**Testing:**

**INTRODUCTION**

Testing is the process of finding differences between the expected behavior specified by system models and the observed behavior implemented system. From modeling point of view, testing is the attempt of falsification of the system with respect to the system models. The goal of testing is to design tests that exercise defects in the system and to reveal problems.

The process of executing a program with intent of finding errors is called testing. During testing , the program to be tested is executed with a set of test cases , and the output of the program for the test cases is evaluated to determine if the program is performing as expected . Testing forms the first step in determining the errors in the program. The success of testing in revealing errors in program depends critically on test cases.

**STRATEGIC APPROACH TO SOFTWARE TESTING**

The software engineering process can be viewed as a spiral. Initially system engineering defines the role of software and leads to software requirements analysis where the information domain , functions , behavior , performance , constraints and validation criteria for software are established. moving inward along the spiral , we come to design and finally to coding . To develop computer software we spiral in along streamlines that decreases the level of abstraction on each item.

A Strategy for software testing may also be viewed in the context of the spiral. Unit testing begins at the vertex of the spiral and concentrates on each unit of the software as implemented in source code. Testing will progress by moving outward along the spiral to integration testing , where the focus on the design and the concentration of the software architecture. Talking another turn on outward on the spiral we encounter validation testing where requirements established as part of software requirements analysis are validated against the software that has been constructed . Finally we arrive at system testing , where the software and other system elements are tested as a whole .

UNUNI

UNIT TESTING

MODULE

SUB-SYSTEM

**Component**

SYSTEM TESTING

**Integration Testing**

ACCEPTANCE

**User Testing**

**Different Levels of Testing**

Client Needs Acceptance Testing

Requirements System Testing

Design Integration Testing

Code Unit Testing

Testing is the process of finding difference between the expected behavior specified by system models and the observed behavior of the implemented system.

**Testing Activities**

Different levels of testing are used in the testing process , each level of testing aims to test different aspects of the system. the basic levels are:

Unit testing

Integration testing

System testing

Acceptance testing

**Unit Testing**

Unit testing focuses on the building blocks of the software system, that is, objects and sub system . There are three motivations behind focusing on components. First, unit testing reduces the complexity of the overall tests activities, allowing us to focus on smaller units of the system. Second , unit testing makes it easier to pinpoint and correct faults given that few components are involved in this test . Third , Unit testing allows parallelism in the testing activities , that is each component can be tested independently of one another . Hence the goal is to test the internal logic of the module.

**Integration Testing**

In the integration testing, many test modules are combined into sub systems , which are then tested . The goal here is to see if the modules can be integrated properly, the emphasis being on testing module interaction.

After structural testing and functional testing we get error free modules. These modules are to be integrated to get the required results of the system. After checking a module, another module is tested and is integrated with the previous module. After the integration, the test cases are generated and the results are tested.

**System Testing**

In system testing the entire software is tested . The reference document for this process is the requirement document and the goal is to see whether the software meets its requirements. The system was tested for various test cases with various inputs.

**Acceptance Testing**

Acceptance testing is sometimes performed with realistic data of the client to demonstrate that the software is working satisfactory. Testing here focus on the external behavior of the system , the internal logic of the program is not emphasized . In acceptance testing the system is tested for various inputs.

**Types of Testing**

1. Black box or functional testing
2. White box testing or structural testing

**Black box testing**

This method is used when knowledge of the specified function that a product has been designed to perform is known . The concept of black box is used to represent a system whose inside workings are not available to inspection . In a black box the test item is a "Black" , since its logic is unknown , all that is known is what goes in and what comes out , or the input and output.

Black box testing attempts to find errors in the following categories:

Incorrect or missing functions

Interface errors

Errors in data structure

Performance errors

Initialization and termination errors

As shown in the following figure of Black box testing , we are not thinking of the internal workings , just we think about

What is the output to our system?

What is the output for given input to our system?

**?**

Input Output

The Black box is an imaginary box that hides its internal workings

**White box testing**

White box testing is concerned with testing the implementation of the program. the intent of structural is not to exercise all the inputs or outputs but to exercise the different programming and data structure used in the program. Thus structural testing aims to achieve test cases that will force the desire coverage of different structures . Two types of path testing are statement testing coverage and branch testing coverage.

**INTERNAL WORKING**

Input Output

The White Box testing strategy , the internal workings

**Test Plan**

Testing process starts with a test plan. This plan identifies all the testing related activities that must be performed and specifies the schedules , allocates the resources , and specified guidelines for testing . During the testing of the unit the specified test cases are executed and the actual result compared with expected output. The final output of the testing phase is the test report and the error report.

**Test Data:**

Here all test cases that are used for the system testing are specified. The goal is to test the different functional requirements specified in Software Requirements Specifications (SRS) document.

**Unit Testing:**

Each individual module has been tested against the requirement with some test data.

**Test Report:**

The module is working properly provided the user has to enter information. All data entry forms have tested with specified test cases and all data entry forms are working properly.

**Error Report:**

If the user does not enter data in specified order then the user will be prompted with error messages. Error handling was done to handle the expected and unexpected errors.