Unit:
Object-Oriented System Analysis and Design

Assignment title:
Estate Agency System

Autumn 2024

Marking Scheme

Markers are advised that, unless a task specifies that an answer be provided in a particular form, then an answer that is correct (factually or in practical terms) **must** be given the available marks. If there is doubt as to the correctness of an answer, the relevant NCC Education materials should be the first authority.

This marking scheme has been prepared as a **guide only** to markers and there will frequently be many alternative responses, which will provide a valid answer. A score of zero will usually reflect that the task has not been attempted or is wholly incorrect.

Each candidate's script must be fully annotated with the marker's comments (where applicable) and the marks allocated for each part of the tasks.

Throughout the marking, please credit any valid alternative point.

Where markers award half marks in any part of a task, they should ensure that the total mark recorded for the task is rounded up to a whole mark.

Marker's comments:

Moderator's comments:

Mark:	**Moderated mark:**	**Final mark:**

Penalties applied for academic malpractice:

Introduction

In this assignment, you will apply knowledge and skills of key elements of the Object-Oriented Systems Analysis and Design approach to software development.

You should read the information provided and each task carefully before you begin.

You must work independently and should not share your work with other students. All work produced must be your own.

Any sources of information, text, images created by others that you include in your work must be clearly identified and referenced. If you use work of others without permission or without proper acknowledgement, you may be disqualified from the assessment.

You may ask your tutor for support if you have questions about the requirements of each task, however, they cannot guide you with solutions for the tasks.

Scenario (Problem Statement)

North Yorkshire Property services (NYPS) is a real-estate agency business. The company's chief executive officer (CEO) has asked you to develop a system (Property Viewing System (PVS)) to help it run its property sales operation. The following is a brief description of the system they would like.

PVS is concerned mainly with the setting up of appointments for clients to view properties.

NYPS has five branches; each branch has a single manager and a number of representatives (part or full-time employees).

Clients may be buyers or sellers and must register with NYPS.

Sellers are property owners who use NYPS to market their property/properties. Each property has a single client as an owner. A property sale is managed from a single branch, though details are available through the system to all branches.

Buyers may browse details of properties available. When they would like to view a property, the representative makes a viewing appointment. Details of buyers' appointments and viewer's comments are kept on file.

Buyer's details are kept until they indicate that they are no longer interested.

The Property Viewing System (PVS) will provide support for NYPS by meeting the following requirements:

- Recording information about the company's employees, including their names and employee numbers and for representatives, their grade and whether part or full time.
- Recording information about the structure of the management of the company
- Recording information about the branches, including their names, locations and staff who work in them.
- Recording information about each of the properties that the company is marketing, including address, description, picture(s), price, type (bungalow, house, apartment etc.), seller, branch responsible, number of bedrooms, date first offered for sale, status (for sale, under offer, offer accepted, contract exchanged, sale completed).
- Recording information about offers made for a property, including offer price, date, action taken (accepted / rejected), client making offer.

- Recording information about clients: names, address etc, any properties they are selling, properties viewed and offers made.
- Recording information about appointments that have been made, including the representative making the appointment.
- NYPS staff should be able to add, amend and delete property details, client details, offers, and appointments. A manager should be able to add, amend, and delete employee and branch details.
- Clients should be able to browse details of properties and search for properties (on district, price range, number of bedrooms, type)
- The system must respond to requests quickly and be secure since personal information is collected.

Task 1: Requirements Elicitation – 15 Marks

The problem statement is brief, incomplete, ambiguous and vague in some places. You should therefore have a number of questions that you want to ask to clarify your understanding. (You cannot solve a problem that you do not fully understand).

During requirements analysis, you need to discover as much ***relevant*** information about the system as you can and clarify any ambiguities.

a) Identify FOUR (4) stakeholders in the PVS system. Provide a clear justification for your choice.

b) Explain TWO (2) methods you would use to elicit the system requirements. Explain why you would use these methods for *this system*.

c) Identify at least FIVE (5) additional pieces of information you need in order to clarify the problem statement above. Explain why each piece of information is needed.

Marking Scheme

0-4 marks	5 marks	6-8 marks	9 -10 marks	11-15 marks
No or irrelevant answer.	***Weak understanding evidenced by identifying at least 1 appropriate stakeholder, 1 elicitation method, 2 pieces of valid additional information and some attempt at justification.***	***Adequate understanding evidenced by at least 2 appropriate stakeholders, 1 elicitation method, 3 pieces of valid additional information with justification.***	***Very good understanding evidenced by at least 3 appropriate stakeholders, 2 elicitation methods, 4 pieces of valid additional information with justification.***	***Excellent understanding evidenced by 4 appropriate stakeholders, 2 elicitation methods, 5 pieces of valid additional information with justification.***
Marker's Comments/Justifications:				

Task 2: Requirements – 10 marks

A requirements specification is an essential document for the development of a system. In this task, you will produce important elements of the specification.

a) Explain the difference between a functional and non-functional requirement and provide an example of each from the PVS system.

Analyse the problem statement and create succinct lists of the following:

b) Functional requirements.

c) Non-functional requirements.

NB. Where you consider that there are ambiguities / omissions in the problem statement, you should make reasonable assumptions and state what they are explaining why they are relevant.

For the highest grade you are expected to identify all requirements from the problem statement and FOUR (4) additional functional/ non-functional requirements with justification.

Marking Scheme

0-2 marks	3 marks	4-5 marks	6 marks	7-10 marks
No or irrelevant answer.	***Weak understanding / application evidenced by:*** ***Attempt at differentiating functional/ non-functional requirements AND*** ***Some functional & non-functional requirements with major omissions or irrelevance.***	***Adequate understanding / application evidenced by:*** ***Clear distinction of functional/ non-functional requirements AND*** ***Clear & succinct formulation of most functional & non-functional requirements from the problem statement.***	***Very good understanding / application evidenced by:*** ***Clear distinction of functional/ non-functional requirements with valid examples AND*** ***Clear & succinct formulation of all functional & non-functional requirements from problem statement and some additional requirements, though justification may be weak.***	***Excellent understanding / application evidenced by:*** ***Clear distinction of functional/ non-functional requirements with valid examples AND*** ***Clear & succinct formulation of all functional & non-functional requirements from the problem statement and detailed, comprehensive additional requirements with justification.***
Marker's Comments/Justifications:				

Task 3: Use Case Model – 30 marks

Use Case models can be used in various stages of system development.

a) Explain the purpose of a Use Case model, with an example of how it can be beneficial in the development of the above system.

Analyse the problem statement above:

b) Identify the Actors in the above system, justifying your decisions for selecting them.

c) Use a CASE tool to draw a Use Case diagram for the above system. You will gain additional credit if you correctly identify and ***appropriately*** use generalisation, <<includes>> or <<extends>>. *NB You do not have to use them all!*

d) Identify TWO (2) scenarios for the Use Case *Make appointment.*

e) Document a Use Case for *Make appointment*. You should use the template provided in the Appendix.

Marking Scheme

0-8 marks	9-11 marks	12-17 marks	18-20 marks	21-30 marks
No or irrelevant answer	**Weak understanding / application evidenced by:** **Attempt at purpose/ example AND** **Some valid content of:** • **Actors** • **Use case diagram.** • **Scenario** • **Use case document.** **with major omissions or irrelevance.**	**Adequate understanding / application evidenced by:** **Clear explanation of purpose & valid example of Use Case model AND** **CASE tool used AND** **Valid content of:** • **Actors** • **Use case diagram.** • **Scenario** • **Use case document.** **with some omissions or irrelevance.**	**Very good understanding / application evidenced by:** **Clear explanation of purpose & valid example of Use Case model AND** **CASE tool used / correct labels AND** **Valid, comprehensive content of:** • **Actors** • **Use case diagram.** • **Scenario** • **Use case document.** **with minor omissions or irrelevance.**	**Excellent understanding / application evidenced by:** **Clear explanation of purpose & valid example of Use Case model AND** **CASE tool used / correct labels AND** **Valid, comprehensive, complete content of:** • **Actors** • **Use case diagram.** • **Scenario** • **Use case document.** **With appropriate use of generalisation/ include/extend.**
Marker's Comments/Justifications:				

Task 4: Sequence Diagram– 15 marks

a) Explain the purpose of a Sequence Diagram, with an example of how it can be beneficial in the development of the above system.

b) Use the CASE tool to draw a Sequence diagram for one of your scenarios for *Make appointment.*

Marking Scheme

0-4 marks	5 marks	6-8 marks	9 -10 marks	11-15 marks
No or irrelevant answer	***Weak understanding / application evidenced by:*** ***Attempt at articulating purpose/ example AND*** ***Some valid content of:*** • ***sequence diagram with major omissions or irrelevance.***	***Adequate understanding / application evidenced by:*** ***Clear explanation of purpose & valid example AND*** ***CASE tool used AND*** ***Valid content of:*** • ***sequence diagram with some omissions or irrelevance.***	***Very good understanding / application evidenced by:*** ***Clear explanation of purpose & valid example AND*** ***CASE tool used / correct labels AND*** ***Valid, comprehensive content of:*** • ***sequence diagram with minor omissions or irrelevance.***	***Excellent understanding / application evidenced by:*** ***Clear explanation of purpose & valid example AND*** ***CASE tool used / correct labels AND*** ***Valid, comprehensive, complete content of:*** • ***sequence diagram.***
Marker's Comments/Justifications:				

Task 5: Class Diagram – 30 Marks

a) Analyse the problem statement to identify classes and use a CASE tool to produce an implementation level Class Diagram for the system.

   The class diagram must show attributes, operations, and the relationship of classes to each other with multiplicity. It should include class and association names. You will have to invent suitable names for the associations.

   The use of abstract classes and sub-classes (where appropriate) will attract additional marks.

b) Provide a justification for why each class was selected for inclusion.

Marking Scheme

0-8 marks	9-11 marks	12-17 marks	18-20 marks	21-30 marks
No or irrelevant answer	**Weak understanding / application evidenced by:**	**Adequate understanding / application evidenced by:**	**Very good understanding / application evidenced by:**	**Excellent understanding / application evidenced by:**
	Correct UML syntax for Associations, Multiplicities, Inheritance, and Classes (names / symbols) for some of the model with major omissions/ errors	**Uses CASE tool and correct UML syntax for Associations, Multiplicities, Inheritance, and Classes (names / symbols) for most of the model.**	**Uses CASE tool and correct UML syntax for Associations, Multiplicities, Inheritance, and Classes (names / symbols) for the entire model.**	**Uses CASE tool and correct UML syntax for Associations, Multiplicities, Inheritance, and Classes (names / symbols) for the entire model with names derived from the problem domain.**
	Model is a valid representation of some of the system.	**Model is a valid representation of the majority of the system.**	**Model is a valid representation of almost the entire system.**	**Model is a valid representation of the entire system.**
	Limited justification for inclusion and relationships with other classes, or the majority of the presented classes are not justified.	**Some classes are justified for inclusion and relationships with other classes.**	**The majority of the classes have valid justification for inclusion and relationships with other classes.**	**All classes have a comprehensive justification for inclusion and relationships with other classes.**
Marker's Comments/Justifications:				

Appendix: Use Case description template

Here is an *example* of a Use Case description for *part of a Library system*. You should use this layout. The example text provides you with an indication of how to express the content.

Use Case Name	*Borrow a Book*
Participating Actors	`BookBorrower`
Entry condition *(The event that triggers the Use Case)*	The `BookBorrower` selects the *Borrow a book* option on the screen menu.
Flow of events	1. The system responds by displaying a new screen (New book Loan) 2. The `BookBorrower` enters his/her member's ID number. 3. The system checks if the `BookBorrower` has already got the maximum number of Books on loan. 4. If the `BookBorrower` has already reached his/her limit, the system displays an appropriate message. 5. If the `BookBorrower` has not reached his limit, the system asks for the ID number of the Book. 6. The system checks to see if the Book is available. 7. If the Book is not available, the system displays an appropriate message. 8. If the Book is available, then the `BookBorrower` records its loan and records the BOOK as no longer available. 9. The system asks for confirmation of the loan. 10. The `BookBorrower` confirms or cancels the loan. 11. The system returns to the main menu, with a confirmatory message of the loan made.
Exit condition *(conditions that are satisfied after the Use Case finishes)*	If the loan was confirmed then it is recorded in the system otherwise, no change is made to the system.
Special requirements *(any constraints etc that are not related to the function of the system)*	None.

Learning Outcomes matrix

Task	Learning Outcomes assessed	Marker can differentiate between varying levels of achievement
1	1	Yes
2	2	Yes
3	2,3	Yes
4	2,3	Yes
5	2,3	Yes

Grade descriptors

Learning Outcome	Fail	Referral	Pass	Merit	Distinction
1. Discuss various approaches to systems analysis and design and explain their strengths and weaknesses.	Demonstrates ***extremely limited*** understanding of systems analysis and design approaches.	Demonstrates ***limited*** understanding of approaches.	Solutions demonstrate ***adequate*** understanding of approaches.	Solutions demonstrate ***sound*** understanding of approaches.	***Coherently*** identifies and applies methods to reach ***well-defined and structured*** solutions.
2. Apply object-oriented techniques for systems analysis and modelling of well-defined but complex problems	***Unable*** to apply key techniques and principles.	In an ***extremely limited*** way, can apply key techniques and principles.	Can ***adequately*** apply key techniques and principles.	Can ***appropriately*** apply key techniques and principles.	Can ***thoroughly apply and adapt*** key techniques and principles in a systematic way.
3. Explain and use UML to represent object-oriented models	***Little to no*** understanding of UML or object-oriented models.	***Limited*** understanding of UML or object-oriented models.	***Adequate*** understanding of UML with ***sufficient*** representations.	Demonstrates ***very good*** ability to apply and adapt UML models with a ***sound*** system understanding. ***Good*** use of CASE tool.	***Excellent ability*** to ***apply*** UML ***and adapt*** models in a manner that demonstrated understanding of effectiveness of methods, actions, and results. ***Excellent*** use of CASE tool.
4. Understand the integration between the design models and implementation	***Lacking awareness*** of different perspectives within the area of study or ***does not demonstrate understanding*** of integration between design	Has ***extremely limited awareness*** of different perspectives within the area of study or ***demonstrates limited*** understanding of integration between design	Has ***adequate awareness*** of different perspectives or approaches within the area of study or ***demonstrates sufficient*** understanding of integration between design	Has ***very good and informed awareness*** of different perspectives or approaches within the area of study or demonstrates ***good*** understanding	Has ***Excellent awareness*** of different perspectives or approaches within the area of study with ***unquestionable*** understanding of integration between design and

	and implementation.	and implementation.	and implementation. It is possible to trace requirements through to estimation and design but with some gaps.	of integration between design and implementation. Requirements can be clearly traced through to estimation and design.	implementation. Requirements are well-defined and clearly traceable to estimation and design.