# Various Types of Testing in Software Development process

## Testing techniques of all types in Detail

# Software Testing

- method to check whether the actual software product matches expected requirements and to ensure that software product is Defect free.
- involves execution of software/system components using manual or automated tools to evaluate one or more properties of interest.
- Purpose: to identify errors, gaps or missing requirements in contrast to actual requirements.

# Benefits of Software Testing

- **Cost-Effective:** It is one of the important advantages of software testing. Testing any IT project on time helps you to save your money for the long term. In case if the bugs caught in the earlier stage of software testing, it costs less to fix.
- **Security:** It is the most vulnerable and sensitive benefit of software testing. People are looking for trusted products. It helps in removing risks and problems earlier.
- **Product quality:** It is an essential requirement of any software product. Testing ensures a quality product is delivered to customers.
- **Customer Satisfaction:** The main aim of any product is to give satisfaction to their customers. UI/UX Testing ensures the best user experience.

# Types of Software Testing

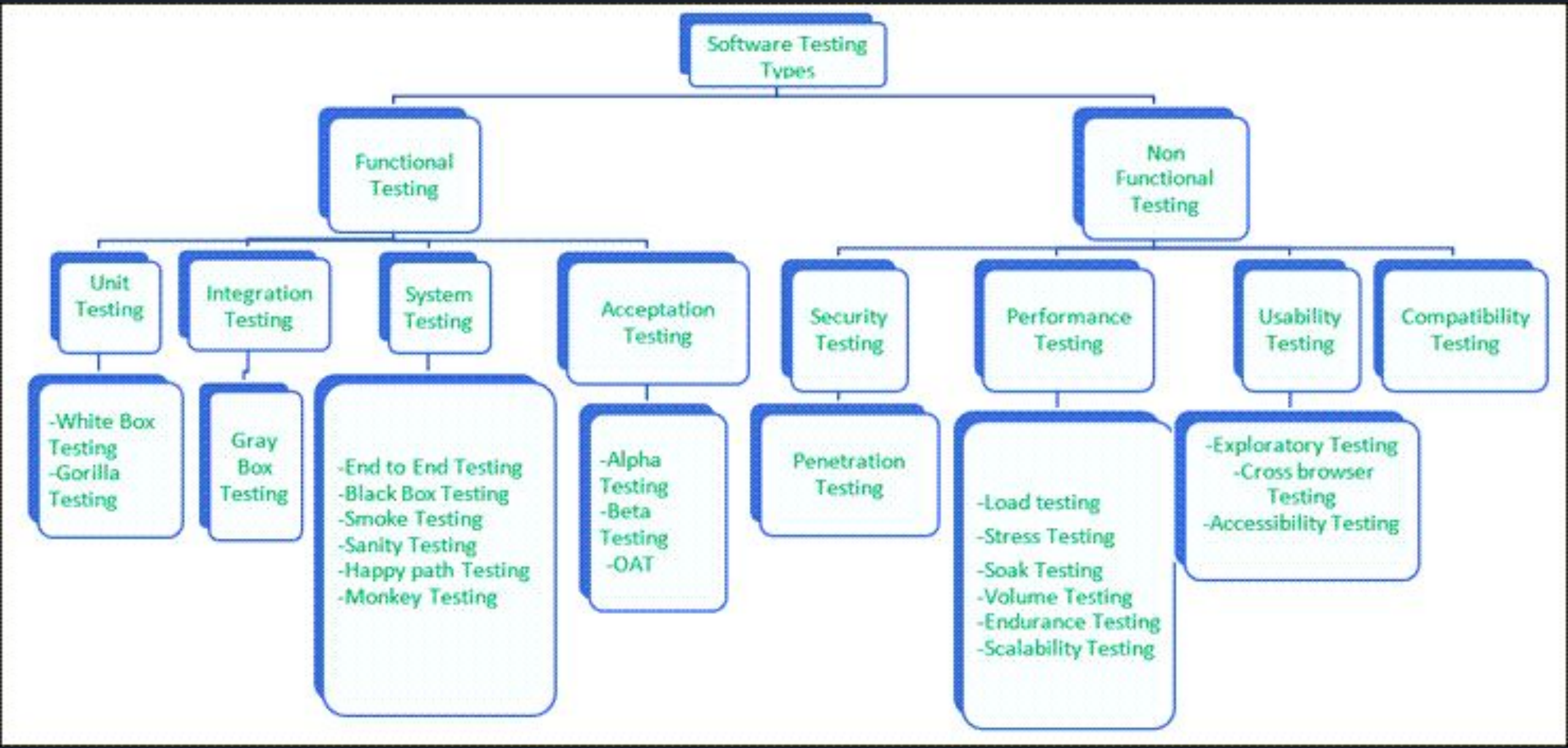
## Functional Testing

1. Unit Testing
2. Integration Testing
3. System Testing
4. Acceptance Testing

## Non-Functional Testing

1. Security Testing
2. Performance Testing
3. Usability Testing
4. Compatibility testing

## Other Types of Testing


Software Testing Types
Functional Testing
Non Functional Testing
Unit Testing
Integration Testing
System Testing
Acceptation Testing
Security Testing
Performance Testing
Usability Testing
Compatibility Testing
-White Box Testing
-Gorilla Testing
Gray Box Testing
-End to End Testing
-Black Box Testing
-Smoke Testing
-Sanity Testing
-Happy path Testing
-Monkey Testing
-Alpha Testing
-Beta Testing
-OAT
Penetration Testing
-Load testing
-Stress Testing
-Soak Testing
-Volume Testing
-Endurance Testing
-Scalability Testing
-Exploratory Testing
-Cross browser Testing
-Accessibility Testing

# Functional Testing

1. Unit Testing
    a. White Box Testing
    b. Gorilla Testing

1. Integration Testing
    b. Gray Box Testing

2. System Testing
    b. End to End Testing
    c. Black Box Testing
    d. Smoke Testing
    e. Sanity Testing
    f. Happy Path Testing
    g. Monkey Testing

3. Acceptance Testing
    b. Alpha Testing
    c. Beta Testing
    d. UAT/OAT Testing

# Functional Testing

1. Unit Testing

- testing which is done on an individual unit or component to test its corrections
- done by the developer at the application development phase
- each unit in unit testing can be viewed as a method, function, procedure, or object.
- developers often use test automation tools such as NUnit, Xunit, JUnit for the test execution.
- Important: because we can find more defects at the unit test level.
- **For example,** there is a simple calculator application. The developer can write the unit test to check if the user can enter two numbers and get the correct sum for addition functionality.

# Functional Testing

a. **White Box Testing**

- a test technique in which the internal structure or code of an application is visible and accessible to the tester
- it is easy to find loopholes in the design of an application or fault in business logic

a. **Gorilla Testing**

- a test technique in which the tester and/or developer test the module of the application thoroughly in all aspects.
- Gorilla testing is done to check how robust your application is.
- **For example,** the tester is testing the pet insurance company's website, which provides the service of buying an insurance policy, tag for the pet, Lifetime membership. The tester can focus on any one module, let's say, the insurance policy module, and test it thoroughly with positive and negative test scenarios.

# Functional Testing

## 2. Integration Testing

- a type of software testing where two or more modules of an application are logically grouped together and tested as a whole.
- The focus of this type of testing is to find the defect on interface, communication, and data flow among modules.
- This type of testing is done on integrating modules of a system or between systems
- **For example,** a user is buying a flight ticket from any airline website. Users can see flight details and payment information while buying a ticket, but flight details and payment processing are two different systems. Integration testing should be done while integrating of airline website and payment processing system.

### a. Gray Box Testing

- gray box testing is a combination of white-box testing and black-box testing. Testers have partial knowledge of the internal structure or code of an application.

# Functional Testing

**2. System Testing**

System testing is types of testing where tester evaluates the whole system against the specified requirements.

a. **End To End Testing**

- It involves testing a complete application environment in a situation that mimics real-world use, such as interacting with a database, using network communications, or interacting with other hardware, applications, or systems if appropriate.
- **For example,** a tester is testing a pet insurance website. End to End testing involves testing of buying an insurance policy, LPM, tag, adding another pet, updating credit card information on users' accounts, updating user address information, receiving order confirmation emails and policy documents.

a. **Black Box Testing**

- testing technique in which testing is performed without knowing the internal structure, design, or code of a system under test.
- Testers should focus only on the input and output of test objects.

# Functional Testing

**c. Smoke Testing**

- performed to verify that basic and critical functionality of the system under test is working fine at a very high level.
- whenever a new build is provided by the development team, then the Software Testing team validates the build and ensures that no major issue exists.
- testing team will ensure that the build is stable, and a detailed level of testing will be carried out further.

**d. Sanity Testing**

- Sanity testing is performed on a system to verify that newly added functionality or bug fixes are working fine.
- Sanity testing is done on stable build. It is a subset of the regression test.
- **For example,** a tester is testing a pet insurance website. There is a change in the discount for buying a policy for second pet. Then sanity testing is only performed on buying insurance policy module.

# Functional Testing

### e. Happy Path Testing

- The objective of Happy Path Testing is to test an application successfully on a positive flow.
- It does not look for negative or error conditions.
- The focus is only on valid and positive inputs through which the application generates the expected output.

### f. Monkey Testing

- It is carried out by a tester, assuming that if the monkey uses the application, then how random input and values will be entered by the Monkey without any knowledge or understanding of the application.
- The objective of Monkey Testing is to check if an application or system gets crashed by providing random input values/data.

# Functional Testing

**4. Acceptance testing**

a. **Alpha Testing**
   - ❏ Alpha testing is a type of acceptance testing performed by the team in an organization to find as many defects as possible before releasing software to customers.

a. **Beta Testing**
   - ❏ It is a type of software testing which is carried out by the clients/customers. It is performed in the **Real Environment** before releasing the product to the market for the actual end-users.
   - ❏ Beta Testing is carried out to ensure that there are no major failures in the software or product, and it satisfies the business requirements from an end-user perspective.
   - ❏ Beta Testing is successful when the customer accepts the software.

a. **OAT(Operational Acceptance Testing)/UAT(User Acceptance Testing)**
   - ❏ Operational acceptance testing of the system is performed by operations or system administration staff in the production environment.
   - ❏ The purpose of operational acceptance testing is to make sure that the system administrators can keep the system working properly for the users in a real-time environment.

# Non-Functional Testing

1. **Security Testing**
    a. Penetration Testing

2. **Performance Testing**
    a. Load Testing
    b. Stress Testing
    c. Scalability Testing
    d. Volume Testing (Flood Testing)
    e. Endurance Testing(Soak Testing)

3. **Usability Testing**
    a. Exploratory Testing
    b. Cross browser Testing
    c. Accessibility Testing

4. **Compatibility Testing**

# Non-Functional Testing

1. **Security Testing**

- ❏ It is a type of testing performed by a special team. Any hacking method can penetrate the system.
- ❏ It is done to check how the software, application, or website is secure from internal and/or external threats.
- ❏ This testing includes how much software is secure from malicious programs, viruses and how secure & strong the authorization and authentication processes are.

   a. **Penetration Testing**

   - ❏ Pen testing is performed by outside contractors, generally known as ethical hackers.
   - ❏ That is why it is also known as ethical hacking.
   - ❏ Contractors perform different operations like SQL injection, URL manipulation, Privilege Elevation, session expiry, and provide reports to the organization.

# Non-Functional Testing

**2. Performance Testing**

Performance testing is testing of an application's stability and response time by applying load.

a. Load Testing

- ❑ It is testing of an application's stability and response time by applying load, which is equal to or less than the designed number of users for an application.
- ❑ **For example,** your application handles 100 users at a time with a response time of 3 seconds, then load testing can be done by applying a load of the maximum of 100 or less than 100 users. The goal is to verify that the application is responding within 3 seconds for all the users.

a. Stress Testing

- ❑ It is testing an application's stability and response time by applying load, which is more than the designed number of users for an application.
- ❑ **For example,** your application handles 1000 users at a time with a response time of 4 seconds, then stress testing can be done by applying a load of more than 1000 users.
- ❑ Test the application with 1100,1200,1300 users and notice the response time. The goal is to verify the stability of an application under stress.

# Non-Functional Testing

c. Scalability Testing

- Scalability testing is testing an application's stability and response time by applying load, which is more than the designed number of users for an application.
- **For example,** your application handles 1000 users at a time with a response time of 2 seconds, then scalability testing can be done by applying a load of more than 1000 users and gradually increasing the number of users to find out where exactly my application is crashing.

Let's say my application is giving response time as follows:

- 1000 users -2 sec
- 1400 users -2 sec
- 4000 users -3 sec
- 5000 users -45 sec
- 5150 users- crash – This is the point that needs to identify in scalability testing

# Non-Functional Testing

**d. Volume Testing**

- Volume testing is testing an application's stability and response time by transferring a large volume of data to the database.
- Basically, it tests the capacity of the database to handle the data.

**e. Endurance Testing (Soak Testing)**

- Endurance testing is testing an application's stability and response time by applying load continuously for a longer period to verify that the application is working fine.
- **For example,** car companies soak testing to verify that users can drive cars continuously for hours without any problem.

# Non-Functional Testing

### 3. Usability Testing

- ❏ It is testing an application from the user's perspective to check the look and feel and user-friendliness.
- ❏ The main idea of usability testing of this kind of app is that as soon as the user opens the app, the user should get a glance at the market.

### a. Exploratory Testing

- ❏ Exploratory Testing is informal testing performed by the testing team.
- ❏ The objective of this testing is to explore the application and look for defects that exist in the application.
- ❏ Testers use the knowledge of the business domain to test the application.
- ❏ Test charters are used to guide the exploratory testing.

# Non-Functional Testing

**b. Cross Browser Testing**

- ❏ Cross browser testing is testing an application on different browsers, operating systems, mobile devices to see look and feel and performance.
- ❏ We need this testing because different users use different operating systems, different browsers, and different mobile devices. The goal of the company is to get a good user experience regardless of those devices.

c. Accessibility Testing

- ❏ The aim of this kind of testing is to determine whether the software or application is accessible for disabled people or not.
- ❏ Here, disability means deafness, color blindness, mentally disabled, blind, old age, and other disabled groups.
- ❏ Various checks are performed, such as font size for visually disabled, color and contrast for color blindness, etc.

# Non-Functional Testing

**4. Compatibility Testing**

- This is a testing type in which it validates how software behaves and runs in a different environment, web servers, hardware, and network environment.
- It ensures that software can run on different configuration, different databases, different browsers, and their versions. The testing team performs compatibility testing.

# Other Types of Testing

1. Ad-hoc Testing
2. Backend Testing
3. Backward Compatibility Testing
4. Boundary Value Testing
5. Comparison Testing
6. Graphical User Interface (GUI) Testing
7. Install/Uninstall Testing
8. Negative Testing
9. Recovery Testing
10. Regression Testing
11. Vulnerability Testing

# Other Types of Testing

1. **Ad-hoc Testing**

- The name itself suggests that this testing is performed on an ad-hoc basis, i.e., with no reference to the test case and also without any plan or documentation in place for this type of testing.
- The objective of this testing is to find the defects and break the application by executing any flow of the application or any random functionality.

1. **Backend Testing**

- Whenever an input or data is entered on the front-end application, it is stored in the database and the testing of such database is known as Database Testing or Backend Testing.
- There are different databases like SQL Server, MySQL, Oracle, etc.
- Database Testing involves testing of table structure, schema, stored procedure, data structure, and so on.
- In Back-end Testing, GUI is not involved, the testers are directly connected to the database with proper access and testers can easily verify data by running a few queries on the database.

# Other Types of Testing

3. **Backward Compatibility Testing**

- ❏ It is performed for web applications and ensures that the software can run with a combination of different browsers and operating systems.
- ❏ This type of testing also validates whether a web application runs on all versions of all browsers or not.
- ❏ It is a type of testing that validates whether the newly developed software or updated software works well with the older version of the environment or not.

**4. Boundary Value Testing**

- ❏ Boundary testing is the process of testing between extreme ends or boundaries between partitions of the input values.
- ❏ Let's Say: Pizza values 1 to 10 is the valid no to enter in a form field. While values 0, 11 to 99 are considered invalid values, "Only 1 to 10 number inputs should be allowed to be entered but lower or higher than that should not be

**5. Comparison Testing**

- ❏ Comparison of a product's strengths and weaknesses with its previous versions or other similar products is termed Comparison Testing.

# Other Types of Testing

**6. GUI Testing**

- The objective of this GUI Testing is to validate the GUI as per the business requirement.
- The expected GUI of the application is mentioned in the Detailed Design Document and GUI mockup screens.
  - **What do we check in GUI Testing??**
    - Testing the size, position, height, width of the visual elements
    - Verifying and testing the error messages are displayed or not
    - Testing different sections of the display screen
    - Verifying the usability of carousel arrows
    - Checking the navigation elements at the top of the page
    - Checking the message displayed, frequency and content
    - Verifying the functionality of proper filters and ability to retrieve results
    - Checking alignment of radio buttons, drop downs
    - Verifying the title of each section and their correctness
    - Cross-checking the colors and its synchronization with the theme

# Other Types of Testing

**7. Install/Uninstall Testing**

- ❏ Installation testing is performed to check that the software application is installed properly and working as per expectation.
- ❏ Installation testing is a phase of testing before users interact with the actual application for the first time.
- ❏ Installation testing is also called “Implementation Testing”.
- ❏ Uninstallation Testing is performed to confirm if all the components or elements of the software are removed from the system or not.

**8. Negative Testing**

- ❏ The mindset of the tester is to “Break the System/Application” and it is achieved through Negative Testing.
- ❏ it is performed using incorrect data, invalid data, or input. It validates if the system throws an error of invalid input and behaves as expected.

# Example for Positive and Negative Testing

**Positive test cases:**

- ABCDEFGH (upper case validation within character limit)
- abcdefgh lower case validation within character limit)
- aabbccddmn (character limit validation)
- aDBcefz (upper case combined with lower case validation within character limit)

**Negative test cases:**

- ABCDEFGHJKIOOOOOKIsns (name exceeding 10 characters)
- abcd1234 (name having numerical values)
- No name supplied
- snddwwww_ ( the name containing special characters)

# Other Types of Testing

**9. Recovery Testing**

- ❏ It is a type of testing that validates how well the application or system recovers from crashes or disasters.
- ❏ Recovery Testing determines if the system can continue its operation after a disaster.
- ❏ Assume that the application is receiving data through a network cable and suddenly that network cable has been unplugged.

**10. Regression Testing**

- ❏ Regression testing is testing of unchanged features of the application to make sure that any bug fixes, adding new features, deleting, or updating existing features, are not impacting the working application.

**11. Vulnerability Testing**

- ❏ The testing, which involves identifying weaknesses in the software, hardware, and network, is known as Vulnerability Testing.
- ❏ In malicious programs, the hacker can take control of the system, if it is vulnerable to such kinds of attacks, viruses, and worms.

Refer this link for more details and contents

# Difference Between Black Box and White Box Testing

| Black Box Testing | White Box Testing |
| --- | --- |
| It is a testing method without having knowledge about the actual code or internal structure of the application. | It is a testing method having knowledge about the actual code and internal structure of the application. |
| This is a higher level testing such as functional testing. | This type of testing is performed at a lower level of testing such as Unit Testing, Integration Testing. |
| It concentrates on the functionality of the system under test. | It concentrates on the actual code – program and its syntax's. |
| Black box testing requires Requirement specification to test. | White Box testing requires Design documents with data flow diagrams, flowcharts etc. |
| Black box testing is done by the testers. | White box testing is done by Developers or testers with programming knowledge. |

# Any Questions???