BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SYSTEMS ANALYSIS AND DESIGN

Tuesday 7th October 2025 – 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

Lady Margaret's College provides a number of courses.

Courses include units. Each course has a course leader who is also a lecturer. Lecturers teach units. One lecturer can teach several units, and one unit can be taught by more than one lecturer.

All courses run on a regular basis (i.e. twice a year).

A few months before a new course run starts, its record must be created. This automatically creates records of all 'constituent' unit runs.

When a prospective student applies for a particular course run, their record is created and their application is passed to an admission tutor (who deals with this course).

The admission tutor takes the appropriate decision (i.e. an offer is either made or the application is rejected), the decision record is created and a letter is sent to the student. If the application has been rejected then the student's record will be deleted after 12 months (i.e. its Delete date is set to Decision date + 12 months).

If the offer has been made, the student is given four weeks to respond to the offer. If the offer is rejected by the student or the student fails to respond to the letter, then the student's record will also be deleted 12 months after the Decision date (i.e. its Delete date is set to Decision date + 12 months). The student's response (i.e. accept, reject or no response) is recorded in the corresponding decision record.

Student records will be automatically deleted on the Delete date.

Decision records are kept in the system for 12 months (i.e. they are also automatically deleted 12 months after their creation).

When students enrol, they pay for their course runs and student records are updated.

Section A
Answer Section A questions in Answer Book A

A1.

a) Identify **four** use cases from the description of Lady Margaret's College (Page 2). For **each** use case provide a brief description and identify the actors.

(8 marks)

b) Consider **one** of the use cases you have identified. Describe that use case in detail by providing **each** of the following:

- Use case title
- Preconditions
- Postconditions
- Basic flow
- Alternate flows
- Exceptions

(6 marks)

c) Identify the processes, data stores and external entities that you would include in a level one Data Flow Diagram (DFD) for Lady Margaret's College.

(6 marks)

d) Discuss the role of use cases and DFD in describing Lady Margaret's College system requirements.

(5 marks)

A2.

a) Explain how each stage in the Systems Development Life Cycle (SDLC) would be applied to developing a software system for Lady Margaret's College (Page 2).

(18 marks)

b) Explain the difference between throwaway prototyping and evolutionary prototyping and explain the roles these might play when developing a system for Lady Margaret's College.

(7 marks)

[Turn Over]

A3.

a) Explain how the following fact-gathering techniques could be applied to requirements analysis for Lady Margaret's College (Page 2):

   i. Interviews
   ii. Surveys / questionnaires
   iii. Focus groups

(15 marks)

b) Explain the differences between function and quality requirements in software development. You should provide examples of each type of requirement as they relate to Lady Margaret's College.

(10 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) The table below refers to Lady Margaret's College described in the case study (Page 2). The table shows an example of a list of students, their courses and the corresponding units.

Student No: 123/24	**Student name: John Smith**	**Student DOB: 11/05/2002**	**Course code: CS2**	**Course title: Information Systems**
	Unit code: IS1	**Unit title: Introduction to IS**	**Unit description: …….**	
	Unit code: IS4	**Unit title: Systems Analysis 1**	**Unit description: ……...**	
	…	**…**	**…**	
Student No: 145/24	**Student name: Adam Black**	**Student DOB: 12/10/2003**	**Course code: CS5**	**Course title: Programming**
	Unit code: PR1	**Unit title: Programming 1**	**Unit description: ……**	
	Unit code: PR2	**Unit title: Programming 2**	**Unit description: ……**	
	Unit code: IS1	**Unit title: Introduction to IS**	**Unit description: ……**	
	…	**…**	**…**	

Normalise the table to produce a set of relations in the **third normal form**.
You must show all of your working explaining each step. State any assumptions you made.

(18 marks)

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

(7 marks)

[Turn Over]

B5.

a) Consider the following extra information about the Lady Margaret's College system described in the case study (Page 2):

> 'There are two types of students: local students and international students. All students have a **student number**, **name**, **date of birth**, and **email address**. Additionally, local students' **postal addresses** are recorded, while international students' **countries** are included and stored as well. An object of class student application consists of **student details**, **course details** and a number of **previous education** lines.'

Explain the following relationships between classes using examples from the Lady Margaret's College 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.

(15 marks)

b) Explain briefly how you would map an inheritance hierarchy in a class diagram to relational database tables. Consider **three** possible approaches.

(10 marks)

B6.

a) Give a brief explanation of the role state machines / state charts play in systems modelling.

(5 marks)

b) Produce a state machine / state chart for the class **offer** in the Lady Margaret's College system described in the case study (Page 2). You may assume that objects of this class are affected by the following **events** specified in alphabetical order:

Accept – offer is accepted by a prospective student
Enrol – offer is deleted as a prospective student has been enrolled
Expire – offer expires as a prospective student did not respond
Make – offer is made
Reject – a prospective student rejects the offer, so the offer is deleted

(10 marks)

c) Produce a sequence diagram for the use case **display student's current units** in the Lady Margaret's College system described in the case study (Page 2). A brief description of this use case is given below.

> 'The student's number is entered by a course leader. The system displays the student's details followed by details of the relevant course and details of units taken by the student.'

(10 marks)

END OF EXAMINATION