Chapter 08

Software testing

Program testing

- Software testing is defined as an activity to check whether the actual results match the expected results and to ensure that the software system is Defect free.
- When you test software, you execute a program using artificial data.
- You check the results of the test run for errors, anomalies or information about the program's non-functional attributes.
- Testing is part of a more general verification and validation process, which also includes static validation techniques.

What is Defect

- What is bug?
  - A bug is the consequence/outcome of a coding fault.
- What is defect?
  - A defect is a variation or deviation from the original business requirements.
  - When a tester executes the test cases, he might come across the test result which is contradictory to expected result. This variation in the test result is referred as a **Software Defect**.

Testing goal

- To demonstrate to the developer and the customer that the software meets its requirements.
- To discover situations in which the behavior of the software is incorrect, undesirable or does not conform to its specification.
  - Defect testing is concerned with rooting out undesirable system behavior such as system crashes, unwanted interactions with other systems, incorrect computations and data corruption.

V & V

- Verification:
  "Are we building the product right".
- The software should conform to its specification.
- Validation:
  "Are we building the right product".
- The software should do what the user really requires.
- Aim of V & V is to establish confidence that the system is 'fit for purpose'.

Three Stages of testing

- Development testing, where the system is tested during development to discover bugs and defects.
- Release testing, where a separate testing team test a complete version of the system before it is released to users.
- User testing, where users or potential users of a system test the system in their own environment.

Development testing

- During development, testing may be carried out at three levels:
  - Unit testing, where individual program units or object classes are tested. Unit testing should focus on testing the functionality of objects or methods.
  - Component testing, where several individual units are integrated to create composite components. Component testing should focus on testing component interfaces.
  - System testing, where some or all of the components in a system are integrated and the system is tested as a whole. System testing should focus on testing component interactions.

Unit testing

- Unit testing is the process of testing individual components in isolation.
- It is a defect testing process.
- Units may be:
  - Individual functions or methods within an object
  - Object classes with several attributes and methods
  - Composite components with defined interfaces used to access their functionality.

Component testing

- Software components are often composite components that are made up of several interacting objects.
- You access the functionality of these objects through the defined component interface.
- Testing composite components should therefore focus on showing that the component interface behaves according to its specification.
  - You can assume that unit tests on the individual objects within the component have been completed.

System testing

- System testing during development involves integrating components to create a version of the system and then testing the integrated system.
- The focus in system testing is testing the interactions between components.
- System testing checks that components are compatible, interact correctly and transfer the right data at the right time across their interfaces.
- System testing tests the emergent behavior of a system.

Release testing

- Release testing is the process of testing a particular release of a system that is intended for use outside of the development team.
- The primary goal of the release testing process is to convince the supplier of the system that it is good enough for use.
  - Release testing, therefore, has to show that the system delivers its specified functionality, performance and dependability, and that it does not fail during normal use.
- Release testing is usually a black-box testing process where tests are only derived from the system specification. Also called ‘functional testing’.

Release testing and System testing

- Release testing is a form of system testing.
- Important differences:
  - A separate team that has not been involved in the system development, should be responsible for release testing.
  - System testing by the development team should focus on discovering bugs in the system (defect testing). The objective of release testing is to check that the system meets its requirements and is good enough for external use (validation testing).

User testing

- User or customer testing is a stage in the testing process in which users or customers provide input and advice on system testing.
- User testing is essential, even when comprehensive system and release testing have been carried out.
  - The reason for this is that influences from the user's working environment have a major effect on the reliability, performance, usability and robustness of a system. These cannot be replicated in a testing environment.

Types of user testing

- Alpha testing
  - Users of the software work with the development team to test the software at the developer's site.
- Beta testing
  - A release of the software is made available to users to allow them to experiment and to raise problems that they discover with the system developers.
  - It is a black box testing
- Acceptance testing
  - Customers test a system to decide whether or not it is ready to be accepted from the system developers and deployed in the customer environment. Primarily for custom systems.

Black box testing

- Black box testing is the Software testing method which is used to test the software without knowing the internal structure of code or program.
- This type of testing is carried out by testers.
- Programming Knowledge is not required to carry out Black Box Testing.
- Black box testing means functional test or external testing.
- Black Box testing can be started based on Requirement Specifications documents.

White box testing

- White box testing is the software testing method in which internal structure is being known to tester who is going to test the software.
- Generally, this type of testing is carried out by software developers.
- Programming Knowledge is required to carry out White Box Testing.
- The main aim of White Box testing to check on how System is performing.
- White Box testing can be started based on Detail Design documents.

Alpha testing

- Performed by Testers who are usually internal employees of the organization.
- Alpha Testing performed at developer's site .
- Alpha testing involves both the white box and black box techniques.
- Alpha testing requires a lab environment or testing environment .
- Alpha testing is to ensure the quality of the product before moving to Beta testing.

Beta testing

- Beta testing is performed by Clients or End Users who are not employees of the organization.
- Beta testing is performed at a client location or end user of the product .
- Reliability, Security, Robustness are checked during Beta Testing.
- Beta Testing typically uses Black Box Testing
- Beta testing doesn't require any lab environment or testing environment. The software is made available to the public and is said to be real time environment.
- Beta testing also concentrates on the quality of the product, but gathers users input on the product and ensures that the product is ready for real time users.