

ii) Generalisation/Inheritance. (5 marks)

The examples should show relevant fragments of a class diagram.

b) Explain the differences between:

i) Generalisation/inheritance and aggregation relationships between classes. (4 marks)

ii) Association and aggregation relationships between classes. (4 marks)

c) Discuss the main differences between class diagrams and entity relationship diagrams. Your discussion must not concentrate on notation. (7 marks)

B6.

a) Produce a sequence diagram for the use case ‘Cancel a trip’ in the Marco Polo system described above. A brief description of this use case is given below.

“The trip’s number is entered by an agent. The system searches the trip’s details and relevant customer’s details and displays both sets of details. Next, the details of all constituent flights are displayed. Finally, the system asks the user to confirm cancellation and the given trip is cancelled.” (12 marks)

b) Discuss the similarities and differences between sequence and communication diagrams in UML. (7 Marks)

c) Produce a state machine/chart for the class Flight in the Marco Polo system described above. You may assume that objects of this class are affected by the following ‘events’ (listed below in alphabetical order):

- Add new flight – to create a new flight record.
- Delete a flight – to delete an existing flight record.
- Update flight details – to amend an existing flight record. The record can be amended a few times. (6 marks)

END OF EXAMINATION