



The University of Fiji

School of Science and Technology

Department of Information Technology and Computer Science

The University of Fiji
Library
Savani, Lautoka

ITC213

System Analysis and Modelling

Semester I, 2013

FINAL EXAMINATION PAPER

Time allowed: 3 hours [10 Minutes Extra Allowed for reading the Paper]

Weighting: 50%

Total Marks: 100

Instructions

- ✚ There are 4 main sections in this examination

Section	Marks
A (Multiple Choice Questions)	20
B (True/False)	15
C (Short/Long Answer Questions)	35
D (Case Studies)	30

- ✚ All sections are compulsory
- ✚ Start each question on a new page
- ✚ Write your Student ID number in all the pages of your answer sheet
- ✚ Do not write with pencil or highlighted pen
- ✚ Hand in the answer Booklet to the supervisor before you leave the examination hall

Good Luck!!

Section A.

Multiple Choice Questions

[20 marks]

1. The _____ of the system operation contracts drive the program design.

A. Name
B. Type
C. Precondition and post condition
D. Description

2. The chief task of object-oriented program design is to assign _____ to the objects.

A. Classes
B. Protocols
C. Association
D. Responsibilities

3. State transition diagrams effectively model the details of user-computer interaction at the automation boundary.

A. State transition diagrams
B. Use case diagrams
C. Sequence models
D. Collaboration diagrams

Question 4 and 5 refers to Figure 1.

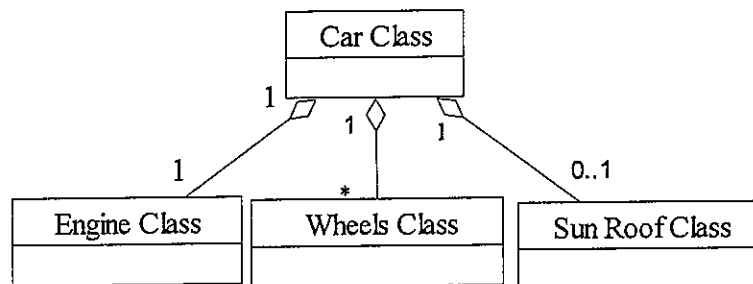


Figure 1

4. Diagram shown in Figure 1 is an example of _____.

A. generalization with multiplicity
B. inheritance with multiplicity
C. aggregation with multiplicity
D. composition with multiplicity

5. The **TRUE** statement that represents Figure 1 is _____.
- A. A car consists of one engine, unlimited number of wheels and an optional sun roof.
 - B. A car consists of one engine, zero or more wheels and zero sun roof.
 - C. A car consists of one engine, zero or more wheels and an optional sun roof.
 - D. A car consists of one engine, an optional wheel and an optional sun roof.
6. What is context diagram?
- A. The most in depth data flow diagram
 - B. A diagram used to document the scope of the system
 - C. A model of the final design, ready for implementation
 - D. A flowchart depicting one small, specific process broken down to its lowest level
7. The act of breaking a system into its component subsystems, processes and sub processes is known as:
- A. Generalization
 - B. Normalization
 - C. Composition
 - D. Decomposition
8. Use case modelling is the process of _____.
- A. Modelling a system's users and the activities they perform.
 - B. Modelling a system's functions in terms of business events, who initiated the events, and how the system responds to those events.
 - C. Modelling a system that depicts the interactions between system processes and data.
 - D. Modelling a system that captures the interaction of the user with technology and implementation details.
9. When looking for actors, which of the following questions is the best one to ask?
- A. How often is the system backed up?
 - B. Who or what provides inputs to the system?
 - C. Who is responsible for the budget of the system?
 - D. Who is responsible for training the users?

10. Which of the following cannot be found on a use case narrative?

- A. use case name
- B. use case type
- C. primary business actor
- D. none of the above

11. A motorist stops at a self-service gas station to fill up her car, paying by credit card at the pump. In this use case, who is the initiating actor?

- A. the motorist
- B. the station owner
- C. the credit card authorization company
- D. the oil company

12. The messages of a use case can be graphically depicted with a(n):

- A. System analysis use case
- B. Use case diagram
- C. Activity diagram
- D. System sequence diagram

13. A technique wherein the attributes and behaviours are common to several types of object classes are grouped into their own class, called a super type, is known as:

- A. Encapsulation
- B. Generalization
- C. Inheritance
- D. generalization/specialization

14. What defines how many instances of one object class can be associated with one instance of another object class?

- A. Associatively
- B. Multiplicity
- C. Relationship
- D. inheritance

15. System interfaces and architectural design are the deliverables or results produced after _____ discipline is performed.

- A. Design
- B. analysis
- C. implementation
- D. project management

16. Deliverables from project activities using object-oriented modeling include:

- A. Structure charts and data flow diagrams.
- B. An updated Baseline Project Plan and a Statement of Work.
- C. A Systems Service Request and a Statement of Work.
- D. Data flow and entity-relationship diagrams and repository descriptions.

17. Which of the following is a true statement?

- A. The UML notation is useful for graphically depicting object-oriented analysis and design models.
- B. The UML notation allows you to specify the requirements of a system and capture design decisions.
- C. The UML notation promotes communication among key persons involved in the development effort.
- D. All of the above are true statements.

18. Benefits of the object-oriented modeling approach include:

- A. The ability to tackle more challenging problem domains.
- B. Improved communication among users, analysts, designers, and programmers.
- C. Reusability of analysis, design, and programming results.
- D. All of the above.

19. During project inception the intent of the of the tasks are to determine

- A. basic problem understanding
- B. nature of the solution needed
- C. people who want a solution
- D. All of the above

20. The system specification describes the

- A. Function, performance and constraints of a computer-based system
- B. implementation of each allocated system
- C. element software architecture
- D. time required for system simulation

Section B**True/False Questions****[15 marks]**

1. Composition is drawn with a filled diamond.
2. In a system sequence diagram an input message called FinalizeOrder would be proper according to UML convention.
3. Class diagrams model how events can change the state of an object class over its lifetime.
4. A data base in the storage layer implements the persistence needed by objects in the business layer.
5. The design of the data base is derived from the objects, attributes, and associations shown in the design class diagram.
6. Systems design defines users' requirements for a new information processing system.
7. Local visibility is where an object obtains visibility to another object by declaring it inside one of its methods.
8. A qualified association in object oriented program design associates two objects using a qualifier to select objects at the other end of the association.
9. In the elaboration phase of the Rational Unified Process the use case is developed as one of the artifacts.
10. Construction phase of Rational Unified Process produces an operational system ready for Beta testing in a user or customer environment.
11. In requirements change management, problem analysis and change specification starts with an identified requirements problem or, sometimes, with a specific change proposal.
12. Scenarios are a way of structuring the requirements to represent the perspectives of different stakeholders.
13. Social and organisation factors do not influence system requirements.
14. Improved communication among users, analysts, designers, and programmers is a benefit of the object-oriented modeling approach.
15. A domain model is a depiction of the interactions among objects during a certain period of time.

Section C Short/Long Answer Questions**[35 marks]****Question 1****[10 marks]**

1. In object oriented program design, objects play a major role. Explain what is an object? List the components of an object. **[2 marks]**
2. List and briefly describe the function of each layer in the three-tier architecture, which is partitioned while designing the overall system structure. **[3 marks]**

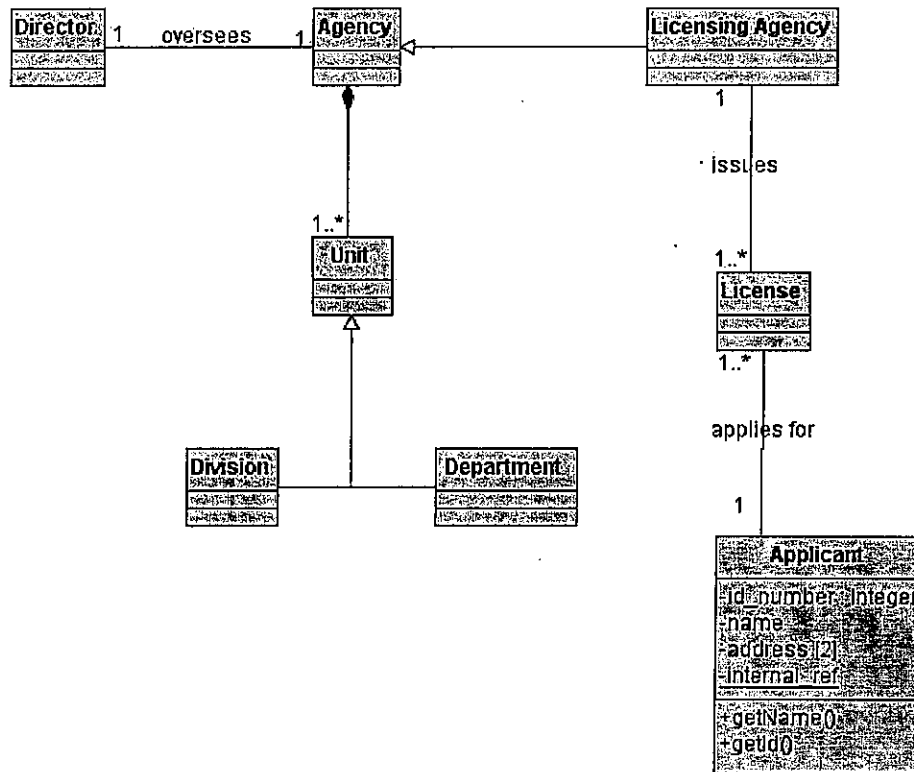
3. There are three common guidelines for assessing and improving the quality of object oriented program design. List and explain the three guidelines. [3 marks]
4. Differentiate between encapsulation and polymorphism. [2 marks]

Question 2**[10 marks]**

1. What is a pattern? Explain the three major object oriented program design patterns. [3.5 marks]
2. Discuss the seven procedures for object oriented program design. [3.5 marks]
3. Discuss some of the impacts of lack of clarity, inconsistency, incompleteness, and lack of rigor on the statement of system requirements. [1 mark]
4. In creating new computer information systems, we need to make good decisions in spite of change and complexity. As a system Analyst you know that to cope with complexity you will have to simplify. Explain at least five ways you can simplify the complex system? [2 marks]

Question 3**[15 marks]**

1. Define analysis and synthesis. How are these concepts related to aggregation, decomposition, and system modelling? [2 marks]
2. Explain the two principal approaches to generate a system model. [1 marks]
3. Name two strategies for simplifying design decisions. [1 mark]
4. What are the components of a domain model? Explain each one of it with examples. [1 mark]
5. What are the two main strategies for finding concepts? [1 mark]
6. Explain in detail, the steps in a general method for design or problem solving? [2 marks]
7. Name four strategies for generating a design and explain them in detail. [2 marks]
8. Read the domain model and answer the questions that follow.



- i. Explain the relationship between:
- Director class and Agency class
 - Unit class and Agency class
 - Licensing agency class and Agency class
 - Licensing agency class and License class
 - License and Applicant class

[1 mark each]

Section D. Case Studies

[30 marks]

Case Study 1

[20 marks]

- Analyse the business case below and answer the questions that follows.

In a local hospital, patients either visit or call the receptionist to request for an appointment. The receptionist checks the system for available appointment times and advises the patient. The patient confirms an appointment time and provides detail such as name, address, date of birth and previous physician. The receptionist then feeds this information in the system. After the system validates all the entered information, it saves the new patient record in the patient file, records the appointment time, issues a new patient number and produces an appointment confirmation. The receptionist then informs the patient of his new patient number and notifies him on the confirmation of the appointment time.

- a.) Create the event table. [4 marks]
- b.) Draw the use case diagram. [4 marks]
- c.) Create a complete sequence diagram. [8 marks]
- d.) List concepts and attributes [4 marks]

Case Study 2

[10 marks]

The following description identifies the business need for a dental clinic system. Based on the description;

- a.) Identify the actors and model the use case diagram. [5 marks]
- b.) Develop the domain model with the help of concepts and attributes. [5 marks]

Dental Clinic System

A clinic with three dentists and several dental hygienists needed a system to help administer patient records. This system does not keep any medical records. It only processes patient administration. Each patient has a record with his/her name, date of birth, gender, date of first visit, and date of last visit. Patient records are grouped together under a household. A household has attributes such as name of head of household, address, and telephone number. Each household is also associated with an insurance carrier record. The insurance carrier record contains name of insurance company, address, billing contact person, and telephone number.

In the clinic, each dental staff person also has a record that tracks who works with a patient (dentist, dental hygienist, x-ray technician). Since the system focuses on patient administration records, only minimal information is kept about each dental staff person, such as name, address, and telephone number. Information is maintained about each office visit, such as date, insurance amount (amount paid by the patient), paid code, and amount actually paid. Each visit is for a single patient, but, of course, a patient will have many office visits in the system. During each visit, more than one dental staff person may be involved in the patient's treatment. For example, the x-ray technician, dentist, and dental hygienist may all be involved on a single visit. In fact, it is even possible that more than one dentist may be involved with a patient, since some dentists are specialists in such things as crown work. For each staff member does procedure in a visit combination (many-to-many) detailed information is kept about the procedure. This information includes type of procedure, description, tooth involved, the total charge, the amount paid, and the amount the insurance company denied. Finally, the system also keeps track of invoices. There are two types of invoices: invoices to insurance companies and invoices to heads of household. Both types of invoices are fairly similar, listing each visit, the procedures involved and the total due. Obviously, the totals for the insurance company are different from the patient amounts owed. Even though an invoice is a report (printed out), it also maintains some information such as date sent, total amount, amount already paid, amount due and also the total received, date received, and total denied. (Insurance companies do not always pay the full amount they are billed for.)

The receptionist keeps track of patient and head of household information. He/she will enter information about the patients and head of household. He/she will also keep track of office visits by each patient. Patient information is also entered and maintained by the office business manager. In addition, the business manager maintains the information about the dental staff.

The business manager also prints the invoices. Patient invoices are printed monthly and sent to the head of household. Insurance invoices are printed weekly. When the invoices are printed, the business manager double-checks a few invoices against information in the system to make sure it is being aggregated correctly. The business manager also enters the payment information when it is received. Each member of the dental staff is responsible for entering information about the dental procedures that he/she performs. The business manager also prints an overdue invoice report showing heads of household who are behind on their payments. Sometimes dentists like to see a list of the procedures they performed during a week or month, and they can request that report.

The End