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1. SOFTWARE TESTING

Testing can never completely identify all the defects within software. Instead, it furnishes a criticism or comparison that compares the state and behavior of the product against oracles—principles or mechanisms by which someone might recognize a problem. These oracles may include (but are not limited to) specifications, contracts, comparable products, past versions of the same product, inferences about intended or expected purpose, user or customer expectations, relevant standards, applicable laws, or other criteria.

Every software product has a target audience. For example, the audience for video game software is completely different from banking software. Therefore, when an organization develops or otherwise invests in a software product, it can assess whether the software product will be acceptable to its end users, its target audience, its purchasers, and other stakeholders. Software testing is the process of attempting to make this assessment.

1.1. What is Software Testing

Software testing is an investigation conducted to provide stakeholders with information about the quality of the product or service under test Software testing also provides an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Test techniques include, but are not limited to, the process of executing a program or application with the intent of finding software bugs.

Software testing can also be stated as the process of validating and verifying that a software program/application/product:

- ✓ meets the business and technical requirements that guided its design and development;
- ✓ works as expected; and
- ✓ can be implemented with the same characteristics.

Software testing, depending on the testing method employed, can be implemented at any time in the development process. However, most of the test effort occurs after the requirements have been defined and the coding process has been completed. As such, the methodology of the test is governed by the software development methodology adopted.

Different software development models will focus the test effort at different points in the development process. Newer development models, such as Agile, often employ test driven development and place an increased portion of the testing in the hands of the developer, before it reaches a formal team of testers. In a more traditional model, most of the test execution occurs after the requirements have been defined and the coding process has been completed

1.2. Software Testing History

The separation of debugging from testing was initially introduced by Glenford J. Myers in 1979. Although his attention was on breakage testing ("a successful test is one that finds a bug") it illustrated the desire of the software engineering community to separate fundamental development activities, such as debugging, from that of verification. Dave Gelperin and William C. Hetzel classified in 1988 the phases and goals in software testing in the following stages:

- ✓ Until 1956 - Debugging oriented
- ✓ 1957–1978 - Demonstration oriented
- ✓ 1979–1982 - Destruction oriented
- ✓ 1983–1987 - Evaluation oriented
- ✓ 1988–2000 - Prevention oriented

1.3. Software Testing Scope

A primary purpose of testing is to detect software failures so that defects may be discovered and corrected. This is a non-trivial pursuit. Testing cannot establish that a product functions properly under all conditions but can only establish that it does not function properly under specific conditions. The scope of software testing often includes examination of code as well as execution of that code in various environments and conditions as well as examining the aspects of code: does it do what it is supposed to do and do what it needs to do. In the current culture of software development, a testing organization may be separate from the development team. There are various roles for testing team members. Information derived from software testing may be used to correct the process by which software is developed.

1.4. Functional vs. Non-Functional testing

Functional testing refers to activities that verify a specific action or function of the code. These are usually found in the code requirements documentation, although some development methodologies work from use cases or user stories. Functional tests tend to answer the question of "can the user do this" or "does this particular feature work".

Non-functional testing refers to aspects of the software that may not be related to a specific function or user action, such as scalability or security. Non-functional testing tends to answer such questions as "how many people can log in at once".

1.5. Defects and failures

Not all software defects are caused by coding errors. One common source of expensive defects is caused by requirement gaps, e.g., unrecognized requirements, which result in errors of omission by the program designer. A common source of requirements gaps is non-functional requirements such as testability, scalability, maintainability, usability, performance, and security.

Software faults occur through the following processes. A programmer makes an error (mistake), which results in a defect (fault, bug) in the software source code. If this defect is executed, in certain situations the system will produce wrong results, causing a failure. Not all defects will necessarily result in failures. For example, defects in dead code will never result in failures. A defect can turn into a failure when the environment is changed. Examples of these changes in environment include the software being run on a new hardware platform, alterations in source data or interacting with different software. A single defect may result in a wide range of failure symptoms.

1.6. Finding faults early

It is commonly believed that the earlier a defect is found the cheaper it is to fix it. The following table shows the cost of fixing the defect depending on the stage it was found. For example, if a problem in the requirements is found only post-release, then it would cost 10–100 times more to fix than if it had already been found by the requirements review.

Cost to fix a defect		Time detected				
		Requirements	Architecture	Construction	System test	Post-release
Time introduced	Requirements	1×	3×	5-10×	10×	10-100×
	Architecture	-	1×	10×	15×	25-100×
	Construction	-	-	1×	10×	10-25×
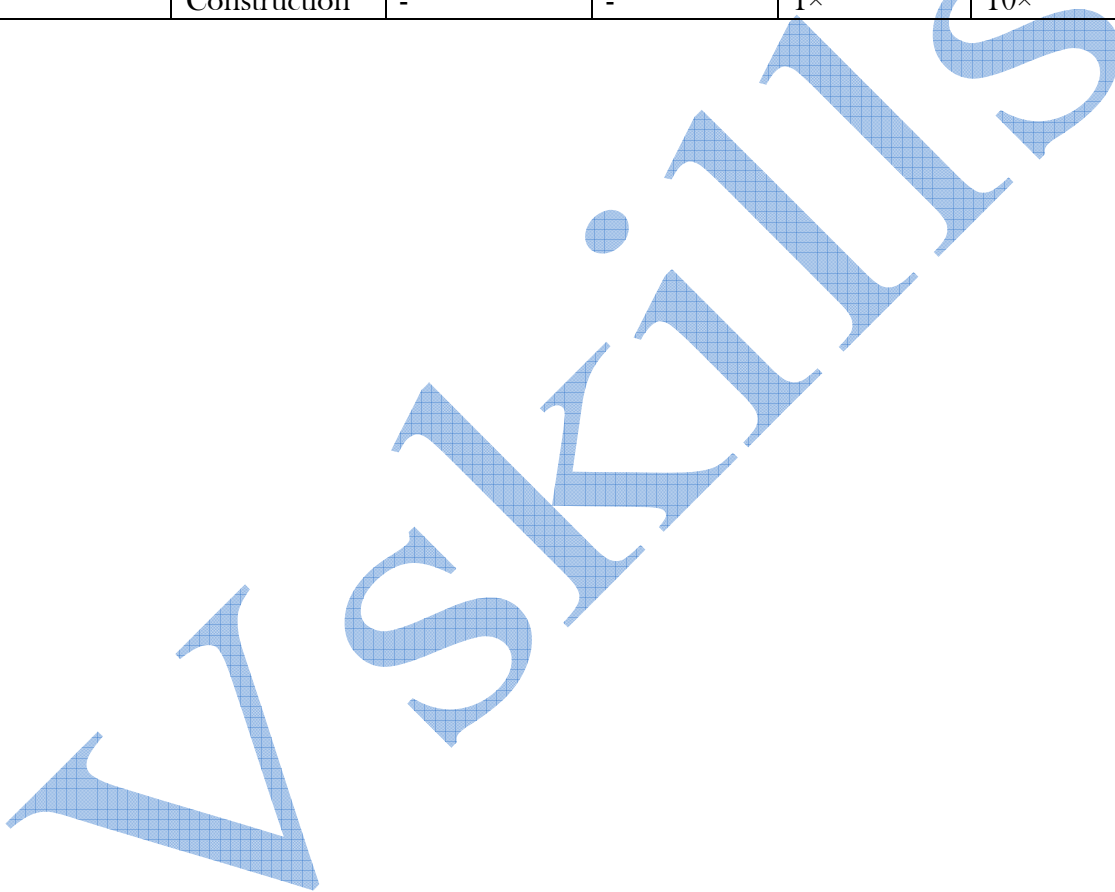
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– Certified Tally 9.0 Professional
– Certified Treasury Market Professional
– Certified Wealth Manager

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Cloud Computing
– Certified Cloud Computing Professional

Design
– Certified Interior Designer

Digital Media
– Certified Social Media Marketing Professional
– Certified Inbound Marketing Professional
– Certified Digital Marketing Master

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– Certified HR Stafffing Manager
– Certified Human Resources Manager
– Certified Performance Appraisal Manager

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– Certified Office Administrator

Project Management
– Certified Project Management Professional

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– Certified Real Estate Consultant

Marketing
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– Certified Six Sigma Green Belt Professional
– Certified Six Sigma Black Belt Professional
– Certified TQM Professional

Logistics & Supply Chain Management
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– Certified Logistics & SCM Professional
– Certified Purchase Manager
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– Certified Corporate Law Analyst

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– Certified Business Intelligence Professional
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– Certified IT Support Professional
– Certified PHP Professional
– Certified Selenium Professional
– Certified SEO Professional
– Certified Software Quality Assurance Professional

Mobile Application Development
– Certified Android Apps Developer
– Certified iPhone Apps Developer

Security
– Certified Ethical Hacking and Security Professional
– Certified Network Security Professional

Management
– Certified Corporate Goverance Professional
– Certified Corporate Social Responsibility Professional

Life Skills
– Certified Business Communication Specialist
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