

The University of Fiji

School of Science and Technology



Department of Computer Science/ Information Technology

ITC213

System analysis and modelling

Semester I, 2014

Final Examination Question Paper

Time Allowed: 3 Hours [10 Minutes Extra Allowed For Reading the Paper]
Weighting: 50%
Total Marks: 100 marks.

Section A:

Multiple Choice - 20 marks

Section B:

True/False - 15 marks

Section C:

Short/Long Answer Question 1 - 10 marks
Short/Long Answer Question 2 - 10 marks
Short/Long Answer Question 3 - 10 marks
Short/Long Answer Question 4 - 15 marks

Section D:

Case study - 20 marks

Total 100 marks

Instructions

- Show your answers clearly in each question to gain maximum marks.
- You may ask for extra sheets from the supervisors if the need arises.
- Do not forget to write your name and ID number on all the extra sheet(s) attached.
- Programmable calculators are not allowed.

Section A.

Multiple Choice Questions

[20 marks]

1. An occurrence at a specific time and place, which can be described and is worth remembering, is called a (n) _____.
 - A. external agent
 - B. event
 - C. temporary effect
 - D. state of requirement

2. A (n) _____ is a good tool for monitoring the progress of a project as it moves along.
 - A. entity-relationship diagram (ERD)
 - B. Gantt chart
 - C. work breakdown structure
 - D. context diagram

3. The stakeholders are those who have interests in the success of a new system. Suppose there are three people, called P1, P2 and P3 respectively. P1 pays for and owns the system, P2 uses the system on a daily basis, and P3 ensures that the system operates in the computing environment of the organization. Which of the following statement is correct?
 - A. P1 is a user stakeholder
 - B. P1 is a client stakeholder
 - C. P1 is a technical stakeholder
 - D. P1 is both a client and a user stakeholder

4. All of the following are the types of events that are associated with inputs on the context diagram EXCEPT:
 - A. external events
 - B. temporal events
 - C. national events
 - D. internal events

5. The act of breaking a system into its components subsystems, processes, and sub processes is known as _____.
 - A. control flow
 - B. data conservation
 - C. dissecting
 - D. decomposition

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

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

7. Consider the following sequence diagram (Figure 1) to answer the question.

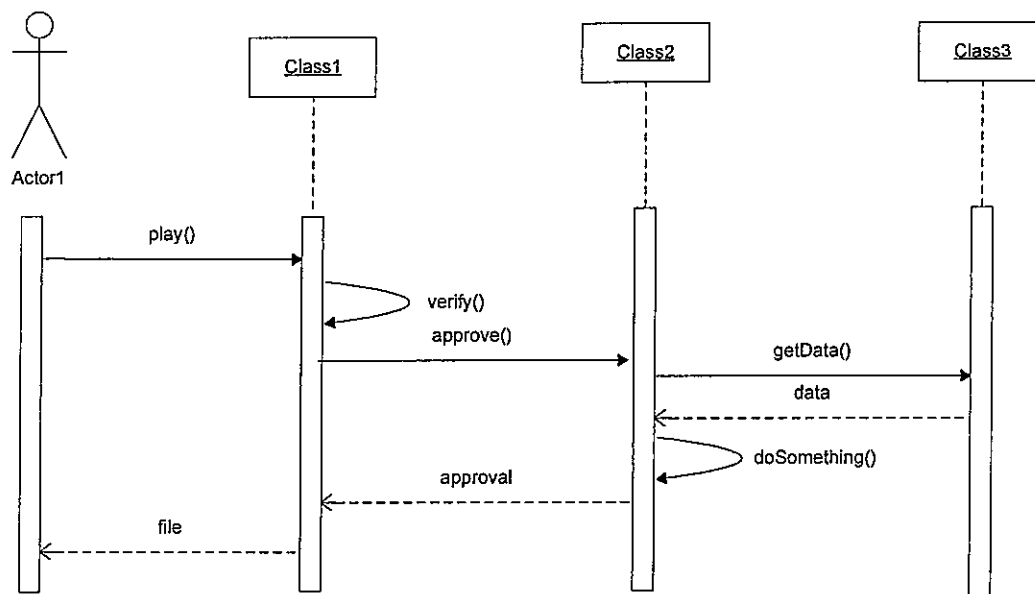


Figure 1. Sequence diagram

Which of the following options show the correct methods of classes Class1, Class2, and Class3?

A. ::class1 play() doSomething()	::class3 getData()	::class2 approve() verify()
B. ::class1 play() verify()	::class3 getData()	::class2 approve() doSomething()

C.	<pre> ::class1 + + + play() doSomething() </pre>	<pre> ::class3 + + + getData() data() </pre>	<pre> ::class2 + + + approve() verify() approval() </pre>
D.	<pre> ::class1 + + + play() </pre>	<pre> ::class3 + + + getData() </pre>	<pre> ::class2 + + + approve() </pre>

8. Consider the following class diagram (Figure 2) to answer the question.

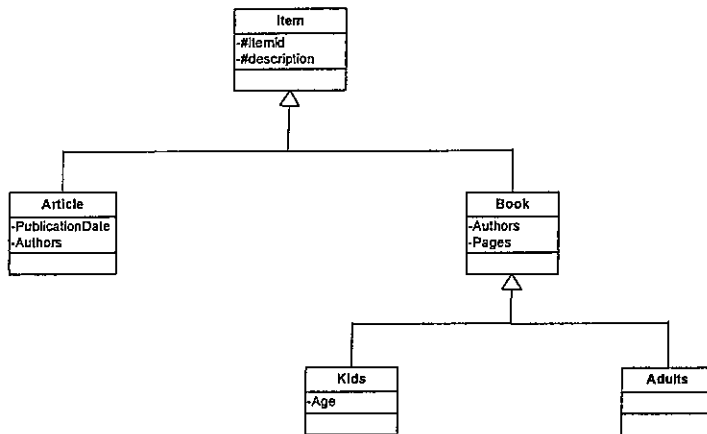


Figure 2. Class Diagram

Which of the following is NOT an attribute of class Kids?

- A. ItemID
- B. Pages
- C. Age
- D. Authors

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

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

10. 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

11. Question 11 and 12 refers to Figure 3.

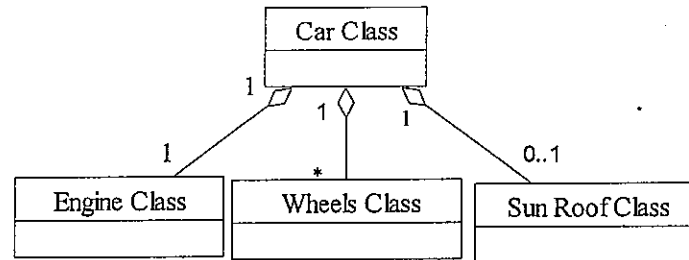


Figure 3. Class diagram

Diagram shown in Figure 3 is an example of _____.

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

12. The **TRUE** statement that represents Figure 3 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.

13. As a model is developed, which of the following does it become?

- A. More abstract
- B. Ambiguous
- C. More detailed
- D. Less formal

14. Which of the following is **not** a good reason for constructing a requirements model?

- A. It can show the business situation in enough detail to check that the requirements have been captured fully and correctly
- B. It can be used while doing validation and verification
- C. It can demonstrate that all the use cases have been drawn using the correct notation
- D. It can be organized in such a way that it will be useful later for designing the software

15. 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
16. 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
17. When indicating the multiplicity for a role, an infinite upper bound is denoted by a:
- A. dash.
 - B. diamond.
 - C. hollow point arrow.
 - D. star.
18. Which of the following multiplicities indicates a minimum of 0 and a maximum of 1?
- A. 1..0.
 - B. 0..1.
 - C. 1 – 0.
 - D. 1: M.
19. 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.
20. During project inception the intent 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

True/ False Questions

[15 marks]

1. Information systems analysis seeks to improve information systems so that they provide better support for the business activities of an organization.
2. Composition is drawn with a filled diamond.
3. In a system sequence diagram an input message called FinalizeOrder would be proper according to UML convention.
4. Local visibility is where an object obtains visibility to another object by declaring it inside one of its methods.
5. Improved communication among users, analysts, designers, and programmers is a benefit of the object-oriented modelling approach.
6. A qualifier is an attribute or set of attributes which has a unique value for each object in the class.
7. It is undesirable to have objects with high cohesion.
8. Using the facade pattern helps increase cohesion.
9. It is desirable to have objects with low coupling.
10. A real information-processing system must contain components which compensate for the imperfections of the hardware.
11. In a real-time system inputs enter the system one at a time. Time delays are handled internally.
12. A batch system responds rapidly enough for its output to affect or control events in its environment.
13. Distributed systems have processors or data bases in more than one location.
14. Each event corresponds to at least one use case.
15. In an expanded use case narrative Alternative Flow of Events shows what the system should do in the case of exceptional conditions or errors.

Short/ Long Answer Questions

[45 marks]

Question 1

[10 marks]

- a) Discuss three reasons why system analysts work with abstract models? [1.5 marks]
- b) Discuss the three functions performed by information systems. [1.5 marks]
- c) What is sequence diagram? [0.5 mark]
- d) Explain 5 things a sequence diagram illustrates. [2.5 marks]
- e) Write four rules which should be followed while writing messages in a sequence diagram. [2 marks]
- f) All the system has **components, structure, function** and **objectives**. Explain the terms with the help of an example. [2 marks]

Question 2**[10 marks]**

- a) Explain the two principal approaches to generate a system model. **[1 marks]**
- b) Discuss some of the impacts of lack of clarity, inconsistency, incompleteness, and lack of rigor on the statement of system requirements. **[1 mark]**
- c) 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? **[2.5 marks]**
- d) Explain the three types in which a system can be structured. **[1.5 marks]**
- e) A new information system is proposed or implemented for an organization or business if they have a problem. Explain the 8 steps in a problem solving process which are used by intelligent system analysts. **[4 marks]**

Question 3**[10 marks]**

- a) Information systems have different type of users. Discuss four different types of users. **[2 marks]**
- b) Explain your understanding on feasibility study. Explain the five categories of feasibility. **[3 marks]**
- c) Name two strategies for simplifying design decisions. **[1 mark]**
- d) What are the components of a domain model? Explain each one of it with examples. **[1.5 marks]**
- e) What are the two main strategies for finding concepts? **[1 mark]**
- f) Who is an actor? Differentiate between two types of actors. Explain when an actor can be identified? **[1.5 marks]**

Question 4**[15 marks]**

- a) In object oriented program design, objects play a major role. Explain what is an object? List the components of an object. **[1.5 marks]**
- b) List and briefly describe the function of each layer in the three-tier architecture, which is partitioned while designing the overall system structure. **[1.5 marks]**

- c) There are three common guidelines for assessing and improving the quality of object oriented program design. List and explain the three guidelines. [3 marks]
- d) What is a pattern? Explain the three major object oriented program design patterns. [3.5 marks]
- e) Discuss the seven procedures for object oriented program design. [3.5 marks]
- f) Name four strategies for generating a design and explain them in detail. [2 marks]

Section D

Case study

[20 marks]

Read this problem statement very carefully and use it to answer parts (a) to (e) of this question. Please clearly state your assumptions.

ExtremeCars is a car rental company and is planning to develop a website that will allow registered customers to reserve cars online. The payment is handled when the customer comes to pick the car, but is outside the scope of the system.

Before a customer can submit a reservation request for a car, the customer has to register online using the system. The customer fills an online registration form and submits this using the system. The Sales Manager approves the registration request online, and upon approval the system generates and emails the customer the login details. The customer can update their profile, for example, change their email address, name, etc. For each customer the company needs the name, residential and postal addresses, email, and home and work phone numbers.

A registered customer can search for cars. When searching for cars the customer can provide the date range (that is when the customer wants to pick the car and when the car will be returned to the company), the car type, etc. After choosing a particular car, the customer can submit a reservation request for that car. This reservation request is reviewed and approved by the Sales Manager using the system. The Sales Manager's decision (whether the application was approved or denied) is emailed to the customer. The basic data collected about online reservations is Date, customer's details, car details, pick up date, return date, and approval date. The Inventory Manager is responsible for adding, removing or updating the car details. The company records the car registration, description about the car, and the last recorded mileage for each vehicle. The mileage is updated every time the car is returned by the customer.

Apart from online booking, the company's salespersons can also reserve cars directly using the system. In this case the reservation does not require an approval from the Sales Manager. The reservation details recorded by the system include Date, customer's details, car details, pick up date, return date, and salesperson details.

- a) Create an event table showing the events of the ExtremeCars Booking System. [5 marks]
- b) Create a class diagram, showing the entity classes for the ExtremeCars Booking System. Show the classes, the relationship between the classes, the multiplicity of the relationships, and the attributes of the classes. [6 marks]
- c) Create a use case diagram for the ExtremeCars Booking System capturing the functional requirements. [4 marks]
- d) The following table shows the flow of events of the use case that is used by the Inventory Manager to update car details. Create a System Sequence Diagram (SSD) using the flow of events. [3 marks]

Description:	The inventory manager wants to update the details of a particular car.	
Actors:	Inventory Manager	
Flow of Events:	Actor	System
	1. The Inventory Manager (IM) enters the car registration. 2. The IM updates the car details 3. The IM submits the change	1.1 Search for the car 1.2 Display car details 3.1 Update the car details. 3.2 Display the updated car details

- e) Give examples of two non-functional requirements of this system. [2marks]

End of Exam