THE BCS PROFESSIONAL EXAMINATION
Diploma

October 2003

EXAMINERS' REPORT

Systems Analysis

General

The standard of papers this year was very good and the pass rate was within 0.1% of the April sitting. Most candidates are preparing well for the first question and some very good models have been presented. However there are still many students who have very poor exam technique and are not answering the question as set or are not reading the question carefully enough thus losing marks.

Question one is compulsory. Attempt TWO other questions.

Question 1 (Mandatory question worth 50% of total marks for this paper)

A Student Accommodation Service helps university students to find properties to rent in the city in which they are studying. An information system is required to help the Service maintain lists of landlords, their properties and of students seeking accommodation.

All of the properties are owned by private landlords; each property is owned by one landlord, though some landlords own several properties. The name, address and telephone number of landlords are kept. When new properties are added to the system they are allocated a unique identifying number and details are taken of the address, type of property (for example, flat, terraced house, detached house), the maximum number of tenants it is suitable for and the amount of the rent. Landlords are charged a fee for each property that is added to the system.

Students seeking accommodation have to register with the Service providing their name, current address, telephone number, their date of birth and gender. Once registered a student can be provided with a list of available properties. If a student makes a request to view a property the Service arranges a viewing with the landlord. Details are kept of each viewing that is arranged including the date on which it took place and which student or students were involved (friends often seek accommodation together).

Landlords notify the Service when a property is no longer available for rent and when a property is once again available. In both cases the Service updates the property file so that students seeking accommodation can be given an accurate list.

a) Draw a Top Level Current Logical Data Flow Diagram for the above scenario. (20 marks)

b) Produce an Entity Relationship Diagram (Logical Data Structure) and a set of normalised tables for the above scenario. You DO NOT have to show evidence of the normalisation process. Your diagram should include the entity type 'Student'. (20 marks)

c) If an object-oriented model were to be prepared for the above scenario a Class Diagram would be drawn.

   i) Show what the class 'Student' would look like using UML notation. (6 marks)

   ii) Explain the difference between the representation of 'Student' as a class and as an entity (as in your solution to 1b). (4 marks)

Answer Pointers
Question 1a

a) Draw a Top Level Current Logical Data Flow Diagram for the above scenario. (20 marks)

Note that for Question 1a and 1b solutions are indicative; plausible alternatives are accepted.
See diagram on separate sheet (other suitable notation will be accepted).
The diagram is necessarily incomplete as the scenario has been simplified for the purposes of the time-constrained examination.
Marking Scheme:

Processes:	1 each up to 5
Data Stores	1 each up to 4
Data Flows	0.5 each up to 8
External Entities	1.5 each up to 3

Examiner's Comments
The DFD was quite straightforward and there were some very good answers. A few candidates presented a Context Diagram instead of a Top Level Data Flow Diagram. The naming of processes was generally rather poor (i.e. many candidates did not follow the convention of naming a process with an imperative verb such as 'Arrange Viewing').

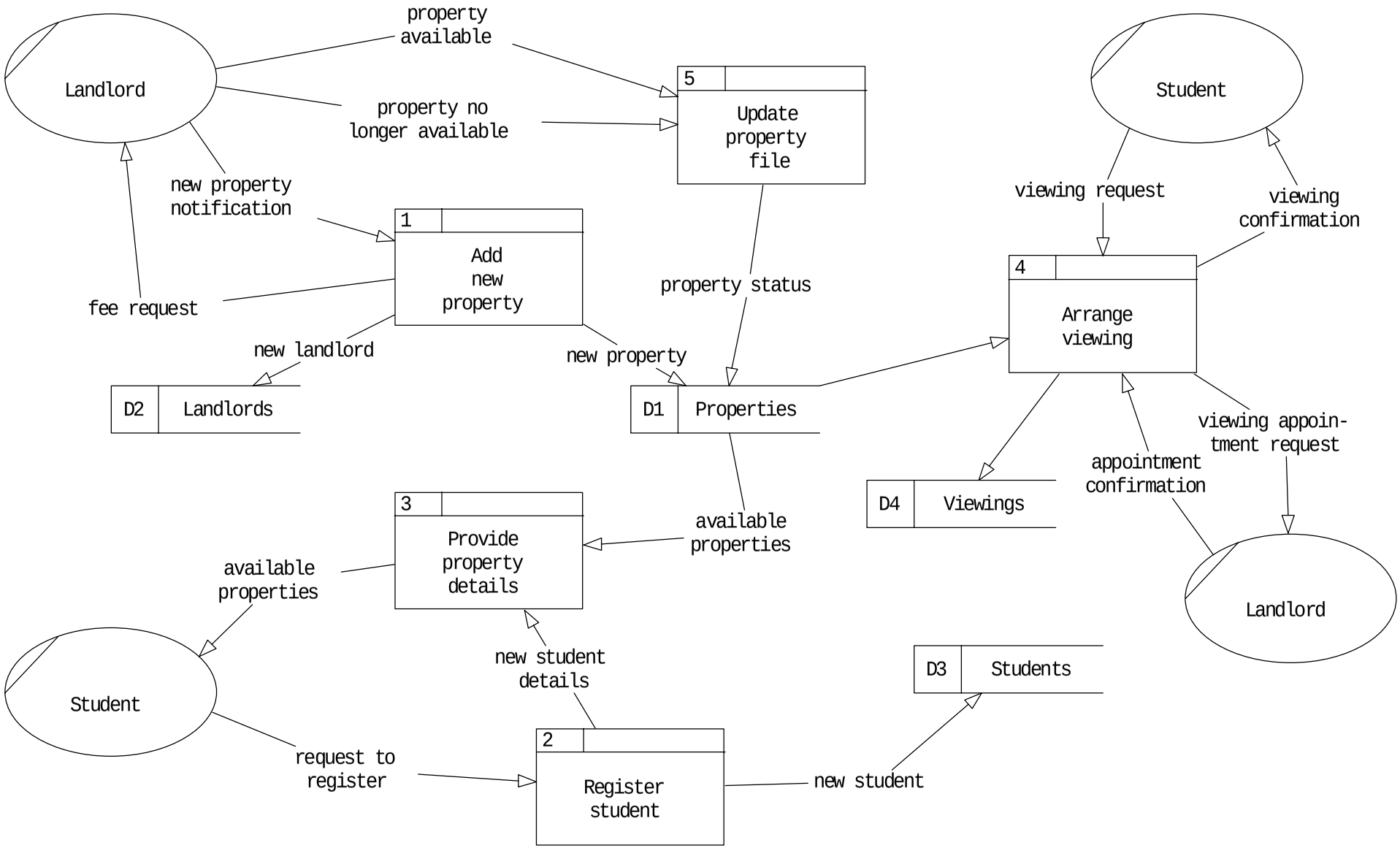
Question 1b
Produce an Entity Relationship Diagram (Logical Data Structure) and a set of normalised tables for the above scenario. You DO NOT have to show evidence of the normalisation process. Your diagram should include the entity type 'Student'. (20 marks)

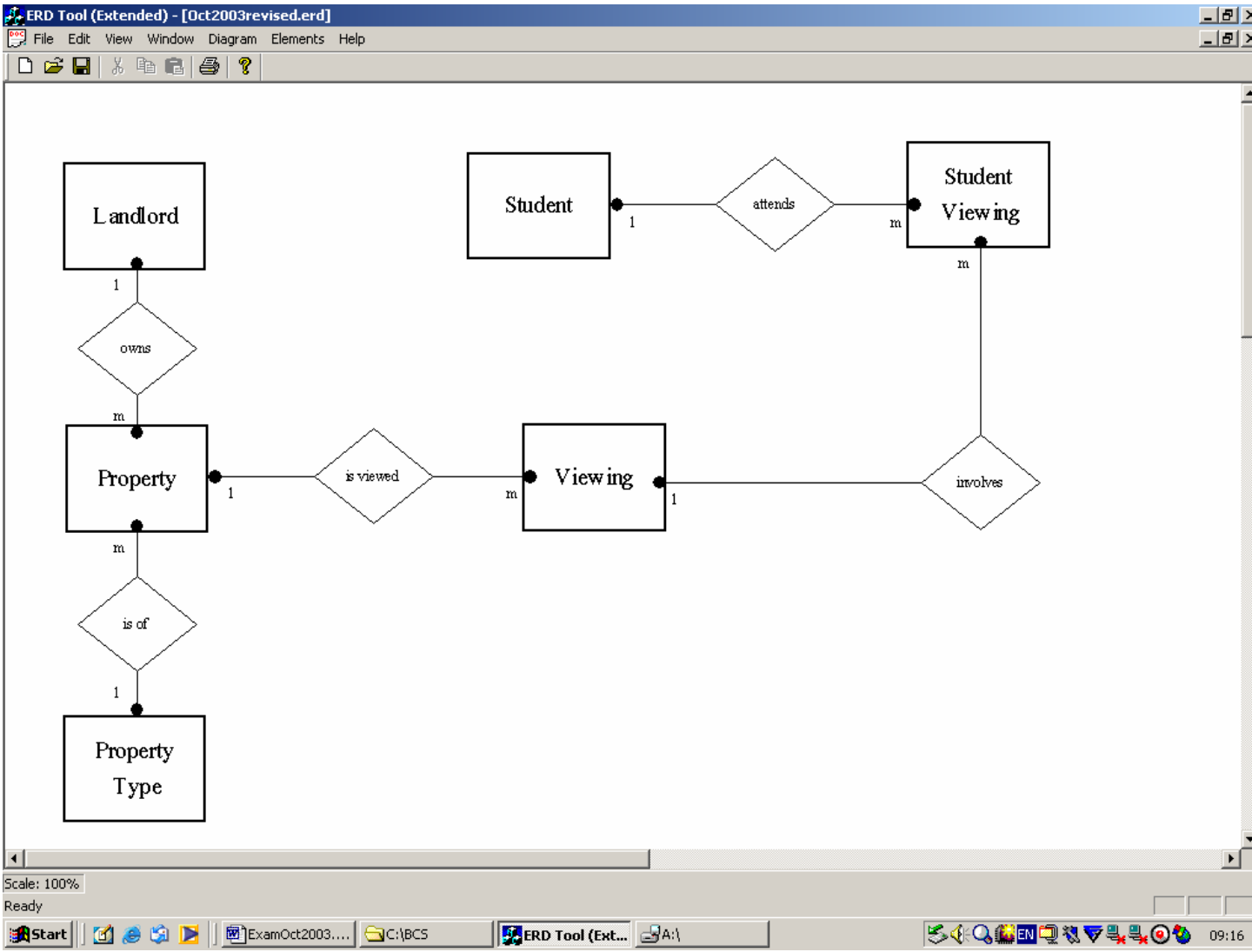
See diagram on separate sheet (other suitable notation will be accepted) and table types below.
Marking Scheme:

Entity types:	1 mark each to max of 6
Relationships with appropriate degrees & membership classes:	1 mark each to max of 5
Table types, consistency with ERD + appropriate PK:	0.5 each to max of 3
FK postings:	0.5 each to max of 2.5
Other attributes placed to result in well-normalised tables:	3.5

Landlord	(landlord_id, name, address, tel_no)
Property	(property_id, address, prop_type_id, landlord_id, max_no, rent, available to rent [Boolean] *or property_status or some other suitable attribute*)
Property Type	(prop_type_id, description)
Student	(student_id, name, address, tel_no, date_of_birth, gender)
Viewing	(viewing_no, property_id, date)
Student Viewing	(viewing_no, student_id)

Examiner's Comments
Overall this was less well answered than Question 1a. Primary Keys were often not indicated in the tables. A few candidates indicated table content by attaching attributes to the entity boxes on the diagram; one drawback of this approach is that foreign keys are usually missing from such solutions.


Landlord
property available
property no longer available
new property notification
fee request
5
Update property file
1
Add new property
new landlord
new property
property status
D2
Landlords
D1
Properties
Student
viewing request
viewing confirmation
4
Arrange viewing
viewing appoin-tment request
appointment confirmation
D4
Viewings
Landlord
3
Provide property details
available properties
available properties
Student
request to register
new student details
2
Register student
D3
Students
new student



Question 1c

If an object-oriented model were to be prepared for the above scenario a Class Diagram would be drawn.

i) Show what the class 'Student' would look like using UML notation. (6 marks)

ii) Explain the difference between the representation of 'Student' as a class and as an entity (as in your solution to 1b. (4 marks)

Answer Pointers

Marking Scheme:

For correct notation (box with 3 compartments): 3 marks

For correctly placing class name, attributes,
& either example operation(s) or note as above: 3 marks

As an entity: has just data (attributes): 2 marks

As a class: has data AND behaviour: 2 marks.

Examiner's Comments
This question was mostly well-answered; it is clear that candidates' knowledge of object-oriented analysis and design has grown.

Question 2

2. Compare and contrast the Structured Systems Analysis and Design Method (SSADM) and the Object Oriented approach to modelling data and processing requirements. **(25 marks)**

Answer Pointers:
Answers must focus on the approaches to modelling data and processes within each method/approach.
Good answers are expected to include some of the following, but other sensible suggestions will be rewarded equally:

a. An introduction.
b. An outline of how each method/approach models data and processes, i.e. DFD, ERM and Class Diagram.
c. A discussion of their similarities, i.e. basic principles, views, requirements modelling, both offer models that carry forward into design, both specify process logic and data element/structures, etc.
d. A discussion of how they differ, i.e. encapsulation -v- separate views, one model -v- two models, claims greater cohesion between stages, event driven, development of web interfaces, degree of seamlessness, etc.
e. A conclusion.

Examiner's Comments
Few candidates achieved high marks for this question, indeed the majority of those attempting this question achieved marks of less than 10/25. Candidates that achieved high marks for other questions often failed to perform as well in this question. The majority of answers went straight into describing SSADM stages and OO principles. Only a very few candidates actually attempted any form of 'Compare' and or 'Contrast'. Equally rare was a focus on 'approaches to modelling data and processing'. The question was seeking a focused discussion on how structured and OO approaches model data and processing. Candidates were required to compare the similarities and contrast the differences between how the two approaches model data and processing. Comparing Structured and OO principles in general without reference to how they model data and processing were rewarded with modest marks but failed to attain high marks. Candidates must pay due regard to the precise requirements of the question.

Question 3

3. *a)* Explain briefly what is meant by a 'hard' and by a 'soft' approach to systems development and identify ONE methodology of EACH type of approach. **(6 marks)**

b) Discuss the disadvantages of both 'hard' and 'soft' methodologies and how these disadvantages may be overcome. **(19 marks)**

Answer Pointers
Q3a. Hard / soft approach:

- 'Hard': e.g. SSADM. Sees systems development as technical problem; scientific, rational, reductionism approach.
- 'Soft': e.g. Soft Systems Methodology. Cannot divorce computer system from the people who will be using it and the organisation within which it is embedded.

Q3b. Disadvantages of 'hard' only:

- As business context not considered, may develop the 'wrong' system
- System may not be acceptable to the end users
- Assumes that requirements are clear and unambiguous
- Conflicts among user groups may not be addressed
- May lead to expensive 'maintenance' to fulfill unmet requirements
- Can be long time before users see any of deliverable product

Disadvantages of 'soft' only:

- (SSM) does not provide the tools to build working system; only helps clarify 'the problem situation'
- Does not cover the entire lifecycle
- Does not address technical issues of analysis, design and implementation
- Requires management support/cooperation

To overcome:

- Multiview claims to incorporate elements of both hard and soft approaches, to provide a methodology that combines the strengths of each.
- SSADM v4+ takes a more business-focused view, suggesting the incorporation of the SSM conceptual model

Examiner's Comments

Generally well answered, but in some cases candidates were less sure of 'hard' approaches than they were of 'soft' approaches. Many candidates presented the 'waterfall method' as their example of a 'hard' approach; strictly speaking this is an approach rather then a methodology, but some credit was given for this suggestion. The majority of candidates identified soft Systems Methodology as the example of the 'soft' approach. Some candidates suggested RAD. JAD and Prototyping as soft methodologies and whilst these approaches to rapid development do embody many 'soft' features they are not the strongest examples of 'soft' methodologies. Some credit was given to those candidates that suggested that these rapid approaches were 'soft' methodologies.

In response to part B many candidates presented long lists of the advantages of 'hard' and 'soft' approaches. As this was not asked for answers of this type were not rewarded with marks.

Pleasingly, most candidates presented good comprehensive suggestions of how to overcome the disadvantages of both 'hard' and 'soft' approaches. Multiview, SSADM V4 and other interactive development strategies were present in most answers.

Question 4

4. *a)* Identify the key document that you would expect to be the output of the systems analysis phase of a systems development project and describe what you would expect it to contain. **(11 marks)**

b) Explain the contribution that a Computer Assisted Software Engineering (CASE) tool can make in the preparation of systems analysis documentation. **(14 marks)**

Answer Pointers

Q4a. A clear identification of Requirements Specification, Functional Specification, definition of requirements or some other term to mean the same thing.

Contents should include (See page 297 of Goodland and Slater):

a. Carry forward documents from project initiation (TOR), FS, etc
b. Review of BSO output.
c. Functional requirements documented according to method used, for example:
   SSADM - expect to see a requirements catalogue, required data and process models, ELH, Functional definition, elementary process descriptions, etc.
   OO – Use case model, Analysis class model, statement of requirements, etc.
d. List of non-functional requirement such as performance, reliability, security issues, user role/function matrix, etc.

These need to be described briefly as well as listed.

Q4b. **Case tools can assist by:**

a. Producing diagrams and models as required by method used.
b. Error checking; syntactic correctness of models.
c. Consistency, completeness checking between models.
d. Communication between development teams and developers and users.
e. Version control, especially in iterative developments.
f. Central repository of project information.
g. Generation of documentation for the requirements specification.
h. Collaborative work on documents.

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Examiner's Comments

This was a popular question and resulted in many very good answers. Most candidates identified some form of Requirements Specification as the key document and were able to explain the main components of this document. Some candidates (the majority from one particular centre) mistakenly suggested that the key document was the Feasibility Study (FS) Report. Answers of this type generally went on to describe the contents of the FS Report and as some of the items identified would also be included in a Requirements Specification some credit was given.

In response to Question 4B too many candidates provided a ‘standard’ answer to ‘What is CASE?’, ‘What types of CASE are there?’ and ‘What are the advantages and disadvantages of CASE tools?’ Whilst these types of answers showed a considerable amount of CASE knowledge or a good memory of their notes per say, they were not rewarded with high marks. Only a small number of candidates applied their extensive knowledge of CASE to the actual question.

Question 5

5. Explain, with an example of each, FIVE of the following terms as used in systems analysis:

a) Systems and subsystems **(5 marks)**
b) Socio-technical analysis **(5 marks)**
c) Spiral life cycle **(5 marks)**
d) Storyboarding **(5 marks)**
e) Physical and logical models **(5 marks)**
f) Functional and non-functional requirements **(5 marks)**
g) <<includes>> use case association **(5 marks)**

Answer Pointers
Specific definitions are not given for these basic terms to avoid lengthy answer pointers. All answers are expected to include:

a. A definition and or explanation of the term.
b. An example of usage to which the item would be put, i.e. an explanation of how it would be used or an example of the model.
c. An illustration of the model, concept or document.

Examiner's Comments
Systems and Sub-systems – Mostly well answered with many candidates included examples of information systems and their sub-systems in response to this question. Terms such as boundary, input and output were frequently included in the description of these terms.

Socio-technical analysis - Answered quite well, but detail was often lacking. Most candidates suggested that this form of analysis includes a consideration of social and technical aspects and whilst this is true it is nevertheless a fundamentally superficial view of a much more complex approach. Some candidates did identify the importance of job design, social and technical aspects of the workplace and the relationship between these aspects and systems analysis (/design).

Spiral Life Cycle - Many knowledgeable answers presented that correctly identified Boehm's spiral model and its components. Iteration was correctly highlighted, as was the emphasis on risk analysis.

Story Boarding – Well understood and explained with an appropriate recognition of its application to the development of systems with substantial multi media components.

Physical and logical models – Candidates found these concepts difficult to explain, but some answers were presented with considerable accuracy and precision.

Functional and non-functional requirements - Mostly well understood and explained, but one frequent misunderstanding noted was that many candidates suggested that non-functional requirements are 'optional requirements' or 'not related to the system'. This is incorrect.

<<includes>> use-case association – Responses to this term were variable. Many candidates were able to explain the role of <<includes>> in use case modelling and provides an extract of a use-case model to illustrate the concept. Other candidates were aware that <<includes>> means that one use-case includes another but were unable to support this with clear explanation or a use case model. The importance of reuse was not suggested as much as the examiner expected.