

BACS2033 Software Requirements Engineering 1

Tutorial 1	2
Tutorial 2	4
Tutorial 3	7
Tutorial 3 – Extra (Use case, use case description, state diagram)	15
Tutorial 4	23
Tutorial 5	27
Tutorial 6	32
Tutorial 7	34

Names:

Chan Jing Xing, Dylan Kong Jun Hong, Tan Siew Wei, Yap Wing Hong

Tutorial 1

Chapter 1

1. With the aid of an example, discuss the THREE (3) main dimensions of SRE.

The WHO dimension - Assign the responsibilities for the objectives, services and constraints among system-to-be components.

- The development team is responsible for the development of the systems functions. The staff are responsible for managing the stock and quantity of items. Admin is responsible for managing the staff and allocating their schedules and roles within the system.

The WHAT dimension - identify and define the system-to-be's functional services.

- The system will be able to let customers make purchases from 99 speedmart, and allow staff to manage stock, and add new products to the store.

The WHY dimension - identify, analyze and refine system-to-be's objectives.

- To develop a mobile application system for customers of 99 Speedmart. That allows users to have a more convenient experience with 99 speedmart by having access to 99 speedmart through a mobile application instead of needing to go to the store physically.

2. Recently you have been assigned to work on a project to implement an e-commerce system for a manufacturing company. This is the first time that your team ventured into this type of project implementation. You found that most of the client staff is not clear about the new system requirements. Furthermore, they were reluctant to accept the new system.

a) Discuss the requirements engineering process that your team would perform for the above mentioned project. State the output(s)(products) for each activity in the requirements engineering process.

1. Domain understanding & elicitation - Initial draft of system requirements.
2. Evaluation & agreement - Agreed document
3. specification & Document - SRS document
4. Validation & Verification - Project contract
5. Requirement change management - Requirement change form

- b) **Give and explain TWO (2) functional requirements and TWO (2) non-functional requirements for the above system.**

Functional requirements:

1. The system shall be able to receive customer orders
2. The system shall be able to track customer orders
3. The system shall be able to keep track of product stock

Non functional requirements:

1. Security: The system shall use two factor authentication when users log into the system
2. Development requirement: The system shall use Oracle DBMS to develop the system database

3. **Differentiate Process requirements from Product requirements.**

Product Requirement - is a constraint on the software to be developed. For example, Flexibility, the system allows users to login to the system using their google email account or their social media accounts instead of registering for an account.

Process Requirement - is a constraint on the development of the product. Example, the software will be complete within 4 months of development.

4. **Discuss any TWO (2) obstacles to good requirements engineering practice in a software project.**

- a. Due to lack of quantitative data on RE benefits and cost savings, progress in RE process is harder to measure than in design and implementation.
- b. Having a lack of time to perform RE due to tight schedules and deadlines.

5. **Give ONE (1) example for each part below to show:**

a. Overlaps of functional and non-functional requirement

- The system shall have two factor authentication in the account login function.

b. Overlaps of non-functional requirement

- Reliability and availability:
 - The system shall be accessible to users for 99.5% of the day
 - The system shall have downtime not more than 0.5% of the day

6. **Discuss the relationship of Agile Development with Requirements Engineering (RE).**

Agile development efficiency and speed is improved by doing more elicitation, evaluation, documentation and consolidation phases of requirement engineering cycles before development.

Tutorial 2

Chapter 2

1. Discuss why knowledge acquisition is a difficult process.

Knowledge acquisition is a difficult process because it has distributed sources, conflicting viewpoints, difficult access to key people and data, different background, terminology as well as culture, hidden needs or/ and irrelevant details, internal politics, competition, resistance to change.... pg5/50

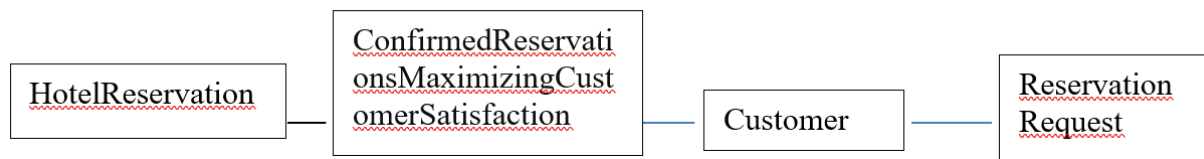
2. Explain **Scenarios** artefact-driven requirement elicitation technique. Discuss the pros and cons.

Use narrative style to explain (story telling).

pros - concrete example, narrative

cons - partially explained which does not cover the whole system, over specification, contains irrelevant/unnecessary information

3. Assume that you are going to adopt Knowledge Reuse requirements elicitation technique for an upcoming project to develop a library system. With the aid of a diagram and example, discuss **Reuse of Domain-Independent Knowledge** technique.



Object → Goal → Agent → Operation (Meta Level, independent of domain)

LateFees → LateBooksReturned → Borrower → PayLateFees (System Level)

Reuse of domain independent knowledge is reusing knowledge across a number of domains that are non specific and more general.

4. Assume that you have been assigned to lead a project team of 15 software engineers to develop an Online Hotel Room Reservation System for STAR Hotel. This is the first time your team ventures into this area. The management of the hotel wanted the new system to be ready in 6 months. Furthermore, after the initial requirements gathering exercise, you found that the top management of the client was very supportive to the upcoming project. However, the lower management and staff were not cooperative and showed resistance to the new system.

- a) Explain **TWO (2)** criteria you would use for stakeholder analysis.
 - personal interest - client (CEO) interested and very supportive to the upcoming project.
 - influence in system acceptance - the users (management staff who interested in new system to be ready in 6 months)
- b) State and explain **THREE (3)** stakeholders for the above mentioned system.
 - Manager
 - Front desk staff / receptionist

Hostel customer

- c) Suggest and explain **FOUR (4)** requirements elicitation techniques that your team would adopt for the project. Justify your suggestions. You may state any relevant assumptions to support your answer.

group session, open and close questions, do not ask biased questions

5. As a senior software engineer, discuss **FIVE (5)** guidelines for an effective interview to your juniors.

The guidelines for effective interviewing include:

- Identify the right interviewee sample for full coverage of issues. Interviewees have different responsibilities in their backgrounds, expertised in different fields/domains, tasks and duties, and the problems to be faced by them.
- interviewers should come prepared with questions, in order to focus on the right issue during the moment. A process of background study is to be prepared first so that the interviewer has knowledge of the interviewee's domain background, and is able to ask the right questions. The interview is supposed to design a sequence of questions prior to the interview.
- The interviewer ought to keep control of the interview, to prevent from going off track of the issues during the interview.
- Making the interviewee feel comfortable. From the start, the interviewer is advised to break the ice between two parties, by chatting about the interviewee's background, providing motivation and asking easy questions as a way to be friendly. When talking about issues, the interviewer should consider not only the roles, but the person too.
- The interviewer should focus on the interviewee's work and concerns, because he/she has different concerns and advises for the issue, and what they care about first.

6. Differentiate *Active observation* from *Passive observation*.

Passive observation is an elicitation technique where the observer has no interference with the task performers. Active observation on the other hand, has the observer actively being involved in the task they are observing, and actually participating in the task being observed.

7. With the aid of a diagram, discuss the activities involved in Requirements Elicitation Process.

The Requirements Elicitation Process starts above:

1. **Identify Stakeholders** - Determine all individuals or groups involved (e.g., clients, users, regulators).
2. **Gather Requirements** - Use techniques like:
 - **Interviews**
 - **Surveys**
 - **Workshops**
 - **Observation**
 - **Prototyping**
3. **Analyze Requirements**
 - Ensure feasibility, consistency, and relevance.
 - Resolve conflicts and clarify unclear aspects.
4. **Document Requirements**
 - Record in structured formats (e.g., SRS).
 - Use diagrams and use cases for clarity.
5. **Validate & Verify Requirements** - Confirm with stakeholders using:
 - Review meetings
 - Prototypes
 - Walkthroughs
6. **Manage Requirement Changes**
 - Handle evolving requirements systematically.
 - Analyze and approve changes to avoid disruptions.

Tutorial 3

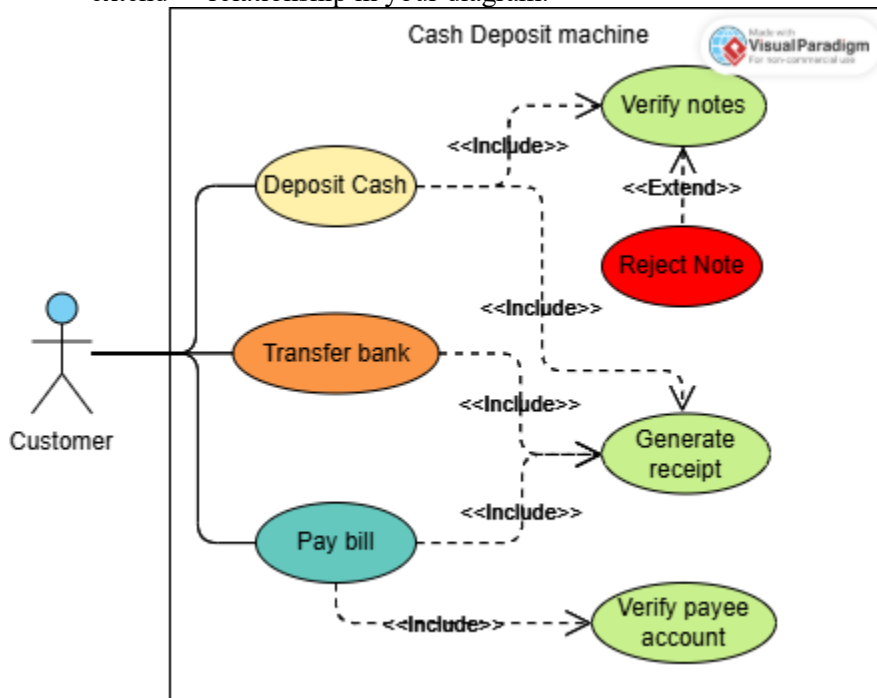
Chapter 3

1. Discuss any 4 common dimensions of requirements classification.
Functional or NonFunctional Requirements - Functional Requirements prescribe what services the software-to-be should provide. Whereas NonFunctional Requirements constraint on how such services should be provided in terms of quality, compliance, architectural and development requirements.
Product or Process Requirements -
Data Requirements - refers to the data and data structure needed for a development
External Requirements - refers to an interface requirements with hardwares, softwares and other users.
2. State the 4 types of conceptual models that discussed in lecture. Briefly discuss the usage and example(s) of each type.
 - I. Context Models
 - II. Interaction Models
 - III. Structural Models
 - IV. Behavioral Models
3. Discuss why should we perform requirements allocation?

Analyst must classify the requirements to various categories so that they can document and use the elicited documents appropriately. If the requirements are not used appropriately, it very much likely leads to confusing and conflicted requirements to be accepted by developers. When all these conflicted documents are developed into a program, it will not have a sturdy foundation and sound logic, which will cause a lot of bugs in the process of development. Thus, the program may not be delivered to the customer or flawed interpretation can happen.

4. The ABC bank provides a cash deposit machine for their customers to carry out a bill payment, transfer fund and deposit cash at any time. The system has the following *functionalities*:
- (Do dis)
- Verify deposited notes.
 - Deposit cash
 - Transfer fund bank
 - Reject notes
 - Pay utility bill
 - Verify payee account
 - Generate receipt

Analyze the above scenario and construct a *use case diagram* that depicts the functional requirements for the cash deposit machine. You are required to add <<include>> or <<extend>> relationship in your diagram.



5. The customer is allowed to place bus tickets reservation based on the bus schedule availability via online. If the bus schedule is available, the system will check the seat availability. If the seat is available, the system will request customer's personal details. The system will check the customer's status. If he or she is a new customer, the system will register the customer details into the system; else the customer can proceed to make the reservation.

Once the reservation transaction is done, the system will display the total amount payable and the customer should make online payment one day before the departure date and time; else the system will automatically cancel the reservation. Once the payment transaction is done, the system should be able to generate the online ticket receipt and the customer is required to print out the receipt as a proof.

Based on the case given above, construct a suitable *use case diagram* for the Online Bus Tickets Reservation System. Your use case diagram should include the following system functionalities:

- Register new customer
- Reserve bus tickets
- Cancel reserved tickets
- Make online payment
- Generate online ticket receipt
- Check the availability of schedule
- Check payment status



Use Case Name: Make reservation

Actor: Customer

Brief Description: This function allows customers to make bus ticket reservation

Pre-condition: Register an account, login

Main flow of events:

Actor action	System Response
1. Browse “make reservation” page	2. Load the “make reservation” page
3. Choose the reservation date	4. Check the availability of schedule

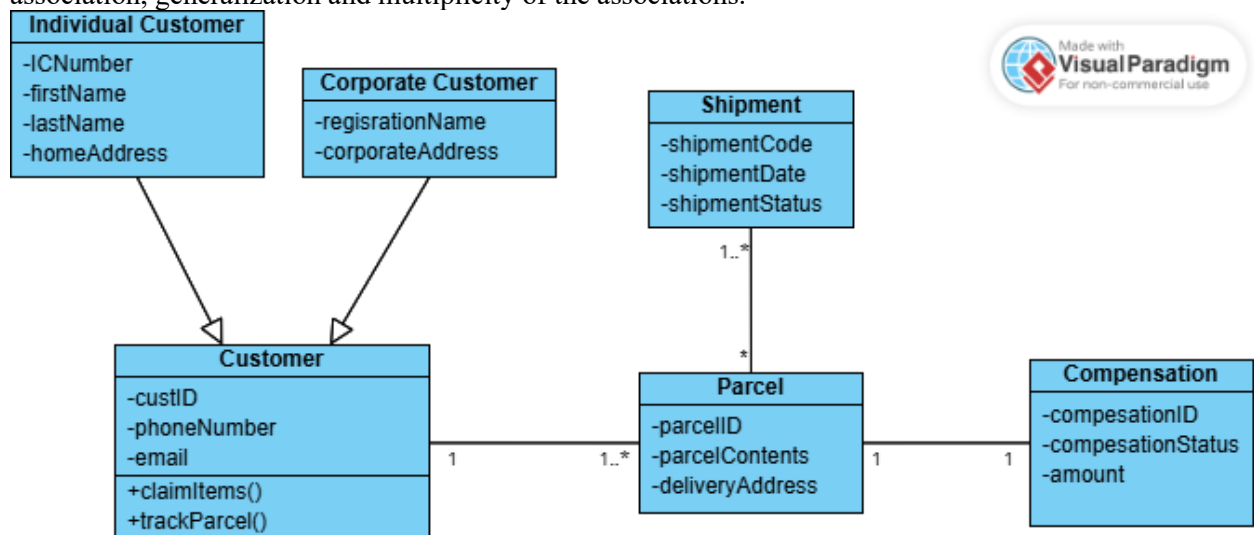
	5. If the schedule is available, the system prompt for seats
6. Choose the seats	7. Check the availability of seat 8. If the seat are available, the system request customer details
9. Enter the customer details	10. Validate the details 11. If details are valid, the system prompt for confirmation
12. Confirms reservation	13. The reservation is saved
<u>Alternative Flow of Events:</u> A1. Step 5: If the schedule is unavailable, the system will display an error message and return to step 3. A2. Step 8: If the seat is unavailable, the system will display an error message and return to step 6. A3. Step 11: If details are invalid, the system will display an error message and return to step 9. A4. Step 12: If the reservation is cancelled, the system will return to step 2.	



6. Construct an *analysis class diagram* based on the following description:

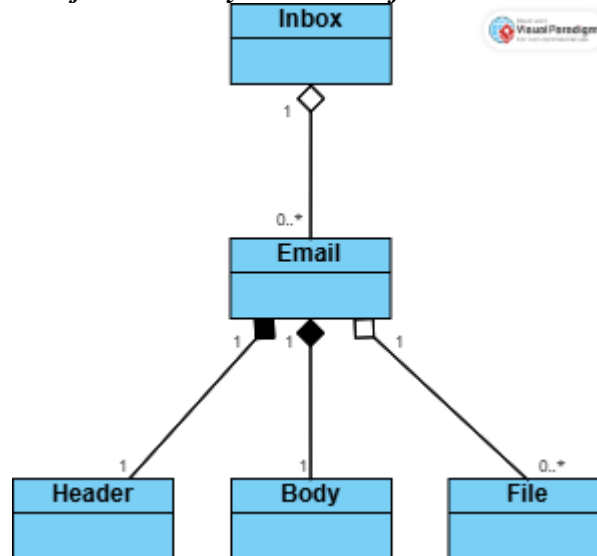
A customer can track the parcel location via online by entering the shipment code. There are two types of customers: individual customer and corporate customer. The shipment details such as shipment code, shipment date, shipment status and etc. will be stored in the system. The customer is allowed to claim compensation for damaged items.

The *analysis class diagram* should include entity classes with appropriate attributes, association, generalization and multiplicity of the associations.



7. Construct a relevant UML Class diagram to show **aggregation** or/and **composition** for the following:

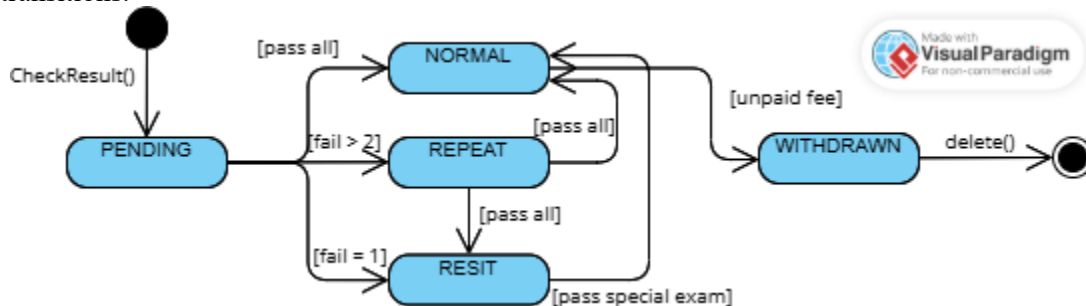
An email inbox has many incoming emails daily. Each email has a header, a body and optionally it may consist of one or many attachment files.



8. The examination center of ABC College releases the students' results at the end of each semester.

The students can proceed to the next semester if they **pass all the subjects for that semester** and the student's status is "**normal**". If the students **fail 2 or more subjects**, they cannot proceed to the next semester and the student's status is "**repeat**". However, if students **failed only 1 subject**, they can take the special examination that will be held 2 weeks time after the results are released and the student's status is "**resit**". Finally, if the students **did not pay the school fees for that semester**, they will automatically be withdrawn from their programme.

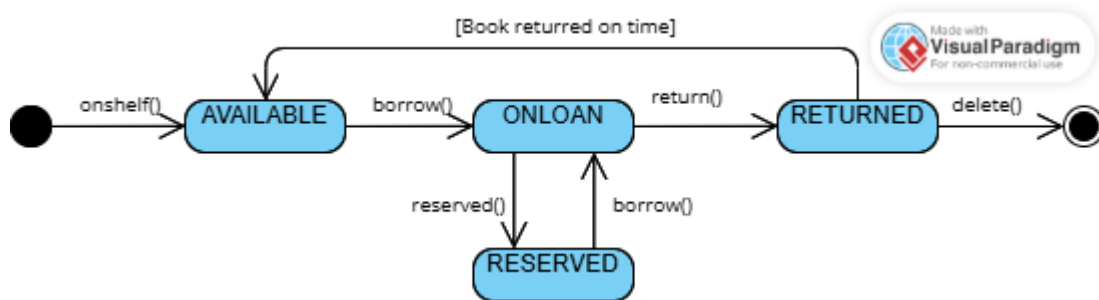
Based on the scenario described, draw a *state chart diagram* for the **Student** class. Your state chart diagram should include relevant states, events, guard conditions and show the state transitions.



9. Draw a *state chart diagram* for a **Book** class based on the following description:

A book is available on the shelf in library. When a member borrows a book, the book's state is on loan. Members can reserve books that are on loan. When the book is returned on time, the member who reserved the item can then borrow it.

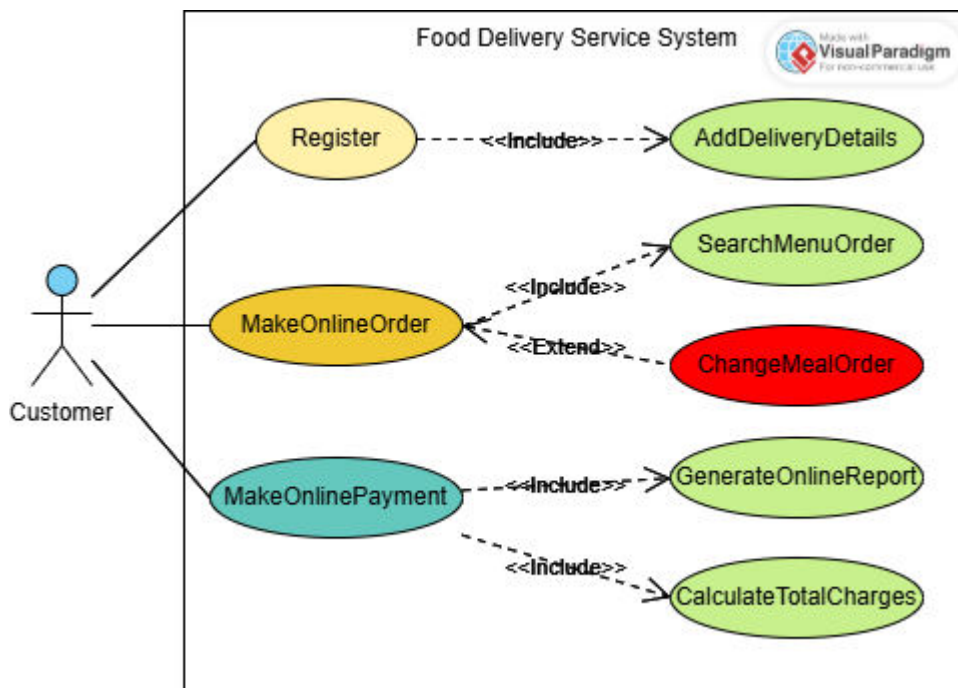
Your state chart diagram should include relevant states, events, guard conditions and show the state transitions.



10. Assume that you, as a project manager, are considering to adopt either Viewpoint-Oriented Analysis method or Object-Oriented Analysis method in requirements gathering and analysis for a project.
- Describe Viewpoint-Oriented Analysis in the requirement analysis process.
 - Evaluate the use of Viewpoint-Oriented Analysis method in requirements gathering and analysis.
 - Discuss the main tasks involved in Object-Oriented Analysis.
 - Suggest and briefly explain 2 approaches to identify objects and classify of objects.
 - Grammatical analysis of a natural description of a system**

Tutorial 3 – Extra (Use case, use case description, state diagram)**Chapter 3**

1. TaPao4U Sdn. Bhd. provides food delivery service to the customers in Klang Valley. They contracted with a variety of well-known restaurants in the Klang Valley to accept orders from customers and to deliver the complete meals. As the business continues to grow, the company realizes that they need a custom computer system to support their daily operations.
 - a) Construct a suitable *use case diagram* that is appropriate for the TaPao4U Sdn. Bhd. for the customers. Your use case diagram should include the following system functionalities:
 - Register a new member
 - Make online meal order
 - Make online payment
 - Generate online receipt
 - Change meal order
 - Search a meal order
 - Add delivery details
 - Calculate total charges



- b) Write a *use case description* to document the basic scenario for the main flow and alternative flow of events for the “Make online meal order” use case.

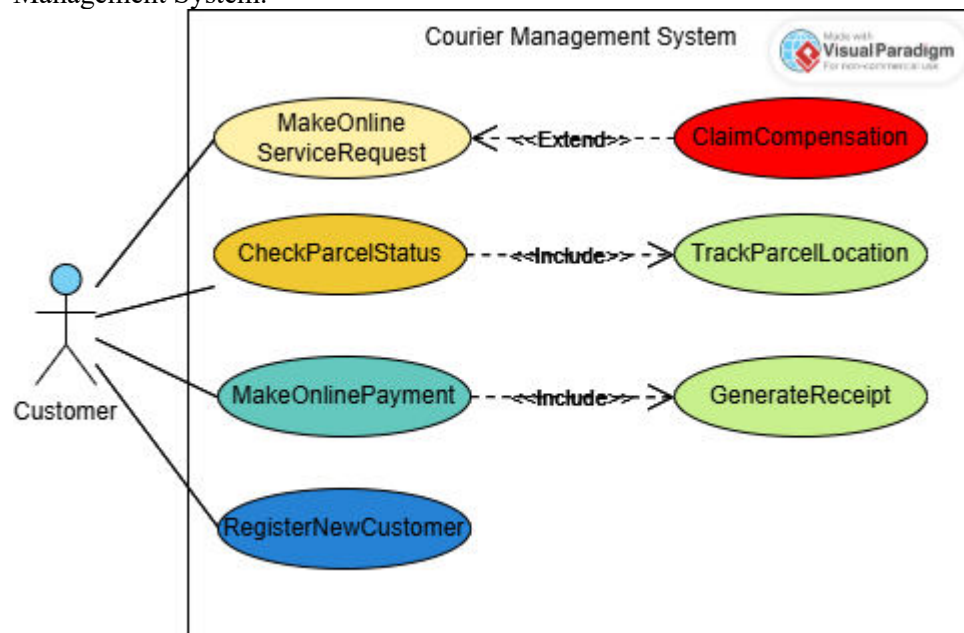
Use Case Name: Make online meal order	
Actor: Customer	
Brief Description: The system should allow customer to make online meal order	
Pre-condition: Register as a member	
<u>Main flow of events:</u>	
Actor action	System Response
1. Browse “Menu” page	2. Load the “Menu” page
3. Choose the delivery address	4. Validate the delivery address is within the Klang Valley 5. If valid, the system prompt to show the menu main page.
6. Search the item	7. Validate the searching item is within menu subsystem 8. If valid, the system displays the available menu
9. Select the menu item/ Enter the menu item details 10. Choose the quantity	11. The system prompt for confirmation
12. Confirm the order	13. The system save the order
<u>Alternative Flow of Events:</u> A1. Step 5: If the delivery address is not valid, the system displays an error message and return to step 3. A2. Step 8: If the searching item is not valid, the system displays an error message and return to step 6. A3. Step 12: If the customer cancels the order, the system will return to step 2.	

2. XYZ Company is one of the leading local courier companies. It provides next day delivery for its courier services; logistics and warehousing; international freight; Air and Sea; pick and pack and etc for its customers.

With the increasing of customer demands, XYZ Company would like to provide more satisfactory services to its customers. Thus, the Chief Executive Officer (CEO) of the company would like to enhance the existing Courier Management System with the following system functionalities that allow customers to perform via online:

- To track parcel location
- To check the parcel status
- To claim compensation for damaged items
- To make online service request
- To make online payment
- To generate online receipt
- To register a new customer

- a) Construct a *use case diagram* that depicts the functional requirements for the Courier Management System.



- b) Write a *use case description* to document the basic scenario for the main flow and alternative flow of events for “make online service request” use case.

3. You as the system developer in CITC have been asked to develop a new *registration system* for TARUC.

The new system allows students to **register for courses** and **view transcript** from personal computers attached to the Internet. At the beginning of each semester, students may **request a course catalogue** containing a list of course offerings for the semester. Information about each course, such as lecturer, department, and prerequisites, will be included to help students make decisions for the course registration. For each semester, there is a period of time that students can **change or maintain their schedule**. Students can access the system during this time to **add or drop courses**. Once the registration process is completed for a student, the registration system will **generate the student's bill** (based on the number of credits that they are registered for) and **sends information to the billing system**. At the end of the semester, the student will be able to access the system to **view an electronic transcript**.

The system also allows the lecturers to **sign up for the courses** which they will teach. They can **view the course schedule** which includes the students' name who registered for the course offered. In addition, the lecturers are also able to **record the grades of the students** for their courses.

The system will have the following functions:

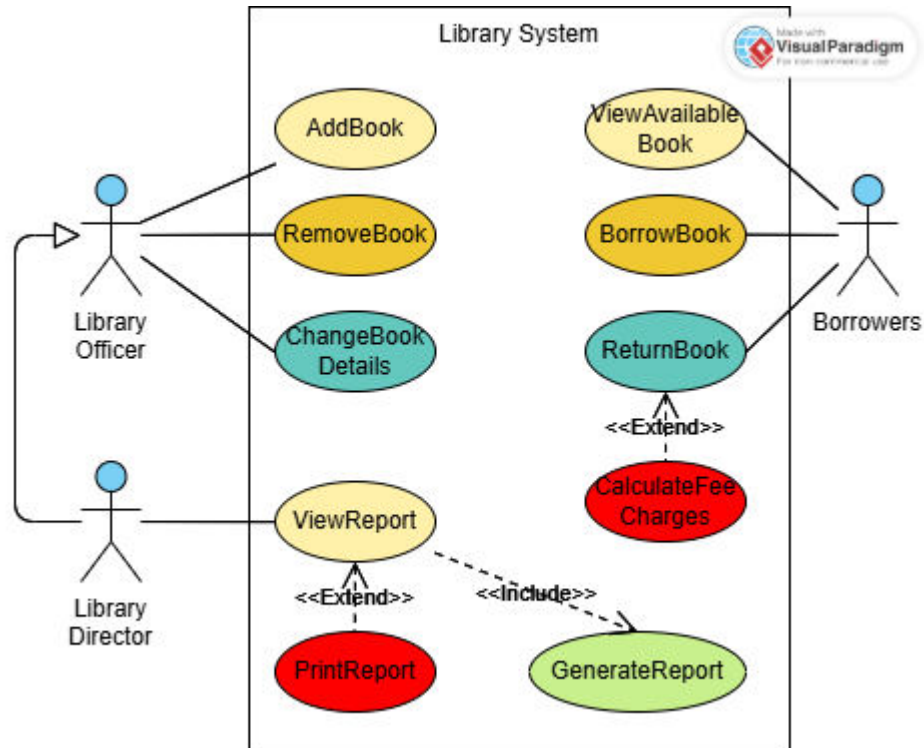
- Register course
 - Maintain schedule
 - Request course catalogue
 - View transcript
 - Sign up for course
 - Record grades
 - View course schedule
 - Generate bill
- a) Construct a suitable ***use case diagram*** that is appropriate for the **Registration System** for TARUC. Your use case diagram should include:
- **All** the use cases
 - **<<extend>>** and **<<include>>** relationships used
 - A **boundary** with a system name
 - Primary and supporting actors
- b) Write a *use case description* to document the basic scenario for the main flow and alternative flow of events for “Register course” use case.

4. You, as a senior system analyst, have been assigned to develop a **Library System** for Excel College. The system should allow the **library officers** to manage the book items in the library. The officers will add new book item(s) into the system whenever there is/are new shipment(s) of book item from book supplier(s). The library officers will perform book item inventory checking every 6 months to track for any outdated or lost items. After the inventory checking exercise, the library officers will use the system to remove the book items that are outdated or lost. The system should also allow the library officers to make changes on certain information on the book items when it is needed.

Besides that, the system should allow the **borrowers** to view currently available book items the library. With the new library system, the borrowers should be able to perform borrow and return book transactions by using the auto book check-in and check-out device. The system will automatically calculate the fine charges if there is late return case when borrower perform book check-in transaction at the device. **The library director can perform all the functions that can be performed the library officers.** Additionally, the library director is allowed to use the system to generate the Monthly Borrow Book Transaction Report and he/she can print the report if it is needed for further analysis purpose.

The system consists of the following main functionalities:

- Add book item
 - Remove book item
 - Change book details
 - Display available book
 - Borrow book
 - Return book
 - Generate Monthly Borrow Book Transaction Report
 - Print Monthly Borrow Book Transaction Report
 - Calculate late fine charges
- a) Construct a suitable *use case diagram* that is appropriate for the **Library System** for Excel College. Your use case diagram should include:
- All the use cases
 - <<extend>> and <<include> relationship used
 - A **boundary** with a system name
 - All Actors
 - Generalization



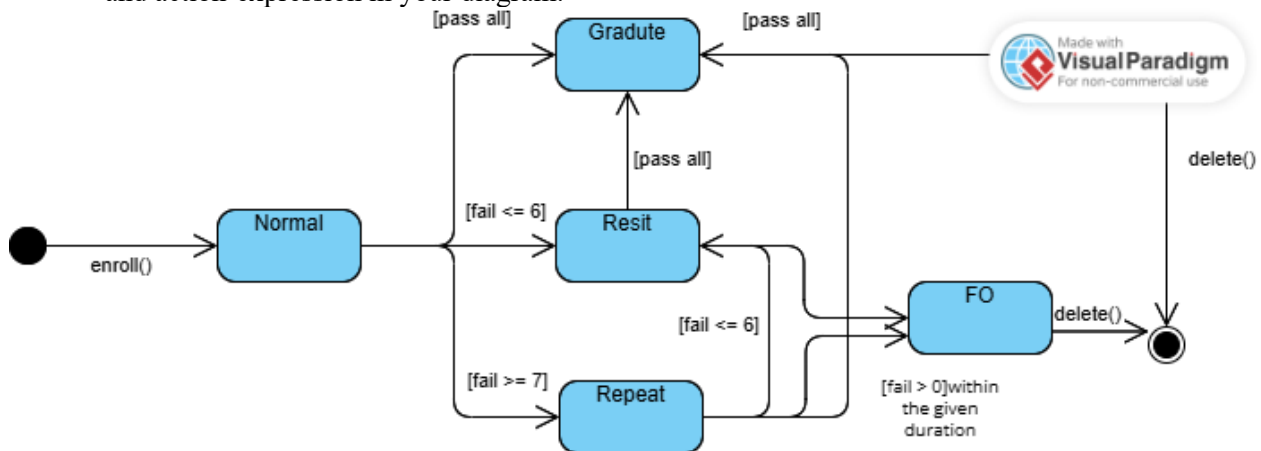
- c) Write a *use case description* to document the basic scenario for the main flow and alternative flow of events for “Borrow book” use case.

Use Case Name : Borrow Book	
Actor : Borrower	
Brief Description : The system shall allow the borrower to borrow books using check in / check out device	
Pre-condition : Registered member of the library	
Main Flow of Events :	
Actor Action	System Request
1. Browse the “Borrow book” page	2. Load the “Borrow book” page
3. Scan the student ID	4. Validate the student ID 5. If student ID is valid, the system prompt to scan the books
6. Scan the book	7. Validate the book 8. If books are valid to be borrowed, the system prompt to confirm transaction

9. Conform the transaction	10. Save the records
Alternative Flow of Events : A1.step 5 : If student ID is invalid, the system displays an error message and returns to step 2 A2.step 8 : If books are not valid to be borrowed, the system displays an error message and returns to step 6 A3.step 9 : If the user cancel the transaction, the system return to step 2	

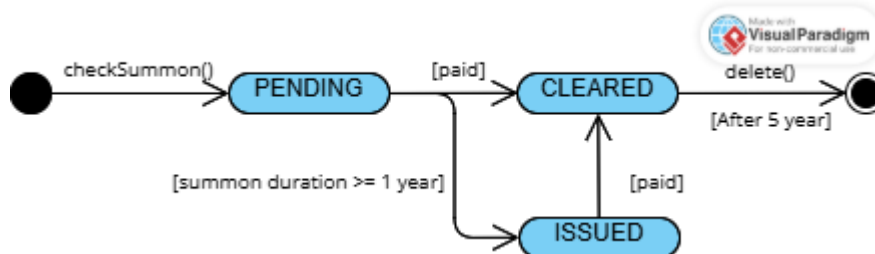
5. A student can only enroll for a programme per intake. On enrollment, the student's status is "Normal". If the student passed all the subjects, the student's status is "Graduate", if not, the student's status is either "Repeat" (fails 7 or more subjects) or "Resit" (fails 6 or less subjects). For the "Repeat" or "Resit" students, if they passed all subjects within the given duration, then the student's status will be "Graduate". Otherwise, the student's status will become "FO" (failed out).

Construct a *state chart diagram* for **Student** class. Include event name, guard-condition and action-expression in your diagram.



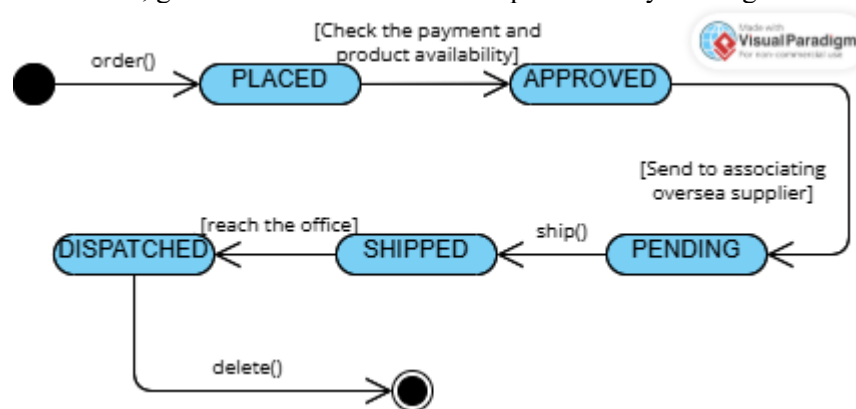
6. A country recently would like to implement an online Automated Enforcement System (AES) which include services such as check and pay summon. The system will help the users to check their recent five years summon records. After five years, the record will be deleted from the system. If summon is not paid within a year, the user will be issued a letter to attend a court defend. Once summon is paid, it will be checked as "Cleared".

Construct a *state chart diagram* for **Summon** class in the AES. Include event name, guard-condition and action-expression in your diagram.



7. MyWarehouse.my is an online ordering system which collaborates with suppliers from different countries such as United Kingdom (UK), United States (US), Canada, New Zealand and Australia. MyWarehouse.my negotiates best price offered by suppliers and sell its products through their online portal for a period of time with deadline given. The customer can place order within the offered time. Once the customer has placed the order, they can check the order status from their account. MyWarehouse.my will check the payment and product availability before approve the order. After the order is approved, it will be sent to the associating overseas supplier. The order status will be changed from “Approved” to “Pending”. Once the deadline is expired, MyWarehouse.my will collect all the orders from the customer and inform the suppliers on the quantity to deliver. All products will be shipped directly from overseas supplier to MyWarehouse.my office in bulk. The order status will then be changed to “Shipped”. Once the products reached the office, MyWarehouse.my will then dispatch it to individual customer through local courier service. The customer can see “Dispatched” status in their account.

Construct a *state chart diagram* for an order in the MyWarehouse.my. Include event name, guard-condition and action-expression in your diagram.



Tutorial 4

1. Your software company has recently secured a project to develop an online banking system for a local bank. Assume that your team is at Requirements Validation phase now and your team has identified some inconsistency and conflicts problems on the requirements that gathered from the previous phase.

- (a) With the aid of examples, differentiate the three common types of inconsistency in requirements, i.e. Terminology clash, Designation clash and Structure clash.

Terminology clash: This occurs when different terms are used to refer to the same concept. Eg, Inconsistent use of terms such as “**userID**” and “**account number**” for identifying users in the system.

Designation clash: This happens when the same term is used differently by various stakeholders, causing confusion. Eg. one team member uses the term “**account closure**” to mean disabling an account temporarily, while another assumes it means deleting the account entirely.

Structure clash: Structural clashes arise when requirements are organized inconsistently or contradict each other. Eg. One requirement specifies a 4-digit PIN for login, but another requires a two-factor authentication process, such as authenticating through the users phone after.

- (b) What are the activities that your team would perform in *managing requirements conflict* for the project?
 - (c) The table below shows the risk likelihood, consequences and severity information for one of the identified risks for the above project. Calculate the *risk exposure* for each independent consequence. What is the *overall risk exposure*? You are required to show all your workings clearly. All the values should be rounded up to 3 decimal points.

Risk : “*The online banking system fails to perform the intended operation*”

Consequences	Risk likelihood		
	Likely (0.8)	Possible (0.5)	Unlikely (0.2)
Unsatisfactory customers	10	8	6
Bad reputation	8	8	4
Number of customers decreased	6	6	2

Note: Assume that the scale of severity level are 10, 8, 6, 4 and 2 for catastrophic, severe, high, moderate and low respectively.

2. Explain any **TWO (2)** conflict resolution tactics. (Use examples for your explanation)
3. With aid of examples, differentiate *product-related risk* from *process-related risk*.

Product-related risk refers to the negative impact on functional and non-functional objectives of the system. For instance, the scenario of failure to calculate transaction fees, as there are some performance or scalability limitations(system overload, memory or storage constraints), coding errors, or data related errors during run time. Whilst **Process-related risk** refers to the negative impact on development objectives. For example, the cost overruns for this system to be developed(undefined scope, ineffective project management and inaccurate cost estimates, etc), and the scenario of a delayed delivery of the developed system(poor planning and estimation, requirement issues, etc).

4. Stages involved in *Risk Management* of requirements engineering



Tutorial 4 (Cont')

5. You are given the following risk Impact matrix and Effectiveness matrix for a project, complete the matrices. Show your workings clearly. All the values should be rounded up to 3 decimal points.

Objectives	Risk			Loss of objective
	System failure (likelihood: 0.3)	System provide inaccurate data (likelihood: 0.5)	System attack by unauthorized personnel (likelihood: 0.3)	
Improve customer services (weight : 0.3)	0.5	0.7	0.5	$0.3*[(0.5*0.3)+(0.7*0.5)+(0.5*0.3)]$ = 0.195
Clients P&C data will be protected (weight : 0.4)	0.1	0	0.9	$0.4*[(0.1*0.3)+(0*0.5)+(0.9*0.3)]$ =0.12
Improve staff job satisfaction (weight : 0.3)	0.7	0.2	0.3	$0.3*[(0.7*0.3)+(0.2*0.5)+(0.3*0.3)]$ =0.12
Risk Critically	$0.3*[(0.5*0.3)+(0.1*0.4)+(0.7*0.3)]$ = 0.12	$0.5*[(0.7*0.3)+(0*0.4)+(0.2*0.3)]$ = 0.135	$0.3*[(0.5*0.3)+(0.9*0.4)+(0.3*0.3)]$ = 0.18	

Countermeasures	Risk			Overall Effect of countermeasure
	System failure (likelihood: 0.3)	System provide inaccurate data (likelihood: 0.5)	System access by unauthorized personnel (likelihood: 0.4)	
Install firewall	0	0	0.9	$[(0*0.12) + (0*0.135) + (0.9*0.18)]$ = 0.162
Systematic & detailed system testing by QA team	0.8	1	0	$[(0.8*0.12) + (1*0.135) + (0*0.18)]$ = 0.231
Software re-engineering	0.7	0.8	0.2	$[(0.7*0.12) + (0.8*0.135) + (0.2*0.18)]$ = 0.228
Combined risk reduction	$1-[(1-0)*(1-0.8)*(1-0.7)]$ = 0.94	$1-[(1-0)*(1-1)*(1-0.8)]$ = 1	$1-[(1-0.9)*(1-0)*(1-0.2)]$ = 0.92	

Tutorial 4 (Cont')

6. You, as a project manager, are in the midst of evaluating and prioritizing the software requirements for a project.

Assume that the software options to be evaluated are: “Get customer feedbacks by email” or “Get customer feedbacks by e-form”. The evaluation criteria are *Fast Response*, *Response Rate* and *Reliable Response*. The significance weighting for the above three criteria are 0.20, 0.30 and 0.50 respectively.

The estimating option scores for “Get customer feedbacks by email” on the three criteria are 0.60, 0.30 and 0.40 respectively. On the other hand, the estimating option scores for “Get customer feedbacks by e-form” on the three criteria are 0.80, 0.70 and 0.40 respectively.

- (i) Prepare a weighted matrix for estimating the **total score** of each option on each evaluation criterion. You are required to show all your workings clearly. All the values should be rounded up to 3 decimal points. (9M)

Factors	Weight	<i>Get customer feedbacks by email</i>	<i>Get customer feedbacks by e-form</i>
Fast Response	0.20	0.60	0.80
Response Rate	0.30	0.30	0.70
Reliable Response	0.50	0.40	0.40
Total Score	1.0	$0.2(0.6)+0.3(0.3)+0.5(0.4)$ = 0.41	$0.2(0.8)+0.3(0.7)+0.5(0.4)$ = 0.57

- (ii) Which is the best software option? (1M)

Evaluate the importance of **requirements prioritization**.

requirements prioritization importances:
 conflict resolution
 resource limitations
 incremental development
 replanning due to unexpected problems

Tutorial 5

Chapter 5

1. Natural language is one of the commonly used techniques for requirement documentation (RD). Discuss 2 advantages and 2 disadvantages of natural language.

Advantages	Disadvantages
Ease of understanding <ul style="list-style-type: none"> - It allows stakeholders with diverse technical backgrounds to comprehend the requirements without needing technical expertise. 	Ambiguity <ul style="list-style-type: none"> - It is prone to misinterpretation, as words and phrases may have different meanings to different readers. This can lead to inconsistent understanding among stakeholders.
Flexibility and expressiveness <ul style="list-style-type: none"> - It allows for a detailed and descriptive explanation of requirements, including complex scenarios and exceptions, without being constrained by grid structures. 	Lack of structure <ul style="list-style-type: none"> - Requirements written in natural language may lack a formal structure, making it harder to systematically analyze, prioritize and test them. Which can result in incomplete or poorly organized documentation.

2. Recently you have been assigned to work on a project to implement an online airline ticketing system. Assume that your team has reached Requirements Specification phase, prepare a requirements document template that you would use for preparing the requirements document for the project.
3. Diagrammatic technique is another commonly used technique for producing RD.
 - (a) Discuss why software engineers would usually use more than one diagrams in preparing RD?
Software engineers use multiple diagrams in Requirements Documentation to provide different perspectives on the system, such as functionality, data relationships and interactions. This ensures that clarity, reduces ambiguity and meets the needs of various stakeholders.
 - (b) Assume that your team has decided to adopt diagrammatic approach on requirements documentation, recommend **FOUR (4)** diagrams that you would include in the requirements documentation for a project. Explain each of the recommended diagrams by specifying its usages and the information presented in the diagram.

Diagrams	Usage	Information
1. Use Case Diagram	Shows interaction between users and the system.	Represents user roles, system features and the relationship between them, helping identify functional requirements.
2. Class Diagram	Defines the system's data structure.	Displays system classes, their attributes, methods and

		relationships, aiding in database and object-oriented design.
3. Sequence Diagram	Models interactions over time.	Illustrations the flow of message between system components or actors for specific processes, clarifying dynamic behaviors.
4. Entity-Relationship Diagram (ERD)	Represents data and its relationships.	Details entities, attributes and their relationships in the system, useful for database design.

(c) Evaluate the use of diagrammatic approach on requirements documentation.

chapter 5 - slide 65

(d) Give and explain **ONE (1)** example of inter-view diagrams consistency rule between Context Diagram and DFD.

Every data in a flow or repository of a DFD Diagram must be declared as entity, attribute or relationship in an ERD diagram.

4. Formal Specification on Requirements Documentation:

(a) Differentiate between Algebraic approach and Model-based approach in formal specification.

Algebraic Approach

Model-based Approach



Tutorial 5 (Cont')

- (b) Suggest a project scenario where formal specification is applicable. Justify your answers.
 - (c) Discuss the **TWO(2)** reasons why formal specification approach is not commonly used for requirements documentation.
 - (d) Explain any 2 advantages of formal specification.
5. Comment on the two quality requirements from the RD (as below) that prepared by your project team. Suggest how would you improve the following quality requirements:
- a) **Performance**
The system shall have fast respond time to any authorization request.
The system shall process and respond to any authorization request within 2 seconds.
 - b) **Reliability**
The system shall have low system down time.
The system shall maintain an uptime of 99.9% annually excluding scheduled maintenance.
6. What is quality trade-off? Use example to explain your answer.
7. Discuss any **THREE (3)** guidelines for writing excellent requirements that are covered in lecture.

Three guidelines for writing excellent requirements are:

System or user perspective: is to write functional requirements from the perspective of either something does or something the user can do. For example, "The system shall send real time notification to remind the user to charge the phone battery".

Writing Style: is to write the functional requirements with clarity and consciousness. The requirements sentences need to include the keyword shall, such as "The system shall....", and also in active voice sequence, for instance "subject→verb→object". The requirements are to be elicited individually without the use of "and, or, unless, except, but".

Representation techniques: is to always consider the most effective way to communicate each requirement to the intended audience. The representation of requirements can be done using natural language, modelling, tables and list, or media to give the audience a visual representation of the written requirements.

8. XYZ College organizes a free seminar entitled "Programming is Fun" to the public. Given the use case diagram as shown in Figure 1, construct an *analysis sequence diagram* that shows the normal flow of events for the use case "Register a seminar".

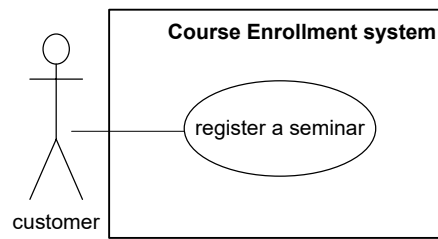
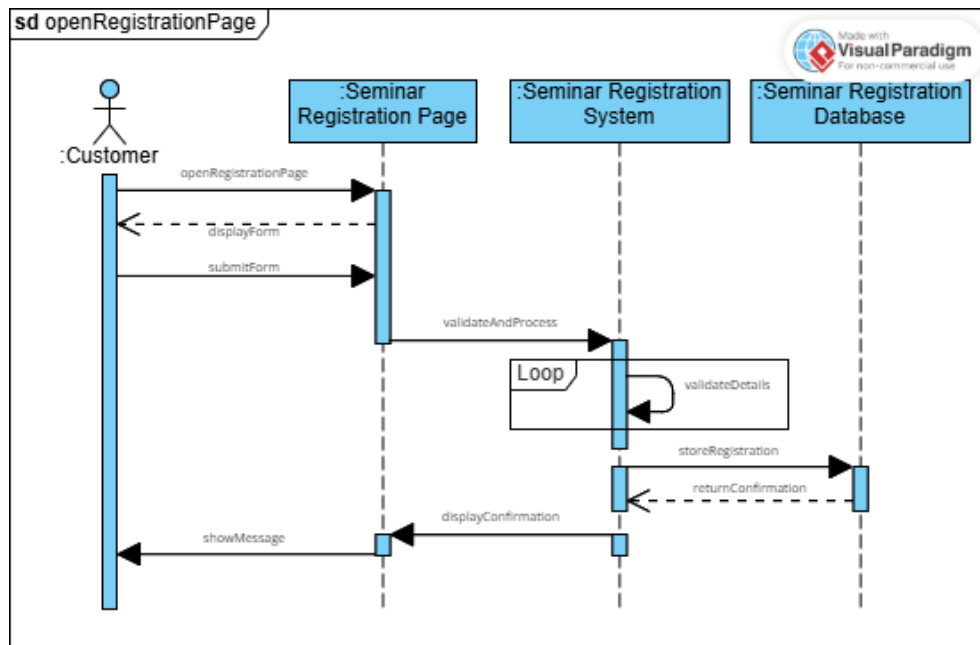


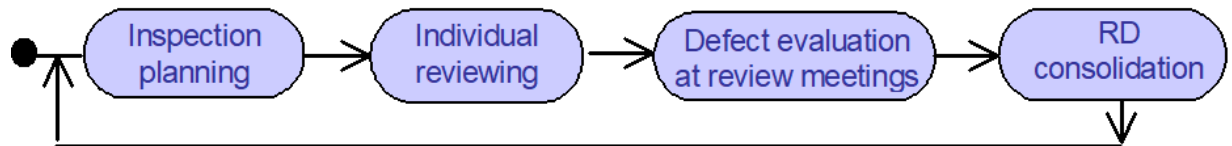
Figure 1



Tutorial 6

Chapter 6

- Discuss the main outputs of Requirements Quality Assurance stage to your team.
 - consolidated RD
 - acceptance test data, prototype
 - development plan
 - project contract
- With the aid of a diagram, explain the FOUR (4) activities that involved in **Requirements Inspection** process to your team members.



- Discuss any **FIVE (5)** items that you would consider to be included in the **defect-driven checklist** for RD.
 - Conflict / contradict
 - Consistency
 - OverSpecification
 - Unmeasureability
 - Ambiguities
- As your project team is going to adopt diagrammatic approach on requirements documentation, suggest and discuss **ONE (1)** inter-diagrams and **ONE (1)** intra-diagram check that you would include in your requirements checklist.
 - Inter-diagram check : Consistency
 - Intra-diagram check : Notation/format/completeness/correctness
- Explain the differences of Mock-up Prototype and Proof-of-Concept Prototype.

Criteria	Mock-up Prototype	Proof-of-Concept Prototype
Definition	UI-navigation with no function	One unit-implements all layers functions
Alternative Name	Horizontal Prototype	Vertical prototype
Purpose	To validate the requirements	Feasibility

- Use relevant examples, discuss the differentiate Model Validation from Model Verification.

	Model Validation	Model Verification
Factors	Validation of requirements models assesses whether you have drawn the	Verification determines whether you have drawn the requirements models

	right requirements models.	right; your requirements models have the desirable properties.
--	----------------------------	--

7. Suggest **TWO(2)** guidelines for defining Acceptance Criteria of Acceptance Testing.
- Specific high-priority functionality that must be present.
 - Essential nonfunctional criteria or quality metrics that must be satisfied.
 - Remaining open issues and defects.
 - Specific legal, regulatory, or contractual conditions.
 - Supporting transaction, infrastructure, or other project (not product) requirements.

Tutorial 7

Chapter 7

1. Discuss any **THREE (3)** reasons why do requirements change in a software project.
 - a. Business - growth, change of management.
 - b. Context - from physical to online mode.
 - c. Technologies - new technology advancements
 - d. Markets - new demand/trend changing
2. Discuss any **TWO (2)** impacts of requirements change.
Chapter 7 - slide 16
3. As part of the activities to improve the software product's quality in your software company, you have suggested to your top management on implementing requirements traceability management system.
 - (i) Discuss **TWO (2)** possible challenges of implementing requirements traceability in your software company.
 - a. Various stakeholders require different information,
 - b. Huge amount of requirements and traceability information must be tracked and maintained.
 - c. Manual creation of links is very demanding - Likely the most annoying problem.
 - d. Specialized tools must be used
 - e. Integrating heterogeneous models/information from/to different sources (requirements, design, tests, code, documentation, rationales...) is not trivial.
 - f. Requires organization commitment (with an understanding of the potential benefits).
 - (ii) Differentiate between *forward traceability* and *backward traceability*.
4. **"Requirements cannot be managed effectively without requirements traceability".**
Do you agree with the above statement? Discuss.
 - I. Prevents losing knowledge.
 - II. Impact analysis.
 - III. Support the verification process (certification, localization of defects).
 - IV. Change controls.
 - V. Process monitoring (e.g. missing links indicate completion level).
 - VI. Improved software quality (make changes correctly and completely).
 - VII. Reengineering (define traceability links is a way to record reverse engineering knowledge).
 - VIII. Reuse (by identifying what goes with a requirement: design, code...).
 - IX. Risk reduction (e.g. if a team member with key knowledge leaves).
5. List and explain the **FOUR (4)** main activities involved in **Requirements Traceability Management**.
6. Differentiate **Project Metrics** from **Quality Metrics**.
7. List **FIVE (5)** capabilities of RM Tool. Discuss the benefits of RM Tool.