

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.

Case Study for Both Sections A and B
Marco Polo Travel Agency

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.

Section A
Answer Section A questions in Answer Book A

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)

[Turn Over]

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.

TripID	CustID	CustName	CustAddr	Start Date	End Date	FlightNo	SeatNo
1/22	10	SMITH A	LONDON	01/01/22	15/01/22	BA452	17D
						BA661	12C
						EZY201	10A
5/22	14	WOOD J	YORK	23/03/22	30/03/22	VS20	16B
						VS21	11A
11/22	12	JONES B	LONDON	11/04/22	24/04/22	FR222	14E
						BA641	7B

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