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| Department of Software Engineering  Mehran University of Engineering and Technology, Jamshoro |

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| Course: SW426 - Software Quality Engineering | | | |
| Instructor | Rabia Iftikhar | **Practical/Lab No.** | 04 |
| Date |  | **CLOs** | CLO-3 |
| Signature |  | **Assessment Score** | 1 Mark |

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| Topic | Applying OO testing strategies |
| Objectives | * To learn OO testing strategies * To learn applying OO testing strategies |

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| Lab Discussion: Theoretical concepts and Procedural steps |

Once a program code is written, it must be tested to detect and subsequently handle all errors in it. A number of schemes are used for testing purposes.

Another important aspect is the fitness of purpose of a program that ascertains whether the program serves the purpose which it aims for. The fitness defines the software quality.

**Testing Object-Oriented Systems**

Testing is a continuous activity during software development. In object-oriented systems, testing encompasses three levels, namely, unit testing, subsystem testing, and system testing.

1. **Unit Testing**

In unit testing, the individual classes are tested. It is seen whether the class attributes are implemented as per design and whether the methods and the interfaces are error-free. Unit testing is the responsibility of the application engineer who implements the structure.

1. **Subsystem Testing**

This involves testing a particular module or a subsystem and is the responsibility of the subsystem lead. It involves testing the associations within the subsystem as well as the interaction of the subsystem with the outside. Subsystem tests can be used as regression tests for each newly released version of the subsystem.

1. **System Testing**

System testing involves testing the system as a whole and is the responsibility of the quality-assurance team. The team often uses system tests as regression tests when assembling new releases.

* 1. **Categories of System Testing**
* **Alpha testing** − This is carried out by the testing team within the organization that develops software.
* **Beta testing**− This is carried out by select group of co-operating customers.

**Object-Oriented Testing Techniques**

* **State model based testing**− This encompasses state coverage, state transition coverage, and state transition path coverage.
* **Use case based testing** − Each scenario in each use case is tested.
* **Class diagram based testing**− Each class, derived class, associations, and aggregations are tested.
* **Sequence diagram based testing** − The methods in the messages in the sequence diagrams are tested.
* **Techniques for Subsystem Testing**

The two main approaches of subsystem testing are −

**Thread based testing −** All classes that are needed to realize a single use case in a subsystem are integrated and tested.

* **Use based testing** – The interfaces and services of the modules at each level of hierarchy are tested. Testing starts from the individual classes to the small modules comprising of classes, gradually to larger modules, and finally all the major subsystems.

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| Lab Tasks |

1. A bank account class may have

* Methods to open the account, deposit funds, withdraw funds and close the account.
* The states of the account include open with positive balance, open with negative or zero balance and closed.
* How the methods behave depends on the state of the account.
  + An account with a zero or negative balance will not allow the customer to withdraw funds. If positive it might allow customer to go to overdraft once.
  + You could introduce a new method to determine if the account is open or closed and if balance is positive.

Test all the classes involved for a bank account for all the states and sequences.

1. A student registration class includes

* The methods for adding a class, dropping a class, transferring to a different section of the class and list classes.
  + A student must first be registered with the university (opened as a student).
  + Holds can be placed on a student and this effects whether he/she can register for a class.
  + There are limits on how many credit hours a student may register for.
  + A student may graduate (close a student).

Test the student registration class for all the states and sequences.

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| Lab Tasks Assessment/Rubrics along with Score/Marks | |
| *Rubric Description* | ***Rubric Marks*** |
| 1. Code originality | 0.25 |
| 1. Coding standards | 0.25 |
| 1. Test coverage | 0.25 |
| 1. Test completeness | 0.25 |