18/11/19

Advanced Software Testing

Basic Aspects of Software Testing

① S/w testing is a process of checking and analyzing a S/w program or application
② S/w testing is a process of verifying and validating a S/w program or application
③ S/w testing finding defects, flows and errors
④ A defect is a variance between the expected and actual result

Waterfall Model

① Business Requirements
   ① The expected output
   ② Exactly the client wants
   ③ Client requirements
   ④ initial requirements of the client

② Software Requirements
   ① H/w components
   ② S/w resources

③ End product of Requirements
   ① Requirement phase
   ② S/w testing life cycle
   ③ Test case design and development
   ④ Test Execution
   ⑤ Test closure
   ⑥ Test process Analysis

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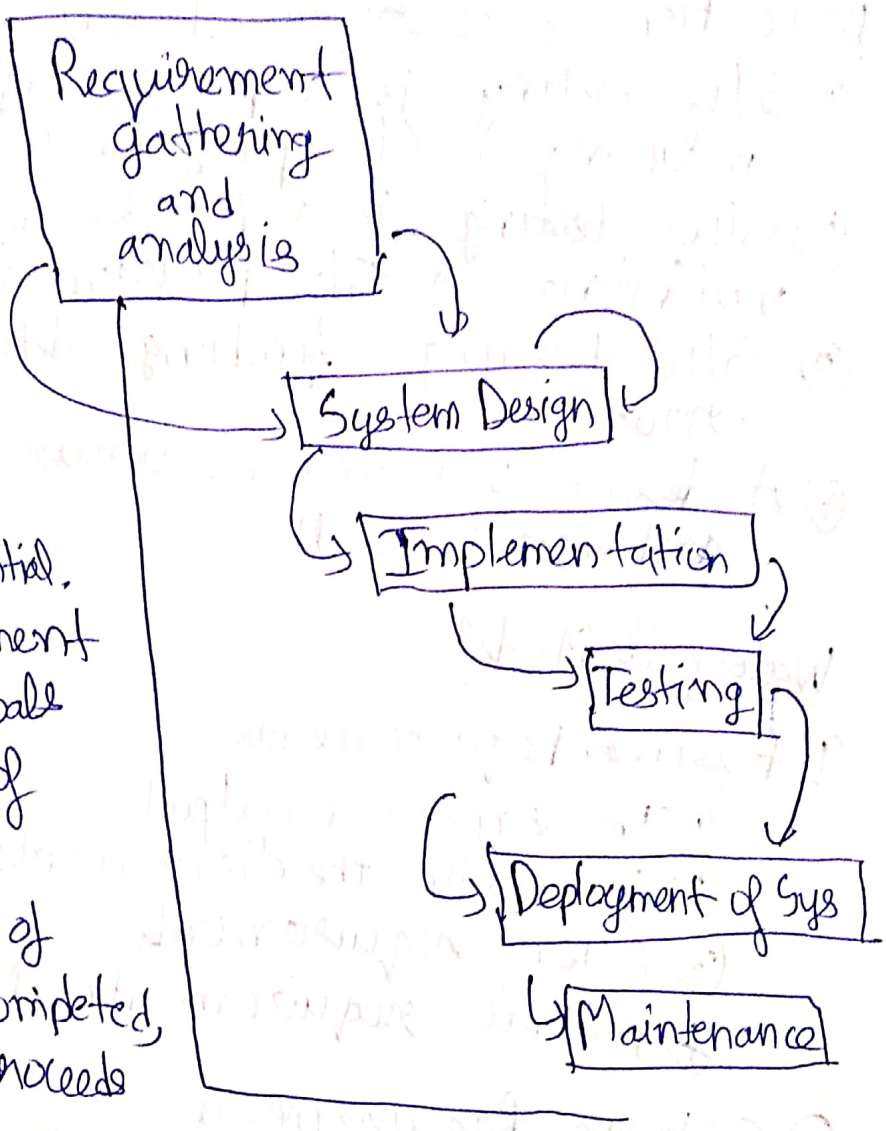
Waterfall Model



① The WFM is popular version of SDLC model of SE

② WFM describes a development method that is linear and sequential.

③ WFM development has distinct goals for each phase of development.

④ Once a phase of development is completed, the development proceeds to the next phase and there is no turning back.

Advantages

① This model is simple and easy to understand.

② In this model phases are processed and completed one at a time.

③ Phases do not overlap

④ WFM works well for smaller projects where requirements are well understood.

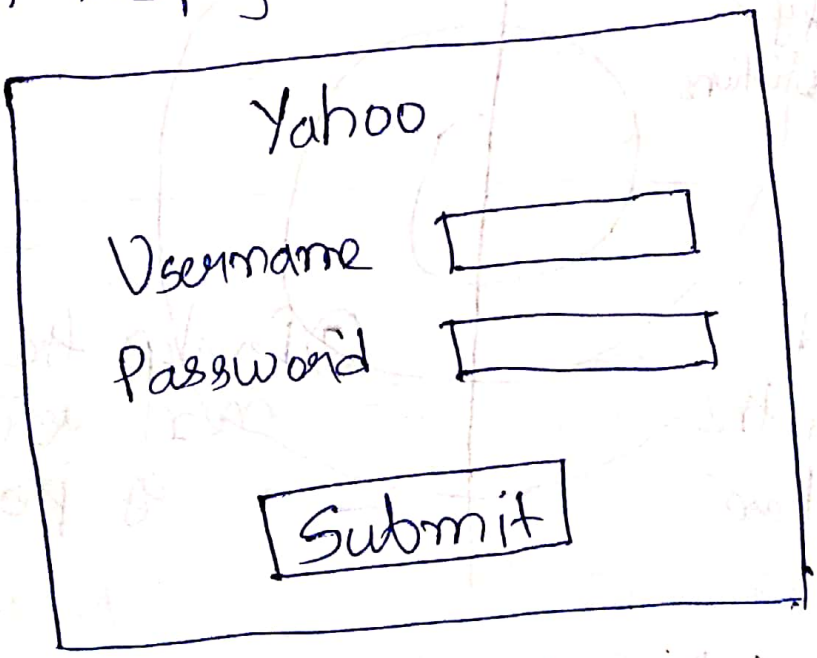
⑤ It is easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.

Disadvantages :-

1. Once the application is in testing stage. It is very difficult to go back and change the stage or process or phase
2. High amounts of risks and uncertainity
3. Not a good model for complex or big projects
4. Poor model for long projects
5. Not suitable for the projects where the requirements are at a moderate to high risk of changing

When to use :-

1. This model is used only when the requirements are very well known clear and understood
2. Technology is very well understood and fixed.
3. When the project is not too long



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Spiral Model

① Spiral Model is one of the most important model in SDLC

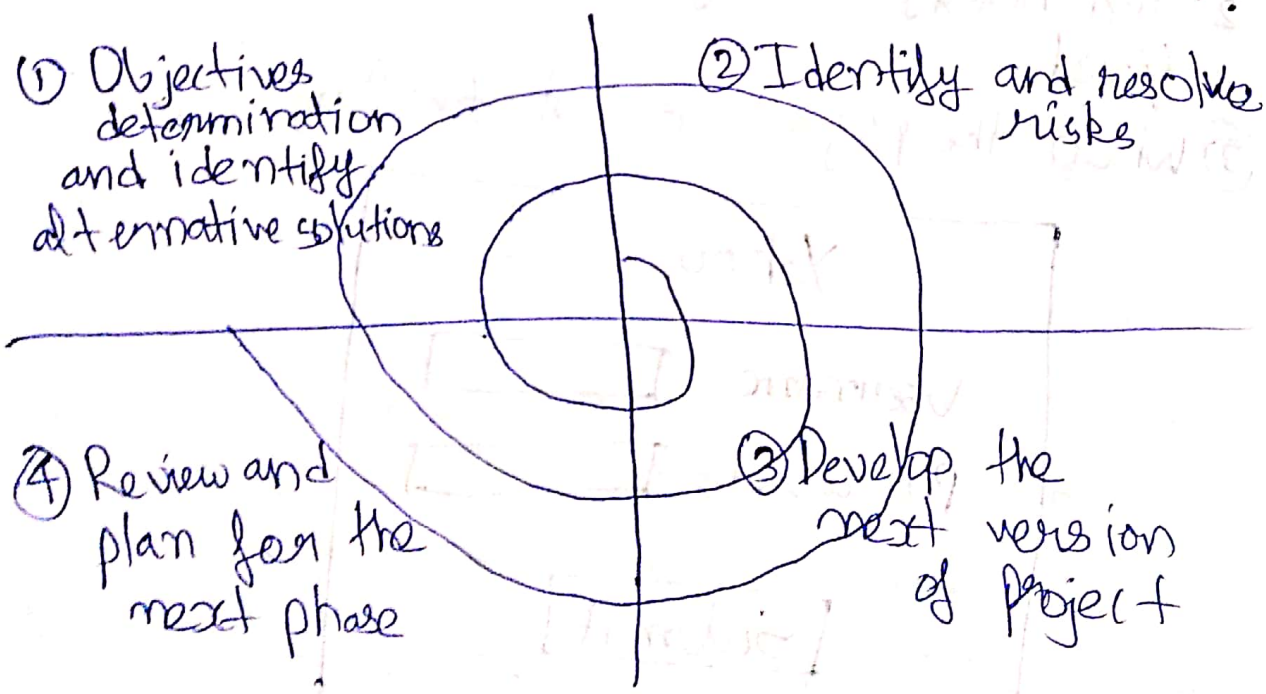
② Which provides support for Risk Handling

③ In this model it looks like a spiral with number of loops.

④ The exact number of loops is unknown and can vary from project to project.

⑤ Each loop is called a phase.

⑥ The exact number of phases needed to develop the product can be ~~verified~~ varied by the ~~product can~~ project manager depending upon the project risks.



① Objectives determination and identify alternative solutions :-

ⓐ Requirements are gathered from customers

(b) Objectives are identify
(c) Analyzed at the start of every phase.

(2) Identify and resolve risks :-
(a) All possible solutions are evaluated to select the best possible solutions
(b) prototype is built for the best possible solution

prototype – a small model

(3) Develop the next version of the project
(a) identified features are developed and verified through testing the next version of software will be available

(4) Review and plan for the next phase
(a) The customers evaluate the so far developed version of the software
(b) In the end, the planning for the next phase is started.

Advantages

(1) Risk handling → The projects with many unknown risks that occur.
(2) development proceeds.
(3) Good for large projects
(4) Complex projects are done using this model.
(5) Customer satisfaction.

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Monkey testing

Agile Model :-

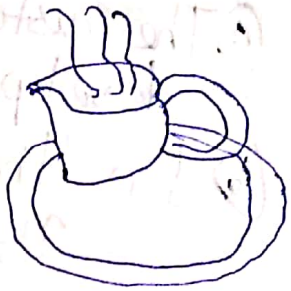
1. Combination of Spiral and Incremental model.
2. Extreme programming (XP)
3. Web Application

Big Bang Model :-

→ No experience, No knowledge the project is done

Agile

1. Agile model is also type of incremental model.
2. S/w is developed in incremental, rapid cycles.
3. This results in small incremental releases with each release building on previous functionality



4. Each phase is throughly tested to ensure s/w quality is maintained
5. It is used for time critical applications
6. Extreme programming is used. (XP) → Web application

Advantages of Agile Model :-

1. Customer satisfaction by rapid, continuous delivery of useful software,

② Customers, developers and testers constantly interact with each other
③ Working s/w delivered frequently (weeks rather than months).
④ face-to-face conversation is the best form of communication
⑤ daily cooperation between business people and developers.
⑥ Continuous attention to technical excellence and good designs.

Disadvantages of Agile Model

① Only sr. programmers are capable of taking the decisions required during development process.
② There is lack of emphasis on necessary designing and documentation
③ The project can easily get taken off track if the customer is not clear what final output he wants.

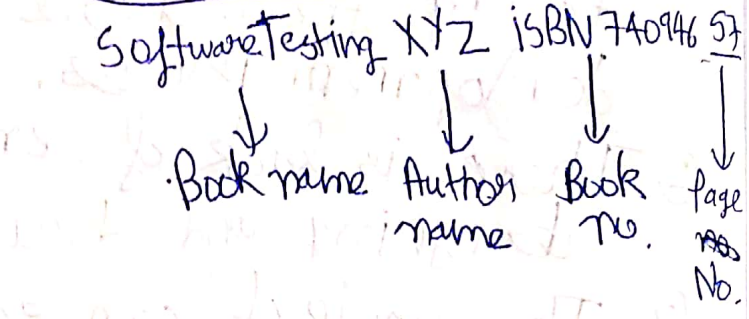
Metrics and Measurement

(1) Metric → what to measure? including data type, scale and unit

(2) Measuring method → The description of how we are going to get data.

(3) Measurements → The actual values collected

(1) Ex :- (1) Size of a book
(2) Number of pages – 57
(3) Measuring method - look at the last page no.
(4) Measurement → Book name Price No. of pages Author name



(1) Measurements are derived from raw data such as timesheets, incident reports, test logs and Work sheets.

(2) by counting the number of log sheets for passed test procedures

(3) counting the number of incident reports

(4) Measurements about progress
(a) Test planning and Monitoring
(1) Test commenced
(2) Test completed

(b) Test development

(c) Test execution and reporting No. of executed procedures.

Ex :-

(1) How many dejects exist within the module?

(2) How many test cases are executed per person?

(3) What is the ~~tes~~ test coverage?

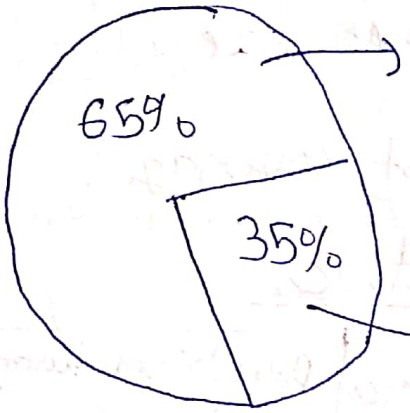
Ex :- S/W Testing Metrics

S.No	Testing Metrics	Data retrieved during test case dev & exe
1.	No of requirements	15
2.	Avg No. of test cases written per requirement	20
3.	Total no. of test cases written	100
4.	Total no. of test cases executed	65
5.	No. of testes cases passed	30
6.	No of test cases failed	26
7.	No. of test cases Blocked	9
8.	No. of test cases unexpected	35
9.	Total no. of defects	30
10.	High defect count	10
11.	Medium	6
12	Low	8

Formulas for calculating metrics

① % ge Test cases Executed

② % ge Test cases Exe = $\left(\frac{\text{No. of Test cases exe}}{\text{Total no. of test cases written}}\right) * 100$



total no. of test cases exe

No. of test cases unexe

Pie chart

Big Bang Model

In this model we not follow any model the students who follow the experiment models

Advantages

1) This is very simple model.
2) No planning is required.
3) Very few resources are used
4) It is a good learning aid for students and new corner
5) Web designing app are used.

Disadvantages :-

① Very high risk & uncertainity
② Not a good model for complex & large projects

(3) Poor model for long projects
(4) Can turn turn out to be expensive

RAD Model (Rapid Application development):
→ Similar to incremental model
(1) RAD model can be applied successfully to the projects in which clear modularizations is possible.
(2) Projects will be broken into small modules
(3) It should be used if there is a high availability of designers for modelling
(4) It should be used where the requirements change during the project.
(5) Working prototypes are to be presented to customers
(6) This model is meant for small projects (2-3 months)

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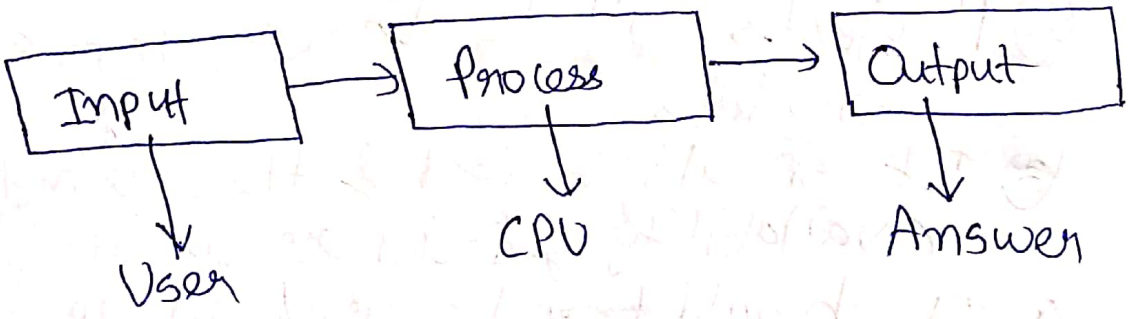
UNIT - I

Important questions

1. What are the different types of S/W models? (10M)
2. What is SDLC ? (5M)
3. What is metrics and Measurement ? (10M)
4. Write a test report on metrics (5M)
5. What is the difference between Water fall Model and Incremental model ? (10M)

Unit - II

Testing processes

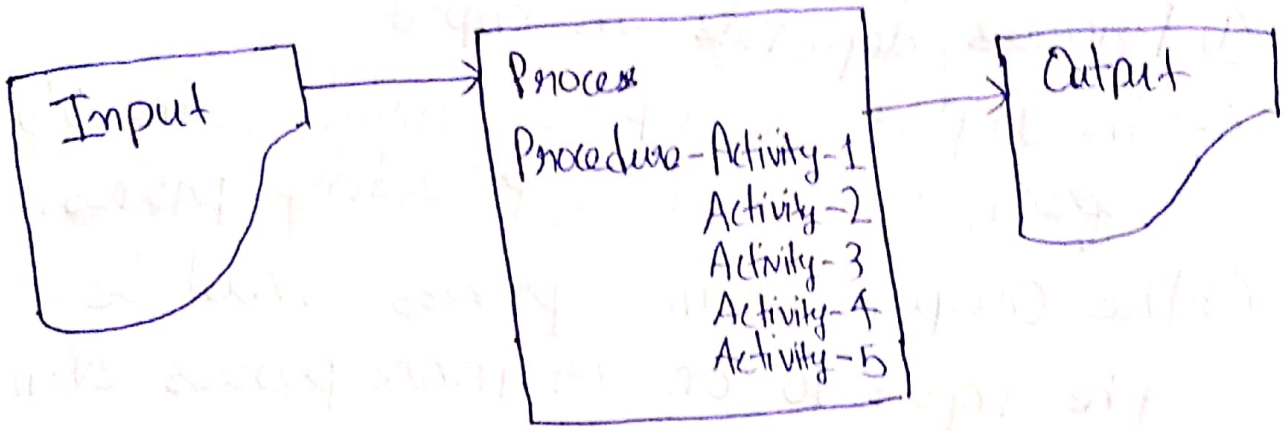


1. Process → Def → A process is a series of activities performed to fulfill a purpose and produce a output based on input.
2. Testing can also be regarded as a process.
3. A process description must always include
   - (a) A definition of the input
   - (b) A list of activities

⑤ A description of output

① Write about testing processes (5M)

Block diagram



① ⟶ data flow

② ⊐ → I/O

③ □ → process

Steps of process

Input ⟶

① Entry criteria — what must be in place before we can start?

② process - A description of what must be achieved?

③ Role - who is going to perform the activities?

④ Methods - How exactly are we going to perform the activities?

⑤ Measurement - what metrics are we going to collect for the process?

⑥ Templates - what should the o/p look like?

⑦ Verification – Are we one the right track?

⑧ Exit criteria – What do we need to fulfill before we have finished?

① Process depends on input

② The input to a process must be the o/p from one or more proceeding process.

③ The output from a process must be the input to one or more process even the final product.

④ A process model could be in a textual form or graphical.

⑤ The output from the top left process serves as input to the top-middle process and to the lower left process.

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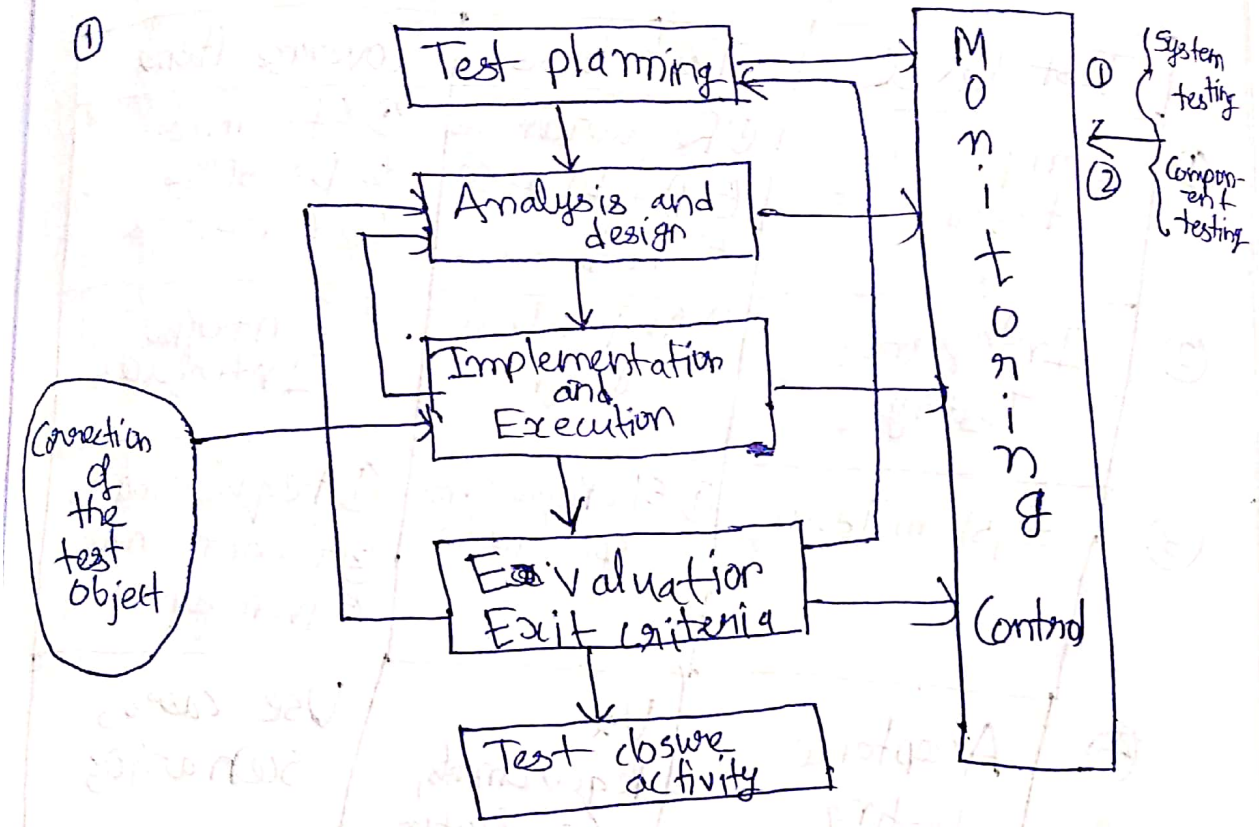
✱ Test process for all test phases (5M/10M)



Q1 Define Testing processes and explain

or

What is Testing processes and draw DFD.

① **Input to test planning and control**

① The planning and control of the test are continuous activities

② The initial planning will take place first.

③ Information from monitoring what is going on as the testing progress may cause controlling actions to be taken.

④ Actions will involves new planning

⑤ Necessary corrections will be made wherever required before writing a test report.

Test object and Test Basis

	Test level	Test Basis	Coverage items
①	Component testing	① Requirements ② Detailed design ③ Code	① Statements ② Decisions ③ Conditions
②	Integration Testing	① Architectural design	① Integral Interfaces
③	System Testing	① S/w Requirements specification	① Requirements ② functional ③ Non functional
④.	Acceptance testing	User Requirements, Specification, User manual	Use cases, Scenarios

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Test Analysis & Design

① The purpose of the test analysis and design activities is to produce test designs with test conditions and test case.

② The inputs on which this process is based are
- ① Level test plan → High level
- ② Basic documentation → Low level

③ The activities are:
- ① Analysis of basic documentation
- ② Design of high level test cases

④ The output consists of

① Test design
② Test environment design and specification

⑤ Input : (Test Analysis & design)
① Definition of test object
② Test case design technique
③ Completion criteria
④ Deliverables

⑥ Documentation of TA & D.
① The result of the TA & D should be documented in the test specification
② The test design —— also called test group
test cases —— many test cases per test design
test procedure —— many-to-many relationship with test cases

Ex :- ① Handling member information
② Test procedure :- member information can be created and maintained

Test procedure 2.1 → creating new member (entering name, age etc)
Test procedure 2.2 → change personal information (address, phno)
Test procedure 2.3 → changing mail-id information (email-id)
Test procedure 2.4 → adding any more info
Test procedure 2.5 → deleting unwanted info

Ex :- ② Eurobonus H.W scheme for star Alliance Compo. USA. There are 3 member levels Basis, Silver, Gold.
Member level is determined by number of Basis points after 12-months period automatically upgraded to Silver member 20,000 Basis point. 50,000 basis points in the period becomes gold member.

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Test Design

① How to write test group
ⓐ Start and Stop of the System
ⓑ functionality X define attribute
ⓒ Non functional attribute XX
ⓓ Error situation
ⓔ End of the test group
ⓕ documentation

Example: Using test condition
① When the sum of basis points is less than 20,000 the member status is Basis
② When the sum of basis points is equal to or greater than 20,000 the member level is set to silver
③ When the sum of basis points is equal to or greater than 50,000 the member level is set to gold.

Creation of test cases

① A high level test case is a test case without specific values for input data and expected results.

② The test case design techniques are used in test case.

③ The test techniques help us identify the input values for the test cases.

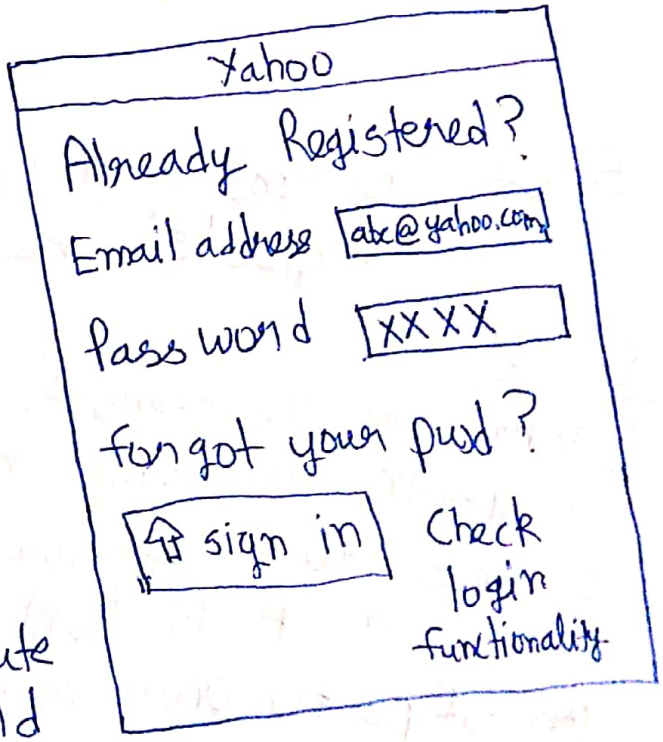
④ documentation of a test case
- ① Unique identification
- ② Description of test case
- ③ Reference to test condition
- ④ End of test cases

✡ How to create a test case → 10M

① Create a test case for the scenario.
Check Login functionality:

Ⓐ Step 1:

Test case #	Test case description
1	Check the response when valid email and password is entered



Step 2: In order to execute the test case you would need test data

Test case #	Test case description	Test data
2	Check the response when valid email and pwd is entered.	Email: abc@gmail.com or yahoo.com pwd: XXXX
Test case# 3		

Step3: In order to execute a test case, a tester needs to perform a specific set of actions

Test case #	Test c desc	Test steps	Test data
3	Check response when valid email & pwd is entered	① Enter valid email address ② Enter valid pwd ↵ ③ Click on sign in to continue ④ Press enter ↵	Email: abc@yahoo.com pwd: XXXX press ↵

Step4: The goal of this test case to get expected result.

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① What are the steps to create test case for opening an account in AXIS Bank.

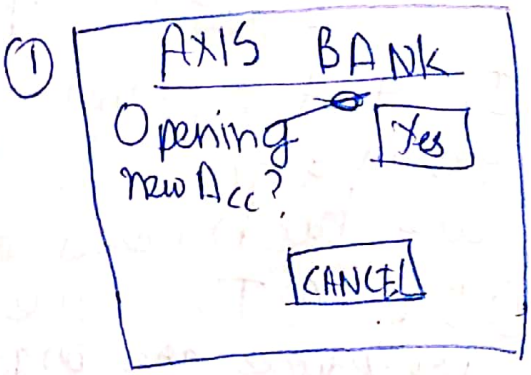
② Steps to withdrawal amount Rs 10,000 in an ATM Bank of AXIS Bank

③ Steps to open a website to give online Examinations of IIT Madras entrance test for M.tech Computer Science Course.

Test case

① Step 1: Opening an account in a bank

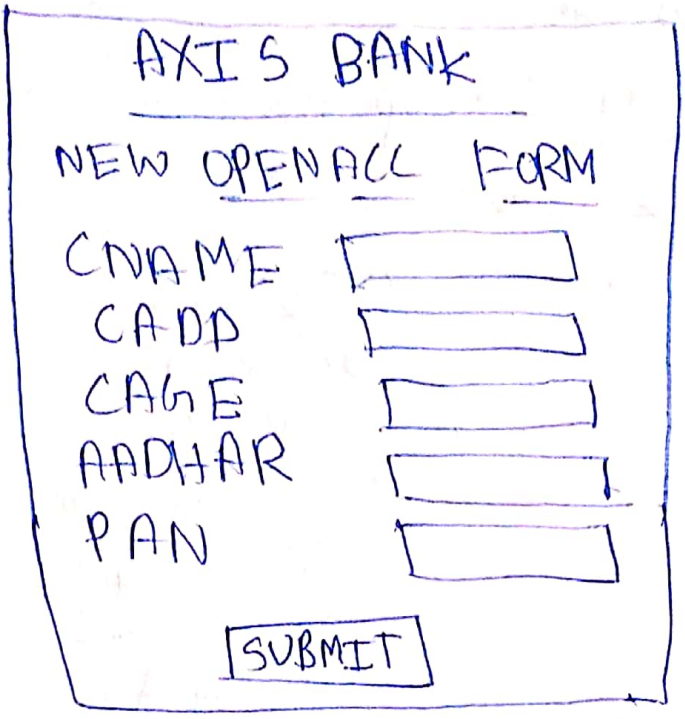
Test case#	Test description	Test data
1	① Opening an account, new account ② fill the form Select the option new and start entering details ③	① Customer name CN: ABC ② Customer address CA: 1-2-3, Street No; 1 ③ Customer phno ph: 71234 5678 ④ Customer email id Eid: abc@gmail.com

① 

Step2: filling the form with customer Aadhar, PAN etc

Test case#	Test description	test data
2	① fill the options of Aadhar ② fill the form with valid details ③ fill the column of Aadhar, PAN details	① Customer Aadhar details ② CA → 123456789 ③ Customer PAN No CP → ABCX1234 ④ Customer address proof Electricity bill, dob certificate, Aadhar, PAN Anyone

①



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Test Implementation

① In test implementation phase test manager ensures that all the pre-requisites are handled to start execution.

② Ex:- ① To ensure that all the test procedures are organised and available to tester.

③ The clear guidelines of who will execute which test cases when and with what data is being defined.

④ The timeline of test execution is also finalized.

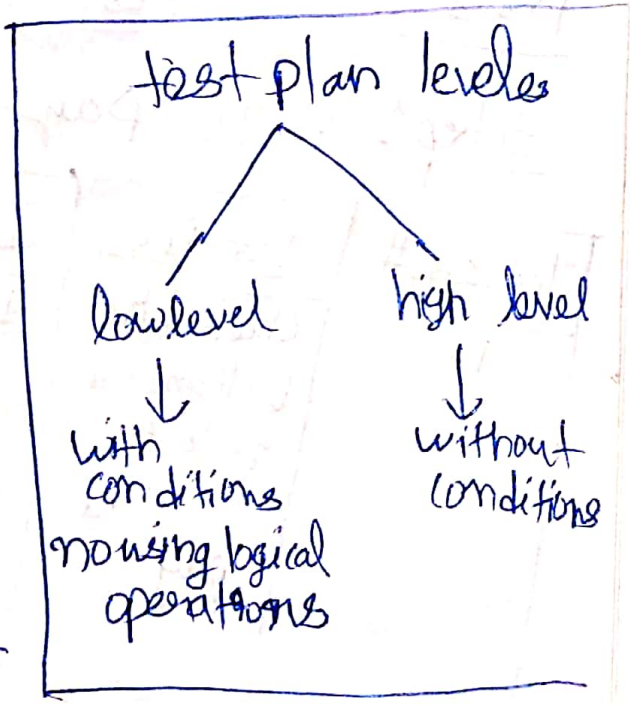
⑤ The tools to be used by testers are in place and checking that the entry criteria has been met.

⑥ Test manager also needs to ensure that test data generation tools are available.

⑦ Test analyst have configured the test environment as per the guidelines and verify that its ready for starting test execution.

⑧ The purpose of the test implementation is to organize the test cases in procedures and scripts

⑨ The inputs on which this process is based are
① Level test plan
② Test conditions
③ Test design
④ Test object



⑩ Activities are
① Organizing test procedures
② Design and verify test environment
③ Execute the test
④ Record the test
⑤ Check the results

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Assignment

(10M)

① What are the steps to pay the amount in supermarket using Paytm. Explain using testcase

② Identify Test Analysis, Test data, Test description, Test steps while entering details of Employee payroll record.

Ans 1

Test Case

Step1 : To pay the amount in supermarket

Test case#	Test Desc	Test steps	Test data	Actual Result	Expected Result
1	Check the bill amount go to the counter and pay	1. check the code of the Paytm 2. go to the bill counter 3. Scan the code 4. Validate the QR code 5. Pay the amount	1. amount (Rs. 500/-) 2. Code (XXXX) 3. Valid pins---) 4. Invalid pin 5. Scan pins the code	① Valid pin pass ✓ ② Invalid pin. fail X	1. Valid pin pass ✓ 2. Invalid pin fail X

Ans 2

T Desc → Employee payroll

TA → Collecting information of employee details from different departments (empname, empno, job, deptno, dname, salary details)

	TD	TS
①	Ename : ABC XYZ Empno : 12345 45678 dept no : 10 dept name : Comp Sal : 65,000/-	① Enter the details of sal basic Sal Rs 6000 ② Enter HRA sal Rs 6500 ③ Enter DA Sal Rs 5000 ④ Total salary ⑤ Calculating total salary total sal = basic + hra + da + pf ⑥ tot sal is above Rs 1,00 000 then bonus Rs 50,000 is given.

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Test Implementation and Execution

① The purpose of the test implementation is to organize the test cases in procedures and script and to perform the physical test in the correct environment.

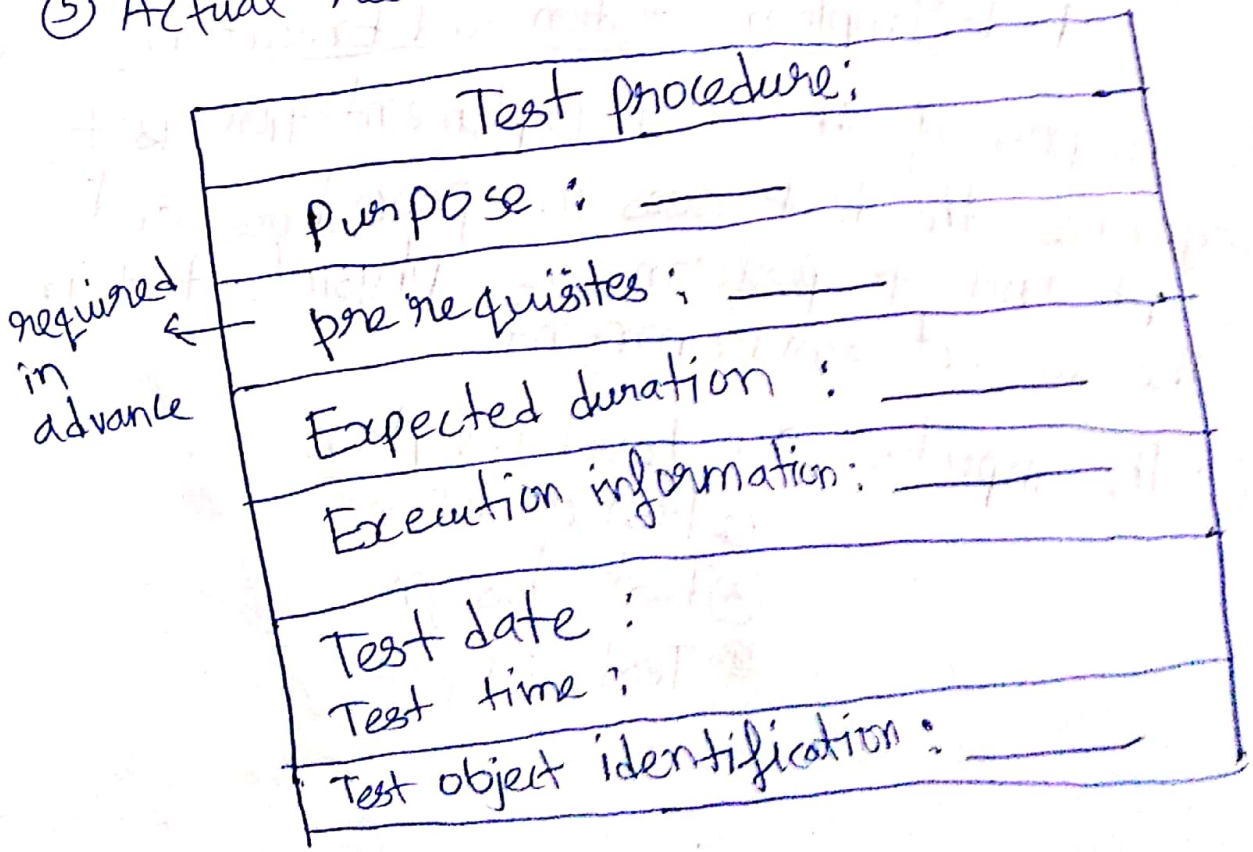
② The inputs → ① Level test plan
② Test condition
③ Test design
④ Test object

③ Activities

① organizing test procedures
② Execute the test
③ Record the test
④ Check the Results
⑤ O/P
  ① Test specification
  ② Test logs
  ③ Incident reports
  ④ Tested test object

Template for a test procedure

① fields for the required information
② unique numbering of the case
③ input
④ Expected result
⑤ Actual result



Test case #	Input	Exp Result	Actual Result

Test Execution

① Test log identifier
② Description of the test
③ Activity entries
④ Event entries

Ex :-

Test procedure : 3,5			
Purpose : This test is used to perform to check login id			
Rationale : User requirement			
Prerequisites : The Login id form			
Execution duration : 15 mins			
Execution time : 10 mins			
System : Identify object			
Test case #	Input	Exp O/p	Actual O/p
1	Entering valid user id and pwd	valid ✓ pass	valid ✓ pass
	Invalid user id	Invalid fail X	Invalid fail X

① The information about which test procedures have been executed
② Rationale - tracing of the coverage items.
③ Checking for test completion
④ Checking for test results
⑤ Confirmation testing is performed here.
⑥ Regression testing is also performed here.

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Important Questions

Unit - II

Q1 Define Test planning
Q2 Explain about Test planning and control
Q3 Define Test case
Q4 What are the steps to create test case.
Q5 Explain the process of Test Implementation
Q6 Define test Execution.

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Unit - III

Test Management

→ Manager is the head of company who would manage all the departments
① Test Management is the art of planning and directing a test assignment to success.
② Test Management is similar to project management

③ The Test Manager is the link between the test team and the development team and between the test team and higher management.

④ The business value of testing lies in savings that the organization can achieve from improvements based on the information the test provides.

⑤ ① The product under development.
② The decisions to be made about the product
③ The process used in both testing and development

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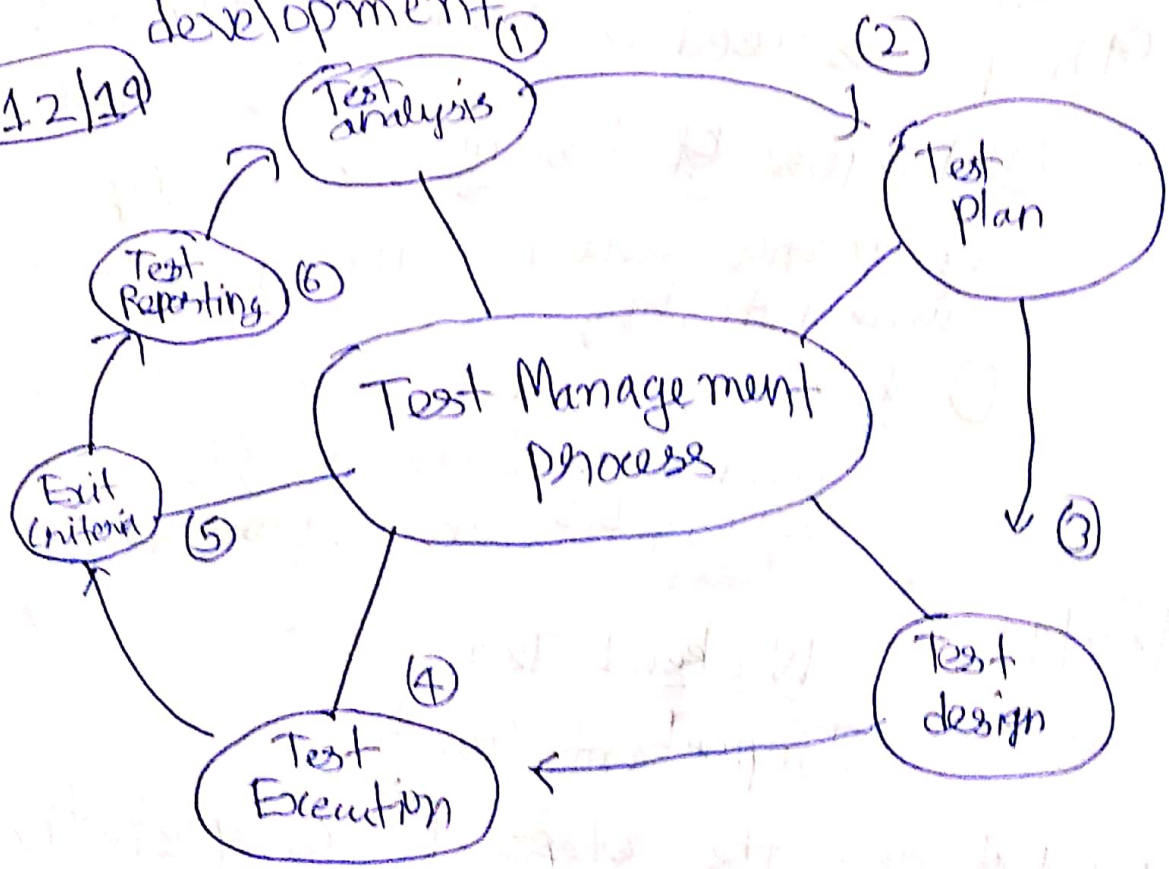

Business Value of Testing

① The business value of testing lies in the savings that the organization can achieve from improvements based on the information the testing provides.

② Improvements can be obtained in places ① The product under development
② The decisions to be made about ~~the~~ product

③ The process used in both testing and development

④ Purpose of testing → getting information about the product under testing

⑤ From raw data we can count and calculate a list of useful quantitative information.

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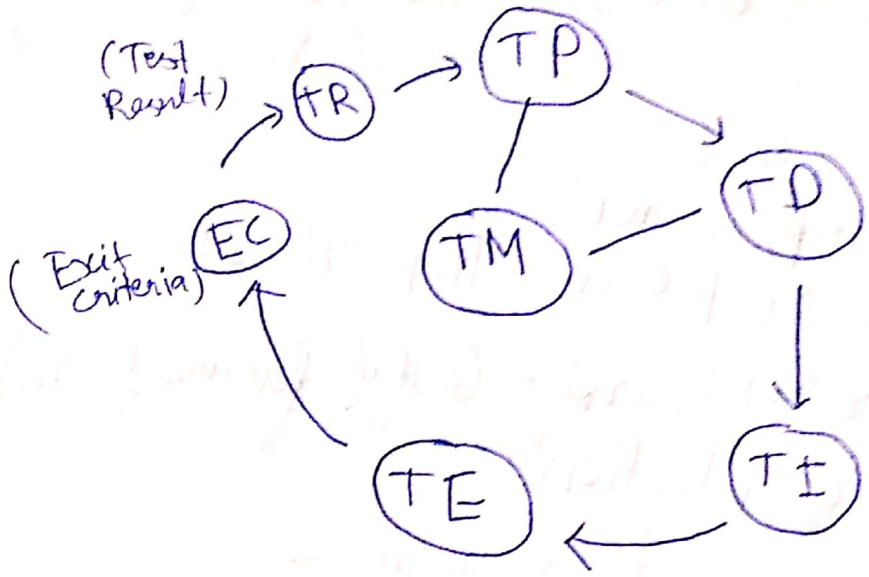
Test Management



① Test management is the art of planning and directing a test assignment to success.

② TM must be done in close cooperation with project Management

Business Value of Testing

The business value of testing lies in the savings that the organization can achieve from improvements based on the information the testing provides.

Information are

① No. of passed test cases
② Coverage of the performed test
③ No. and types of failures
④ Defects corrected over time
⑤ Root causes of failures

✡ The testing Business Case

The ↑ Product is based on the cost of quality

Value of testing for the

① product improvement =

Value of product improvement =

(Cost of failure not found − Cost of failure found) − Cost of detection.

② Value of decision improvement =

(Cost of Wrong decision − Cost of right decision) − Cost of getting decision

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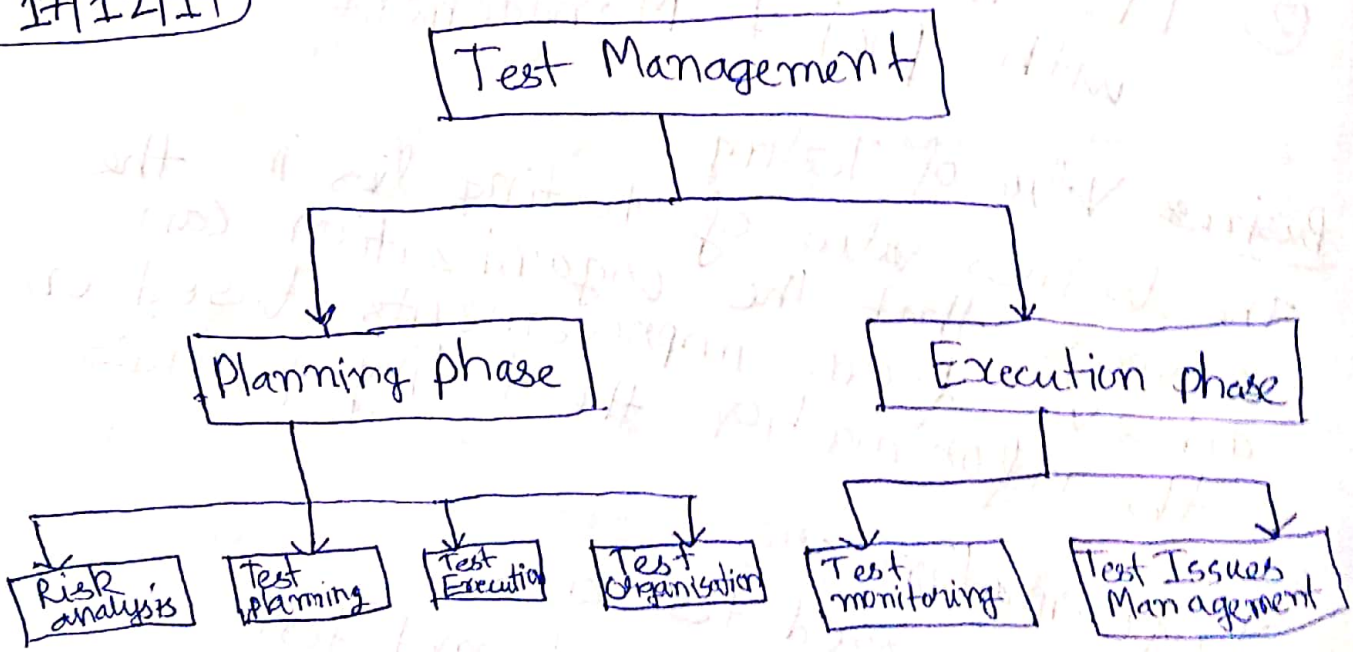


The testing Business case

① Value of product improvement

value of product improvement = (Cost of failure not found
− Cost failure found)
− Cost of detection

② Value of decision improvement

(Cost of wrong decision − cost of right decision)
− Cost of getting decision basis

③ process improvement

(Cost using old process − Cost using better process)
− Cost of process improvement

① ② ③ aspects add up to form the entire business case for testing

② The aim is to get as high a value as possible.

③ A value may be expressed quantitatively and qualitatively.

④ Quantitative values are pounds, euros, dollars, rupees.

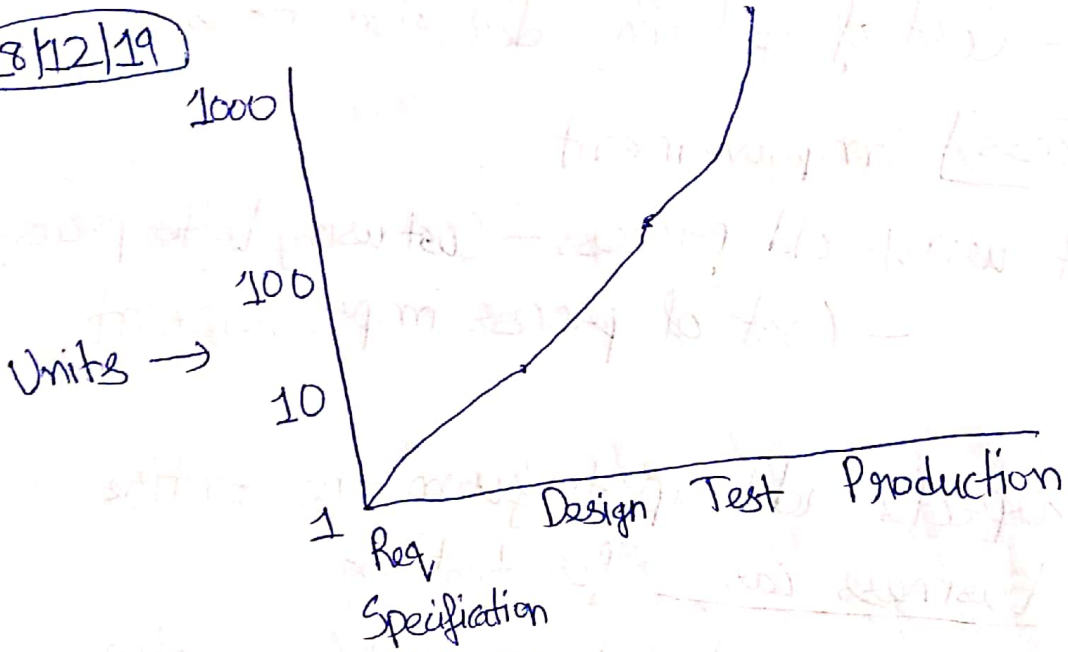
⑤ Qualitative values cannot be calculated.

Ex:- If we assume that it costs 4 units to correct a defect in the requirement phase and 6 units to detect a defect or a failure.

(A) Value of finding a defect in the system testing is = (4,000 − 400) − 6 = 3,594 units

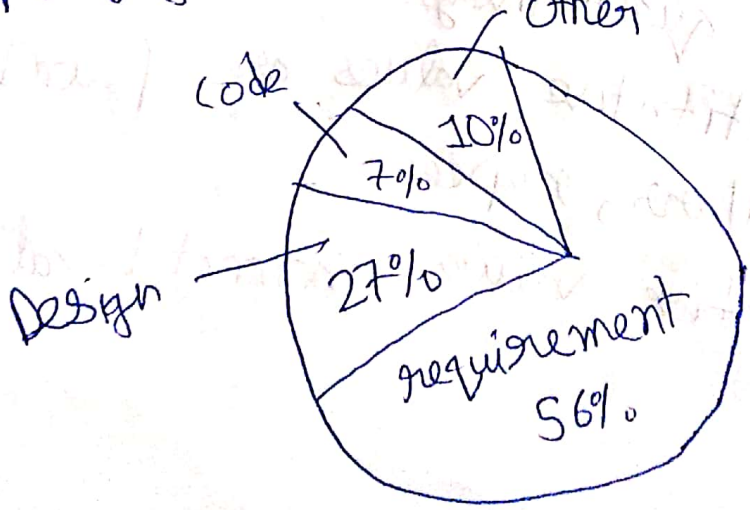
Value of finding a defect in requirements specification = (400 − 4) − 6 = 390 units

18/12/19

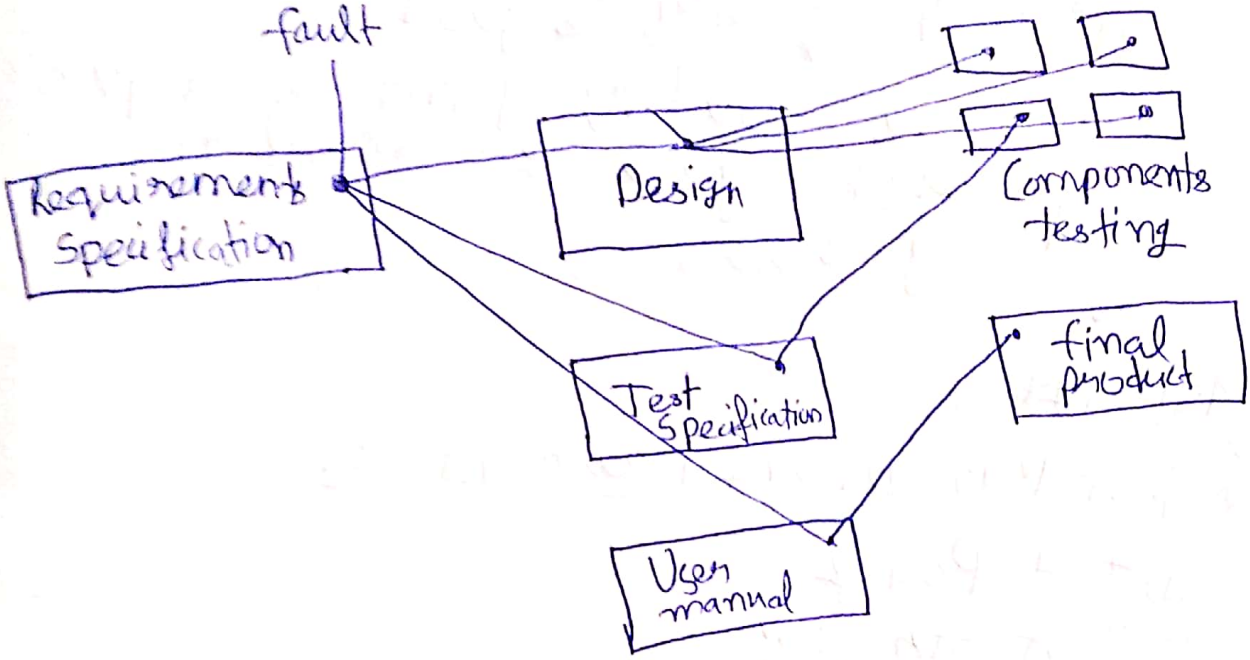


No. of faults = 100% reliability

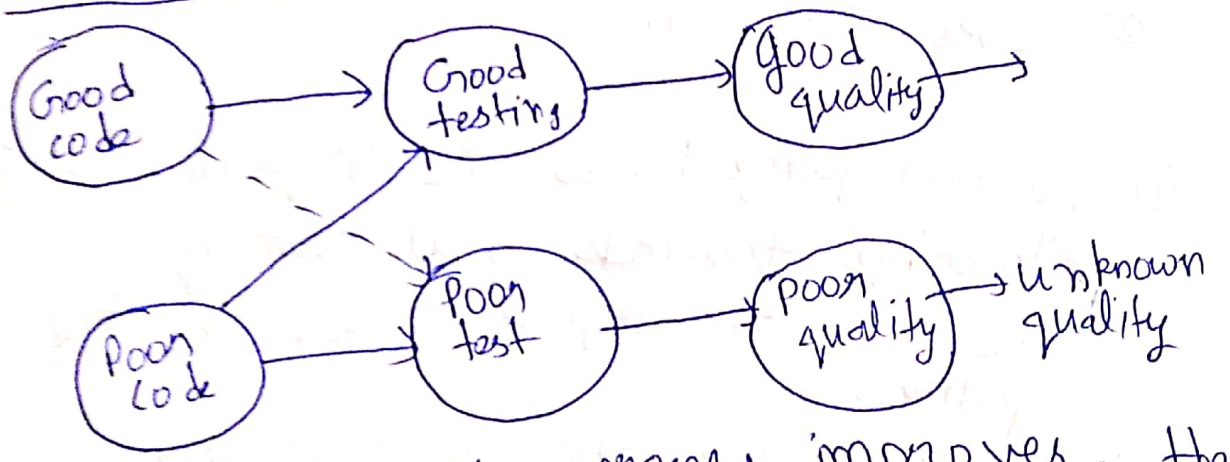
Many faults = X % reliability



① The failures found during development and testing are called internal failures.



* The value of decision Improvement :-



① When the testing process improves, the number of failures sent out to the customer and the organization's reputation for delivery quality products will rise.

② As testing progresses more and more information is gathered and this enhances the basis for the decisions.

③ Good testing provides trustworthy information.

④ If the starting point is a good product a good test will provide information to give us confidence that the quality is good.

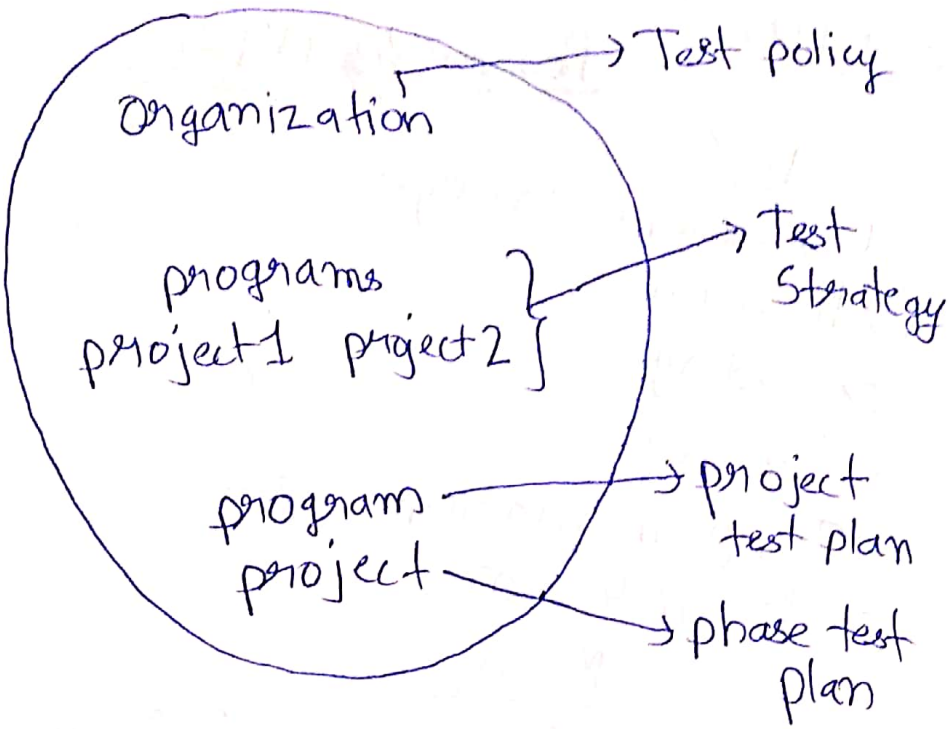
⑤ If the starting point is a poor product a good test reveal that quality is low.

19/12/19

Test Management Documentation

① Test Policy
② Test Strategy
③ project test plan
④ Level test plan

① The test policy holds the organization's philosophy towards S/W testing
② The test strategy is based on the policy.
③ It can have the scope of an organizational unit or a program
④ A master test plan is for a particular project. It makes the strategy operational and defines the test levels to be performed and the testing within those levels.



Test plan

	1	2	3	4	5	6
Test leader	R	C	I	I	I	I
Test department	C	R	R	P	P	R
Quality assurance	C	C	R	–	–	I
Sales/marketing	C	C	C	–	–	P
The customer	C	C	C	–	R	P
Method department	I	I	P	R	–	–

R – Responsible
P – Performing
C – Consulted
I – Informed

1 – Test management
2 – Test Analysis & design
3 – Test Environment
4 – Test tools
5 – Test data
6 – Test Execution