

THE BCS PROFESSIONAL EXAMINATION
Diploma
October 2014
EXAMINERS' REPORT
Systems Analysis and Design

Section A

General Comments

Many candidates lack the skill of being able to apply theoretical knowledge to practical examples. This was particularly evident in question 2. Answers to question 1 suggest that many candidates are confused about the use of UML diagrams in analysis, and are therefore not applying them correctly.

Candidates need to read questions carefully to make sure they are actually answering the questions rather than writing long descriptions or explanations that are irrelevant.

Question Number 1

Learning Outcomes:

3. Evaluate the tools and techniques of systems analysis and design that may be used in a given context.
4. Use appropriate methods and techniques to produce an analysis of a given scenario
6. Provide suitable documentation for systems analysis and design activities.

Question

a) List the processes and the external entities that you would include on a top level data flow diagram (DFD) of the Golden Racquet tennis club. (You do not need to draw the DFD).

(9 marks)

b) Produce an Activity diagram with swim lanes to represent the tennis club's activities and processes.

(9 marks)

c) Explain the differences between a DFD and an Activity diagram. Use your answers to parts (a) and (b) to illustrate your points. (You should not compare the notation).

(7 marks)

Answer Pointers/Model answer

Processes and/or activities concerned with paying for sessions were also accepted.

a) Processes: Approve and Register new members

Manage team membership

Manage bookings

Book a playing session

Cancel a playing session

Handle payments

Plan sessions

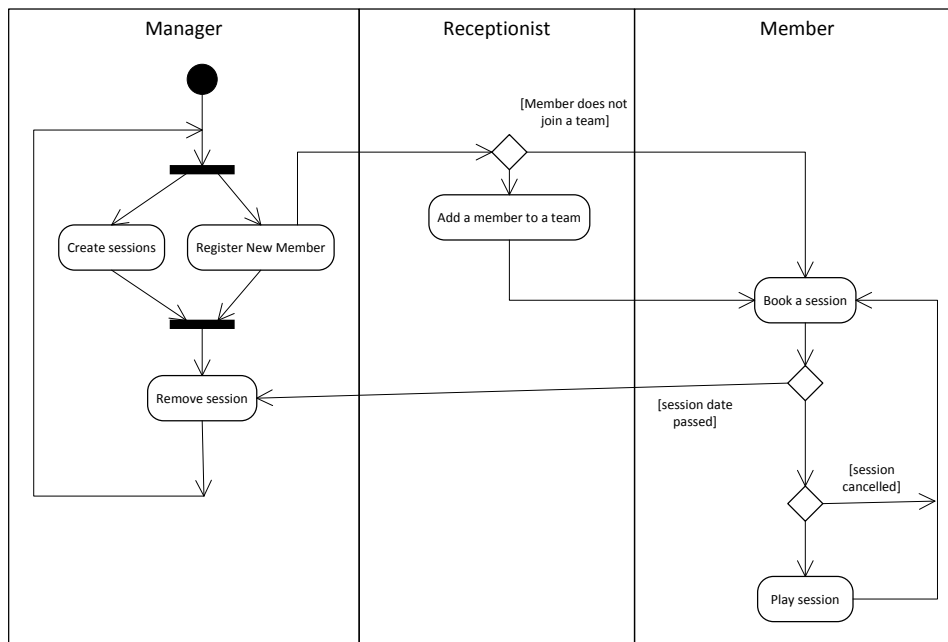
Create sessions
Remove sessions

External entities: Club Manager
Receptionist
Member
Team leader

1a – 9 marks

b) Activities:

This example solution is not 100% complete but is indicative of an answer that would have received 9 marks.



1 mark for each activity in the correct swim lane, up to a maximum of 6.
Up to 3 marks for correct notation

1b – 9 marks

c) Answers should include discussion about different system boundaries in the two diagrams (where human activity inside the boundary or outside), level of abstraction/detail, sequence, and the inclusion of data. In the discussion the difference between physical and logical DFDs should be noted. Marks were not be awarded for a factual comparison of notation.

1c – 7 marks

Question 1 - 25 marks

Examiners' Guidance Notes

Although 77% of candidates attempted this question this is less than in previous years. This may be because candidates are not as familiar with UML modelling techniques as they are with data flow diagrams. A number of candidates produced use case diagrams or sequence diagrams rather than an activity diagram. Some candidates represented a single scenario such as 'Make a booking' in the activity diagram instead of an overview of the business processes. However, some marks were awarded for this where it was done correctly.

In general candidates are not good at making comparisons. Part (c) was often answered with separate lists of the features of the two diagramming techniques rather than a direct comparison. Very few candidates gave examples from part (a) or (b) to support the points they made.

Question Number 2

Learning Outcomes:

3. Evaluate the tools and techniques of systems analysis and design that may be used in a given context.
4. Use appropriate methods and techniques to produce an analysis of a given scenario

Question

- a) Produce a list of requirements for a system to support the Golden Racquet tennis club's business processes shown in the scenario.

(9 marks)

- b) Explain the difference between functional and non-functional requirements. Use examples from part (a) to illustrate your answer.

(6 marks)

- c) Describe a technique for prioritising requirements, and explain why it may be helpful to the development of a system to prioritise requirements.

(10 marks)

Answer Pointers/Model answer

- a) 1 mark for each requirement, for example:

The system must be able to:
Register a new member
Remove a member
Set up a team
Add a member to a team
Remove a member from a team
Set up sessions
Reserve a session
Cancel a session
Remove a session after 6 months
System must be available from 10am to 8pm every day

2a - max 9 marks

- b) A functional requirement is something the system must do. A non-functional requirement is how or how well the system must perform. 3 marks

1 mark each for examples of a functional requirement (e.g. registering a new member), a non-functional requirement relevant to a functional requirement (e.g. a response time for a query), and a system wide non-functional requirement.

3 marks

2b - max 6 marks

- c) A description of a technique such as MoSCoW (Must have/Should have/Could have/Won't have this time). is expected but other techniques are acceptable

5 marks

Prioritisation makes sure important requirements are met if time/budget run out.

Incremental delivery needs requirements to be prioritised to plan increments.

5 marks

2c - 10 marks

Question 2 - 25 marks

Examiners' Guidance Notes

Nearly half the candidates attempted this question, but the average mark was quite low. Candidates did not seem to be proficient at identifying requirements from the case study. It was also evident that the difference between functional and non-functional requirements is not generally well understood. Examples of each type of requirement tended to be generic rather than identified in the case study. This was particularly true of non-functional requirements.

Very few candidates seemed to understand requirements prioritisation, with many answering by describing requirement gathering techniques. Prototyping was described by a number of candidates including the advantages and disadvantages of the technique, but this was not relevant to the question.

Question Number 3

Learning Outcomes:

1. Describe different life cycle models and explain the contribution of the systems analysis and design within them.
6. Provide suitable documentation for systems analysis and design activities.

Question

- a) Explain the purpose of a feasibility report, and when in the system development life cycle it should be produced.

(5 marks)

- b) You are preparing a feasibility report for a proposed IT system and have decided to write the contents page first to help you structure your report. Produce your contents page and describe the purpose of each section.

(20 marks)

Answer Pointers/Model answer

a) The feasibility report is used to justify the start of work on a project by demonstrating that the business benefit will be greater than the cost. It can also show that a project is technically feasible.

5 marks

b) The contents list could include:

- Terms of reference (Scope and constraints)
- Background to the proposal
- Overview of current system
- Problems with current system
- Additional new requirements
- Alternative solutions
- Legal implications
- Organisational/social impact
- Technical options
- Cost/benefit analysis
- Recommendation on whether to proceed.
- Recommended solution + outline requirements specification
- Risk analysis of proposed solutions
- Outline plan

0.5 mark (up to 5) for each section identified

5 marks

2 marks for each description (up to 15)

15 marks

Question 3 - 25 marks

Examiners' Guidance Notes

This question was also answered by nearly half the candidates. This question was entirely theoretical and was answered better than questions requiring the application of theory. The majority of candidates answering this question identified legal, social, technical and financial feasibility as being part of this report. The model answer is indicative and alternative content headings were accepted if correct.

Section B

General Comments

Nearly all candidates attempted Question 4, and 85% of candidates attempted Question 5. Question 6 was attempted by less than 50% of candidates. Most candidates attempting Question 4 gave reasonable and satisfactory answers. The Question 5 results are weaker. Question 6 caused many problems.

Question Number 4

Learning outcomes:

5. Use appropriate methods and techniques to produce a design for a given scenario
6. Provide suitable documentation for systems analysis and design activities

Question

This question refers to the case study described above – Golden Racquet Tennis Club. The table below shows an example of a list of club members, their teams, and their session bookings.

Member No.: M7	Member name: Smith P	Team code: T2	Team descr: Local ladies..
	Session No: S12	Session Time: 12.00	Session Date: 8/10/12
	Session No: S49	Session Time: 17.00	Session Date: 14/10/12
	
Member No.: M18	Member name: Jones T	Team code: T4	Team descr: Old Boys...
	Session No: S14	Session Time: 13.00	Session Date: 8/10/12
	
Member No.: M20	Member name: Wilson G	Team code: T4	Team descr: Old Boys...
	Session No: S13	Session Time: 12.00	Session Date: 8/10/12
	
	

- 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.

(18 marks)

- b) Draw an entity relationship diagram (ERD) based on the relations produced in part a).

(7 marks)

Answer Pointers/Model answer

a) The steps of normalisation are shown below:

UNF	1NF	2NF	3NF	Relations
Member No Member name Team code Team description	<u>Member No</u> Member name Team code Team description	<u>Member No</u> Member name Team code Team description	<u>Member No</u> Member name Team code* <u>Team code</u> Team description	Member Team
Session No Session Time Session Date	<u>Member No</u> <u>Session No</u> Session Time Session Date	<u>Member No</u> <u>Session No</u> <u>Session No</u> Session Time Session Date	<u>Member No</u> <u>Session No</u> <u>Session No</u> Session Time Session Date	MemberSession (link) Session

For correct 1NF with explanation (remove repeating groups)

5 marks

For correct 2NF with explanation (remove part key dependencies)

5 marks

For correct 3NF with explanation (remove non-key dependencies)

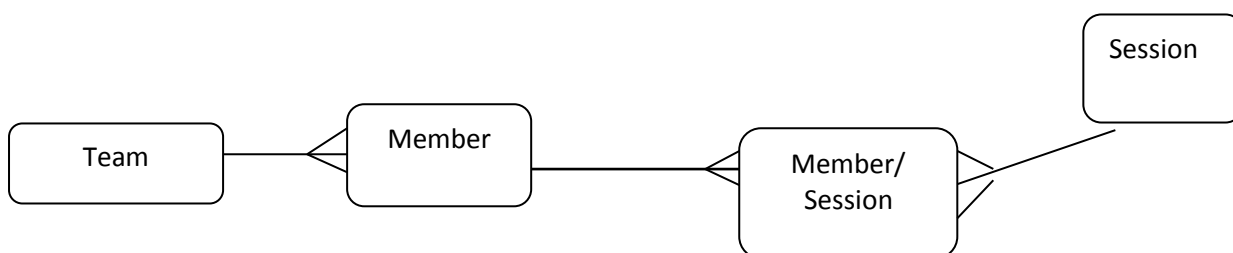
5 marks

For correct relations

3 marks

4a - 18 marks

b)



For correct relationships and their multiplicities

5 marks

For correct entities

2 marks

4b – 7 marks

Question 4 -25 marks

Examiners' Guidance Notes

a) A substantial number of candidates answered this part satisfactorily. Some answers were very good as they provided a proper explanation of each step and applied the normalisation process correctly. Many candidates however did not provide any explanations.

b) This part was generally answered well, but in some cases ERDs were inconsistent with the correctly identified relations/entities in part a.

Question Number 5

Learning outcomes:

2. Discuss various approaches to systems analysis and design and explain their strengths and weaknesses.
5. Use appropriate methods and techniques to produce a design for a given scenario
6. Provide suitable documentation for systems analysis and design activities

Question

- a) Consider the following extra information about the Golden Racquet system described above:

"There are two types of members: permanent members and visiting members. The following data should be stored about each permanent member: *Member no.*, *Member name*, *Member tel. no.*, *Date of registration*, *Date of birth*. The attributes of each visiting member are: *Member no*, *Member name*, *Member tel. no.*, *Date of registration*, *Expiry date*, *'One off' payment*.

Permanent members are required to submit their CVs. A CV consists of a header, a number of CV lines, a member's signature."

Explain the following relationships between classes using examples from the Golden Racquet 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) There are many characteristics/attributes of a good software design. List FIVE of them and provide a brief explanation of each.

(10 marks)

Answer Pointers/Model answer

- a) Explanation of association 2 marks
Example of association (e.g. between Team and Member) 3 marks
- Explanation of aggregation 2 marks
Example of aggregation (e.g. object of class CV 'consists' of Header, iteration of CV lines, Signature) 3 marks
- Explanation of inheritance/generalization 2 marks
Example of inheritance/generalization (e.g. Member – superclass with two subclasses: Permanent and Visiting) 3 marks
- 5a – 15 marks
- b) Possible characteristics of a good software design include: Functional, Efficient, Economical, Reliable, Secure, Flexible, General, Manageable, Maintainable, Usable, Reusable.
Five of these should be briefly explained (2marks * 5)
- 5b – 10 marks

Question 5 -25 marks

Examiners' Guidance Notes

- a) This part was generally answered well, but many candidates had problems with the proper explanation of relationships between classes (association in particular) and proper examples of these relationships (aggregation in particular).
- b) Only a small number of candidates answered this part well. Many candidates discussed irrelevant issues e.g. modelling techniques, object-oriented concepts such as encapsulation, messaging, etc.

Question Number 6

Learning outcomes:

3. Evaluate the tools and techniques of systems analysis and design that may be used in a given context.
5. Use appropriate methods and techniques to produce a design for a given scenario
6. Provide suitable documentation for systems analysis and design activities.

Question

- a) Explain briefly how you would check consistency between Use Case diagrams , Sequence diagrams and Class diagrams.

(5 marks)

- b) Produce a Sequence diagram for the use case 'Book session' in the Golden Racquet system described above. A brief description of this use case is given below.

“ A member enters his/her number and the system displays the member's details. Next the system displays a list of all available sessions. The member selects one of the sessions and the system books this session for the member and displays the booking confirmation.”

(12 marks)

- c) Produce a state machine/chart for the class Session in the Golden Racquet system described above.

(8 marks)

Answer Pointers/Model answer

- a) Possible checks will include:

- Each use case has a corresponding sequence diagram (and vice versa)
- Each sequence diagram refers to class(es) which are in a Class Diagram (and vice versa i.e. each class should be included in one or more sequence diagrams)
- Messages between classes on sequence diagrams should correspond to relevant class operations

6a – 5 marks

- b)

The sequence diagram should have the following elements:

Actor – Member

2 marks

Classes/Objects: Member, Session, possibly Booking.

4 marks

Right messages/operations

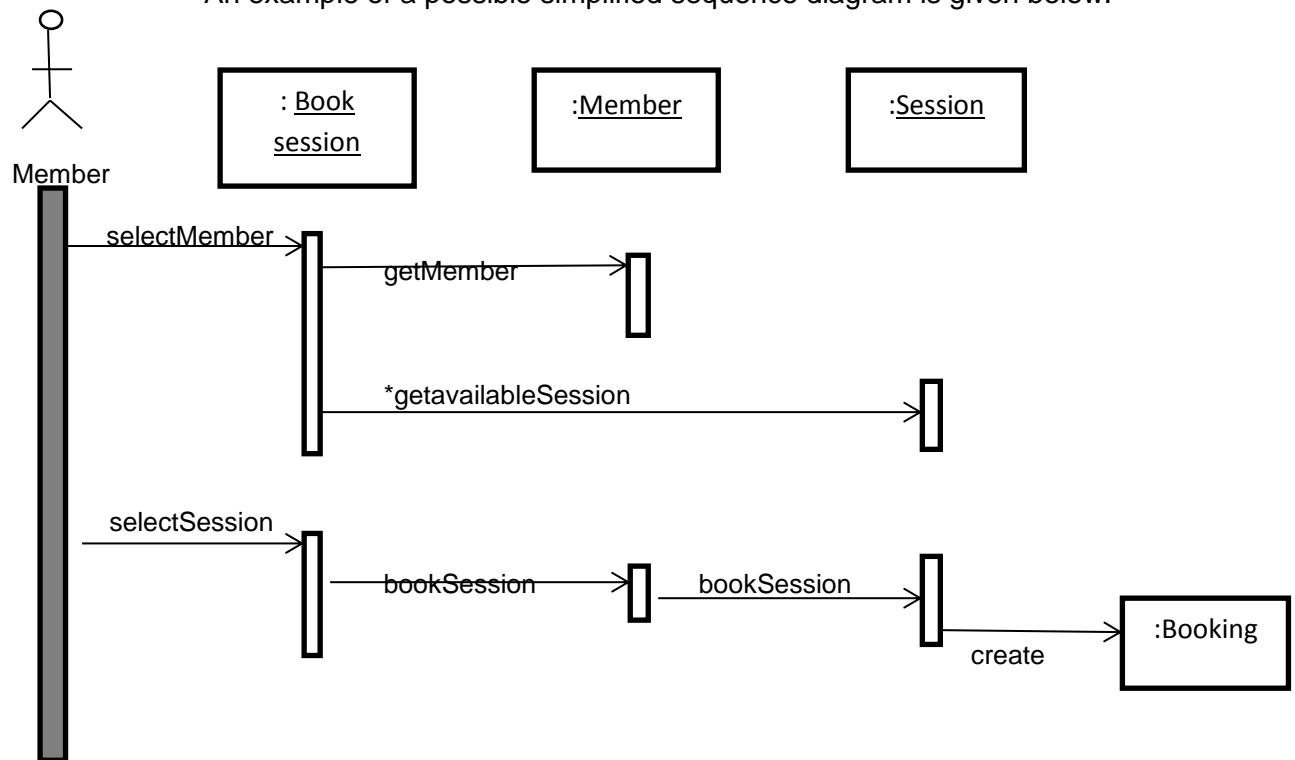
4 marks

Iteration/loop (to show lists displayed by the system)

2 marks

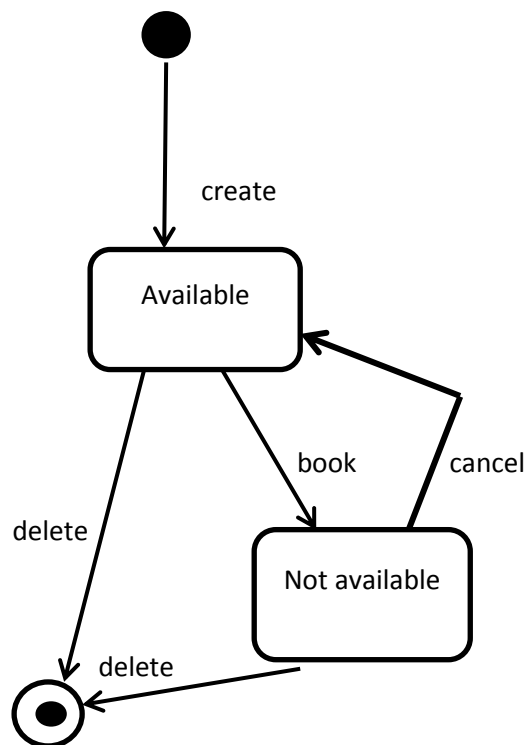
6b– 12 marks

An example of a possible simplified sequence diagram is given below.



N.B.' Book session' class represents both the boundary and control class for this use case. Please note that iteration/loop is denoted by an asterisk '*' (other notations can also be used).

c)



correct state nodes	2 marks
initial and final states	2 marks
correct transitions	4 marks

6c -8 marks

Question 6 -25 marks

Examiners' Guidance Notes

Very few candidates answered this question properly.

- a) Only one candidate properly explained how Use case diagrams, Sequence diagrams and Class diagrams can be cross-checked for consistency. Most candidates described these modelling techniques instead.
- b) Some answers were satisfactory, but only a few candidates identified the right classes i.e. Member, Session, and possibly Booking.
- c) Only a few reasonable and satisfactory diagrams were produced. Some candidates drew Activity diagrams instead.