CHAPTER 5: AN E-GOVERNANCE DEPLOYMENT FRAMEWORK IN SOFTWARE DEVELOPMENT LIFE CYCLE BASED ON CLOUD SECURITY MEASURE

It has become the most exciting development & delivery alternative to arise in the new millennium. It is still in early adoption phase & will continue to move into the mainstream adoption. With the upcoming of cloud computing the enterprises are also moving towards its horizon in order to expand their premises facilities & reducing the cost of the resources. An e-governance deployment framework using the cloud computing security measure is proposed with respect to the software development life cycle model. This model will be incorporated with the e-governance deployment framework using the cloud computing.

5.1 Introduction

Government is well aware of cloud & it’s potential. But people are just waiting to get it more matured & real one. (Saripalli P, B. Walters (2010)) From the point of view of industry and government organization this technology may lead to chance of designing of new application processes as well as fundamental infrastructures for order of migration from current to the cloud platform (Bannister F (2009)). For reducing these various issues & related concerns a governance deployment framework based on cloud technology with the security perspective is needed for the enhancement of the security requirement especially in each & every phase of the system development life cycle (S. Ramgovind, M. M. Eloff, E. Smith (2010)). Cloud computing works on the principle of, “Pay as You Use” policy & this leads to reduction of resource prices for the companies. (B. Grobauer, T. Walloschek et al (2011)). The leakage of the data occurs at the third party most of the time called as the cloud service provider which can also lead to loss of data privacy & security. (T. Ristenpart, E. Tromer et al (2010)). The service owner takes the responsibility to keep the user’s data privat & secure by applying security protection laws & other protection related concerns. (S. Ramgovind et Al (2010)). The example has implied that the service providers who construct and operate their service at third party side called as cloud computing service provider should also involve in
considering of much more issues related to the purely outsourcing. (T. Ristenpart, E. Tromer et al (2010)). Several possible deployment models in cloud computing are shown in Figure 5.1. In this figure a very brief description of the services along with their service providers are shown.
Figure 5.2 shows the data handling responsibilities by CSP to keep data safe. We can see that direct communication between the cloud provider & users shows more privacy protection instead of involving the third party vendor which leads to leakage or the data lost in between. So there should be a strict Service Level Agreement ensuring the data security of user in any manner which is a very crucial thing. Establishing the right definition of e-governance is a prerequisite for any serious issue, analysis & decision that carry the legal consequences. E-Governance poses serious challenges of conceptualizations. The European commission defines the e-governance as follows:

“The use of Information & Communication Technology in the public administrations combined with the organizational change & new skills in order to improve public services as well as democratic processes & strengthen support to the public policies”.

The development of technology & the growing complexities of the software systems, information system management and governance are few critical security measures. Governance implies the process where the chains are established consisting of responsibilities, authorities & communication for the empowerment of public, as well as measuring & controlling mechanisms in order to carry out their roles and responsibilities. (M. Pokharel, J. S. Park (2009)). So the governance in information system pays a lot more attention for clarifying the responsibilities, roles, relationships, data process rules, and auditing standards of information systems (Karpati P, Sindre G et al (2011)). Many standards and guidelines have been proposed currently by the standards organizations of different national governments including the US government’s National Institute of Standards and Technology (NIST), the European Network and Information Security Agency (ENISA). In this study, an e-governance deployment framework based on security aspect of cloud SDLC perspective from the government specially as well as the industry perspectives so as to bring out the advancement in the Bhoomi Project of Karnataka. The secure software development life cycle proposed hereby will be incorporated with the cloud security critical domain guidelines as well as the risk considerations will be done for every phase. The five main phases in the cloud security SDLC consists of envisioning, planning, developing, stabilizing & deploying.
5.2 Similar tasks

5.2.1 Guidelines for cloud security

It aims at the identifying & understanding the problems among the cloud service providers & the consumers for the security guidelines which are very crucial & the data is kept more securely by means various principles related to the security. The most crucial Security guidance is the particular cloud security guideline most probably the crucial areas of focus in this technology (M. Pokharel, J. S. Park (2009)). The series related to the NIST publication regarding the cloud computing guidelines are listed below.

- **Security and Privacy guideline of NIST SP800-144**: A brief description of the privacy and security challenges has been provided by this guideline which is usable & familiar for the public clouds and thereby pinpointing the considerations which should be taken care of by the organization during the data outsourcing to a public cloud environment.

- **NIST SP800-145**: This guideline describes the cloud definition as the service and deployment models by means of a simple taxonomy being followed thereon without intending to for prescribing any specific techniques of deployment, service delivery & the business operation.

5.3 Legal Issues in cloud computing

5.3.1 Identification & authentication

The target of this process is the verification and validation of individual cloud users by providing the usernames and passwords protections to their cloud profiles as per requirements.

5.3.2 Authorization: It is an important information security requirement in Cloud computing so as to ensure the referential integrity constraint & the user data can be kept private & protected.
5.3.3 **Confidentiality:** The principle of confidentiality also plays an important role especially for maintaining the control over an organization data that is also located across the multiple distributed databases & also keeping the data confidential & private of the ultimate user is an ultimate importance for the cloud service provider.

5.3.4 **Integrity:** The ACID (atomicity, consistency, isolation and durability) property of the cloud’s data should also robustly impose across all cloud computing delivery models without any doubt.

5.3.5 **Investigation:** The aim of investigating an illegitimate activity may be difficult but not impossible in the cloud computing environments because it is a very typical process & the cloud services are normally difficult to investigate as the data for multiple customers may be co-located and may also be spread across multiple datacenters & the users may have very little knowledge about the network topology of the underlying environment. The cloud service provider has the authority for applying the restrictions on the network security of the service users.

5.3.6 **Data Segregation**

In the cloud computing environment the data of multiple customers can be located at a same location which is called as the data centers. Hence the data encryption is not the single solution for data segregation problems but other concerns of security need to be evaluated.

5.4 **An E-Governance framework**

An e-governance is a technology based on the e-commerce platform which signifies an online availability of various services offered by the government. It is popular in India as well as worldwide. In order to make the working of government more efficient it is therefore seen that a more responsive and transparent developed and developing countries have taken up few crucial steps in order to expand the e-governance in their respective countries. It allows the government to make the best possible use of internet technology in order to provide & communicate the information to the common people and
businessman. Today the electricity, water, phone and all kinds of bills can also be paid over the internet by means of e-commerce very easily immediately. The four very crucial pillars of E-Governance:-

5.4.1. Connectivity: - It is a requirement for connecting people to the respective government services.

5.4.2. Knowledge: - It refers to as the knowledge of information technology & there is a need for skilled engineering professionals to the government who can easily handle the e-governance very efficiently. The engineers have the responsibility of handling all kind of faults, failure & maintenance that may occur during the working of e-governance.

5.4.3. Data Content: - It allows sharing of any kind of knowledge or information over the internet medium which all exists in the database & the database should have the data content related to the government services.

5.4.4. Capital: - It means the money used by government for providing the services or to that sector of the economy based on its operation whether in private or the public partnership.

The pillars of e-governance namely capital, knowledge, connectivity and data content are shown in Figure 5.3. The e-governance important component capital is concerned with the choosing of the appropriate funds for the government projects. The knowledge component is concerned with the gaining of knowledge from the various sources. The connectivity component is concerned with making the connection with the other for gaining the knowledge. The data content pillar is concerned with getting the right content for the respective content. These pillars are the crucial for the effective e-governance approach and for the proper functioning of every task of an e-governance.
5.5 Report Card of the Public Affairs Council

Bhoomi is called as one of the few e-government projects which have been accessed by an individual organization by means of techniques which are systematic in nature. This leads to evaluating conduction at the public affairs council at Bangalore in July 2002 due to which a drastic impact on efficiency in delivering and corruption was shown.

5.5.1. Bhoomi kiosks usage: It allows more users to utilize the Bhoomi kiosks without any assistance during the presence of the manual mode of operation & many of them found it to be very simple to operate.

5.5.2. Procedures complexities: The Bhoomi users generally operate the project on their own without the help of any official or any other helping body in comparison to those who need at least one official meeting for the manual system.

5.5.3. Errors in documents received: The error free documents are provided to most of the users in the manual system usage & those which were reporting errors, wrongly spelt names were the most frequent error.
5.5.4. Rectification of errors: There has been unusualness in the existence of the errors at this stage of development of of this system for the land & analysis of the response tyne of this project was also analysed in this project. Every user in the Bhoomi system has the confidence to complain at any time & correspondingly getting the rectification solution on time & fact lies in that many complaints are being solved before time.

5.5.5. Service cost: The user may get the facility of the hard copy in the manual system at a very economical range of INR 10 to 20 & correspondingly & getting the acknowledgement in the form of receipt but large number of users complains that they had not got the receipt for the payment they have made.

5.5.6. Hidden costs: It can also be incurred by the Bhoomi users in terms of time and effort so as to make the certificates more secure & respectively many Bhoomi users have reported minimization of waiting time to 10 minutes or less in the queues were seen.

5.5.7. Reduced corruption: Two third of the users or citizens paid a bribe for doing their work on time & hence the corruption & bribe were the serious issues.

5.6. E-governance models

E-governance services can be shared among the citizens, businessman, government and employees. These four models of e-governance are as:-

5.6.1 Government to citizens (G2C):-This model of e-governance refers to that portion of the government services which are shared by the citizens who in contrast visit to the link of services which they want to use. By the help of this model a strong bond can be developed between the citizens & the government. It includes the payment of online bills such as electricity, water, telephone bills etc. Few are shown below example:

- Online Applications registration by online mode.
- Land-record copies.
- Online filling of complaints.
Availability of every kind of online information.

5.6.2 Government to government (G2G):- This model includes the services that are to be shared among the governments of one state with the other, or one country to the other. Huge amount of information needs to be shared among the various government agencies, department and organizations at every movement of time. These types of services or information are as:-

- Sharing of information among the police department of various state.
- Exchanging of the government document including preparation, approval, distribution, and storage of all government documents.
- Mostly the finance and budget work are also done through e-governance.

5.6.3 Government to businessmen (G2B):- This model allows the creation of bond between the private sector and government & thereby increasing the communication of businessmen with the government. The information is shared by the following means:

- Collection of taxes.
- Rejection and approval of patent.
- All kinds of payment related to bills and penalty.
- Sharing of all kind of information, rules as well as the data.
- Complaints or any kind of dissatisfaction can be shown by this.

5.6.4 Government to employees (G2E):- The transparency between the government & its employees can be increased by this model as the employee can keeps a check on the functioning and working of government and government can keeps on its employees. The information that can be shared by this model are as below:-

- Data submission such as attendance record, employee record of various government departments.
Employee can file all kinds of complaints and dissatisfaction by this model.

All kind of rule-regulation and information for employees can be shared by this.

Checking of payment & working records by the employees.

Registering of all kinds of working forms online by the employees.

An e-governance deployment framework in SDLC based on cloud security measure is shown in Figure 5.4 & the detailed description is discussed in this section. The cloud security SDLC comprises of 5 phases: Envisioning, planning, developing, stabilizing & deploying & the starting point is from envisioning till the last phase i.e. deploying.

**Envisioning**

This phase is composed of the software requirements which are to be developed as well as goals and constraints regarding the same are defined in this phase. After collecting the information we create vision or scope that at what extent it can be used and hence we develop the software for the same. The main procedures that need to be taken care of in this phase are: accessing requirements, initiating the security planning, accessing business impact, categorizing information system, & ensuring the process of security. To obtain these goals there should be the focus on the components like: Law & electronic evidence, Enterprise governance, creating cloud policy & risk assessment. The relationship among the components is shown in the Figure 5.5.

**Planning**

In this phase we define the requirements and create planning whereby we estimate risks, estimate costs, create work plans as well as schedule is created. Besides this we also trace the requirements to the features and define the functional specification. At last we create the use case model where the role of different actors is involved. Hence the secure architecture design & accessing the system risk need to be considered to achieve the
various components including Auditing, information life cycle management. This phase is shown in Figure 5.6.

Figure 5.4. E-Governance Model based on Cloud Security Measure
**Developing**

After the planning phase in this phase the design procedure is followed and some features are developed, thereby daily build is created, finalize the scope as well as we also develop the instruction. Integrating the security policies into the established system is the ultimate objective.
of this phase. The developer needs to follow various components such as application security, virtualization as well as the cryptography techniques. This phase is shown in Figure 5.7

![Figure 5.7: Developing Phase](Image)

**Stabilizing**

Software being developed by the developer needs to be tested for the bugs or any faults and that thing is done in the stabilizing phase. The software is tested by the tester and necessary precautions are taken to resolve those bugs occurring using various test cases and the tools and finally after resolving bugs review is done to again conform, whether any bug is there or not. The objective of this phase is to implement the secure system & keeping track on the Operation data centers, Security as a Service & Incident response. This phase is shown in Figure 5.8.
Deploying

This is the final stage where the tested software is finally implemented using various tools and techniques. In this phase the attention is made on the performance monitoring of the system by the administrator & the relevant staff on the continuous interval. This phase is depicted in Figure 5.9.

![Diagram of Deploying Phase]

**5.7 Results & the case study**

Here the proposed framework can be incorporated with Bhoomi project of Karnataka. For cloud information system description we took the study of Bhoomi project. This is based on maintaining the land records in a computerized manner. For that various taluks in different places of villages are established where the computers were kept & farmers can get the details of its property by providing the relevant details. The problem with such taluk is that the system used herein needs maintenance of hardware & the response time of system is very low. Besides these there is also a security issue as the land record of any farmer can be obtained by any other
farmer leading to potential vulnerabilities. So to avoid these things & reducing the cost of resources Bhoomi System Taluks needs to be migrated to the cloud based system from the existing one due to the integration of Kaveri with the Bhoomi. First & foremost in the envisioning the data privacy need to be considered by the government by identifying whether the individual farmer profiles should be measured as the private information or not & thereby taking necessary measures. Secondly the stabilizing phase is concerned with the fact that it allows the consideration of the data life cycle by the government & ensuring that the land records are well stored, well indexed, and completely destroyed. Besides the E-Governance deployment framework various security critical aspects are also incorporated with each phase of software development life cycle.

5.8 Re-usability Live Example

Being a student of technical field as a part of JJT University family we have observed that the entrance examination system is totally manual and it leads to wastage of resources in large amount in terms of green product so here in this project we have sorted out that problem thereby software entitled “Entrance Examination” has been developed wherein a student answers his exam on the computer and submits his answers. The submitted answers are evaluated by the examination software and the results are available immediately. This provides automation to the process and saves the evaluation time. Besides this a large amount of details like examination trends can be made available immediately if required. Online test process makes it simple from pencil/paper system to computer based testing. The examination system for the entrance exams are yet conducted manually which leads to wastage of resources, more cost, and time wastage. So keeping in mind and removing these drawbacks & introducing automated based an Entrance Examination System with smart named “Object Sure” based on Green Technology wherein a student answers his exam on the computer and submits his answers. The submitted answers are evaluated by the examination software and the results are available immediately. This provides automation to the process and saves the evaluation time thereby reducing the manual work & wastage of resources. Besides this a large amount of details like examination trends can be made available immediately if required. Automated test process makes it simple from pencil/paper system to computer based testing. This can be used by any educational institution according to their requirements. This examination system has the core advantage that it is built on by the use
of re-usability of code already existing called as the components which are taken from the repository & as per the requirements they are modified accordingly. This project can further be re-engineered in the advanced technology so as to make it suitable for running on the web with the multiple clients giving the exam. The below use case diagram simply shows the login page prompt for the user in which the user is prompted for the user name & password allotted to him & on successful login he will proceed further else he needs to input details again. The use case model of this system is shown in Figure 5.10.

5.9 SRS for ObjectSure

1. Purpose

1.1 Objective

This software can be used to conduct online entrance examination i.e. from test development and test delivery to data management and test conversion, working to make the process effective and reliable.

1.2 Scope

Scope of this project is very broad in terms of other manual exams. Few of them are:

- This can be used in educational institutions as well as in corporate World.
- Can be used anywhere any time as it is a web based application.
- No restriction that examiner has to be present at the time of examination.

1.3 References


1.4 Document Overview

An online Entrance Examination is one wherein a student answers his exam on the computer and submits his answers. The submitted answers are evaluated by the examination
software and the results are available immediately. This provides automation to the process and saves the evaluation time. Besides this a large amount of details like examination trends can be made available immediately if required. Online test process makes it simple from pencil/paper system to computer based testing.

2. Overall Description

2.1 Product Perspective

This Product can be used independently or with other products (integrated manner). It is flexible enough in the sense that it can be modified as per the organization requirements. The system will provide a functionality of online exam for different courses. Regarding the operability of the system the proper database of the questions will be maintained.

2.2 Product Functions

There are two different users who will be using this product:

- Administrator who will have full control over object sure.
- Students who will be accessing the object sure.
- The features that are available to the Administrator are:
  - The administrator has the full-fledged rights over the Object sure.
  - Can create/delete an account.
  - Can view the accounts.
  - Can change the password.
  - Insert/delete/edit the information of available on Object sure.

The features available to the Examiner are:

- Can take the test.
- Can view their marks.

2.3 User Characteristics

There will be two users who will be using the library:

- ADMIN who will be able to setup the questions.
Candidate who will use this software to give the exam.

2.4 General Constraints

The whole implementation is done in two modules. The first one is Administrator and the second is Examinee.

Module I:-

This first module tracks the path of Administrator. In this module it shows the admin can log into the system with a valid password and can add new valid user to the database. His user id and password is saved in the database. Also he can manipulate the database and add new question in the database from the webpage itself. It also shows how many questions are in database.

Module II:-

This second module track the path for the examinee. The examinee can log into the system with a valid ID issued by the admin. After successfully login into the system the examinee moves to the instruction web page where he will get instruction about the examination process. Then after clicking the start button the exam starts and timer also starts. In this manner examinee can take up the test and clicking the submit button, he will get the result immediately. At the end system displays the initial web page.

The constraints includes:-

- GUI is only in English.
- Login and password is used for identification of authorized persons.
- The course selected for the examination should be correct.
- Everyone has to read the instruction carefully.

2.5 Assumptions & Dependencies

Full working of object sure is dependent on the availability of PC with the required JRE & JDK.

Assumptions:
In general it has been assumed that the user has complete knowledge of the system that means user is not a naive user. Any data entered by him/her will be valid. To make the software as user friendly as possible but at the same time keeping in minds user requirements.

- Server OS should be Windows NT/2000/XP.
- Client PC should be Windows 9X/NT/ Windows 2000/vista/7 with latest service pack.

**Dependencies**

It will work according to the information provided by the users. If the information provided by the user is not appropriate, then it will not allow the user to use the System.

**3.0. Requirement specifications**

**3.1. Specific Requirements**

**3.1.1. Input**

The inputs include Login ID, Password which will be given as input by the user/candidate. Mouse click event will act as an input during the migration of user/candidate to the next page and the attemptation of the question.

**3.1.2. Output**

After the successful completion of the exam regarding the particular course the result report will be generated on which the username along with the marks obtained details of that candidate will be displayed and the candidate will be given the date on which final selection will be made.

**3.1.3. Processing Requirements**

**3.1.3.1. 256MB of RAM**

**3.1.3.2. Pentium 4 Processor, 2.2 GHz**

**3.1.3.3. Operating System (Windows)**

**3.1.3.4. LAN Connectivity**

**3.1.3.5. Server**

**3.1.3.6. Minimum of 60 MB of Hard Disk Space.**

**3.1.4. Valid Range**
There will be only single button named “ANSWER” and clicking that will migrate the candidate to the next question window and on the final window when user clicks the button “ANSWER” the Result Report will be generated.

3.1.5 External interface requirement-
3.1.5.1 User interface –

Application will be accessed by running the software. The interface would be viewed best using 1024 x 768 and 800 x 600 pixels resolution setting. The software would be fully compatible with Windows operating system like window xp/vista/7.No user would be able to access any part of the application without logging on to the system.

![User interface diagram]

Figure 5.10: Use Case Diagram of Login

3.1.6 Sequence of Operations

When the user run the software, the login page will be displayed which will prompt the user for the username & password input on the login page where the valid username & password details are required. If the credentials are incorrect or the fields are left blank so the correspondingly a message window indicating for entering the correct credentials or fill the appropriate credentials will occur. If the login credentials are correct so the candidate will be migrated to the course selection window following the loading of the particular section then after selecting the course & the appropriate set and clicking on the submit button so the instruction window for the exam will occur & on clicking the button “BEGIN” the exam will start up wherein the question along with its four options & the time limit of the exam is shown in the test page. This test page evaluates for each of the right & the wrong answer & finally after giving all the answers the results
correspondingly is shown in the result page. The design structure of this system is prescribed in the figure shown below.

3.1.7. Response to abnormal situation

When on the login page user enters the invalid login details or leave the details blank so the message dialog window will occur telling the user to input the valid login details.

3.2 Functional Requirements:-

i) Login: This module is designed for the user/candidate wherein he/she log in attempt to give the entrance exam. Also an administrator can also login in order to add/modify questions & user details in the database.

ii) Database: This module is designed to store the questions, answers and user details and it will be handled by the administrator.

iii) GUI: This module is the first module just to give an attractive starting look & feel by means of downloading process of various files.

iv) Test Section: This module will be responsible wherein the candidate can give an exam after the successful login & reading instruction.

v) Result: This module will provide the result in a proper manner to the candidate as per user/candidate has answered the question answers.

3.3 Performance requirement:-

The System is cable of working with the single user as well as the many users. In the case of many users the performance of the system may slow down.

3.4 Design constraints:-

The Information should be Secure; there should not be any kind of malfunctioning. All the results, details of Exams taken and Questions are stored securely in the system. System Information will not be changed by any person rather than the by administrator.
3.5 Attributes:-

The Quality of the software is maintained in such a way so that it can be very user friendly to all the users. The software quality attributes are assumed as under:

- Accurate and reliable.
- Secured.
- Fast speed.

The design structure of the objectsure model is shown in Figure 5.11.

![Design Structure of ObjectSure](image)

**Figure 5.11: Design Structure of ObjectSure**

A **Data Flow Diagram (DFD)** is a means of representing the flow of the data in the graphical representation through the source of information system. It differs from the flowchart as it shows the data flow of the program instead of the control flow of the program. A data flow diagram can also be used for the visualization of data processing (structured design). It is shown in Figure 5.12.
Figure 5.12: Level 2 DFD

5.10 Activity Diagram

Its pictorial representation is shown in Figure 5.13.
5.11 Result of Entrance Examination System
When the executable file of the Objectsure is run so the below process starts up as soon as the OK button is clicked the loading of software takes place. This process does not require any inputs and is pictorially being shown in Figure 5.14.

**STARTING PAGE**

![Home Page](image)

**Figure 5.14: Home Page**

As soon as the loading is complete of the software so the user will be prompted to input the correct username & password. If the candidate inputs the wrong username & password or an field is left blank so the candidate will be prompted to input the valid credentials detail. The username & password is allotted by the software through database randomization. As soon as the correct details are inputted & the candidate needs to click the login button adjacent to the password field & as soon as the button is pressed the validating page will occur for the data verification & validation. If the validation is OK so the candidate will be migrated to the course selection page. The welcome screen of the Objectsure is shown in Figure 5.15. Although the validating page is shown in Figure 5.16.
Object sure is a new & emerging platform developed by the software engineering students keeping in mind to remove the manual work for entrance examination and thereby automate everything so that candidate can get instant results. This software can be used by various educational institutions for conducting examination. It is a Green technology as it will reduce the usage of paper, pen & pencil work & saves various resources.

Figure 5.15: Login

VALIDATE PAGE

Figure 5.16: Validating
As soon as the user got entered into the page of selecting course he/she needs to select an appropriate course say MBA here & the subsequent SET as shown in the figure. If either of the field is not selected so the candidate will be prompted to select the details again till the correct thing is not selected. So selecting the appropriate details & clicking on the “Begin” the candidate is migrated to the instruction page which he/she need to read before the conduction of exams. Various important guidelines, Do’s & Don’t are also mentioned in the instructions as well as marking criteria is being also shown.

**COURSE SELECTION PAGE**

Figure 5.17: Course Selection Window
Every candidate needs to read the instruction before the starting of the exam as various precautions need to be taken care of during the exam session is being started as the user cannot go back once any step is missed of.

INSTRUCTION PAGE

![Instruction Page](image)

As soon as the candidate has read the instructions so by clicking on the begin button the user will directly been migrated to the Questionnaire page where the question alongwith the options & the
total time left is shown in the digital clock. The user needs to check the radio button against the right answer & then clicking on the continue to get the next question. There is no scope of coming back once an answer is given instead at last the review can be done based on the requirement. The right answer is awarded th particular marks & a negative marking for the wrong answer is a penalty. The marking is done internally of each & every answer respectively.

**QUESTIONNAIRE PAGE**

![Questionnaire Page](image)

Figure 5.19: Questionaire Page

At last when the candidate click on the submit button by completing the exam so the result page indicating the marks obtained alongwith the wrong answers are shown.
RESULT PAGE

Figure 5.20: Result

5.13 Test Cases of Objectsure

<table>
<thead>
<tr>
<th>TEST ID.</th>
<th>PAGE ON WHICH TEST IS PERFORMED</th>
<th>DESCRIPTION OF TEST CASE</th>
<th>ACTUAL RESULT</th>
<th>EXPECTED RESULT</th>
<th>TEST CASE STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Login Page</td>
<td>When user Id textbox &amp; password textbox</td>
<td>Invalid username &amp; password.</td>
<td>Invalid username &amp; password.</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>Login Page</td>
<td>Action 1</td>
<td>Response 1</td>
<td>Response 2</td>
<td>Response 3</td>
</tr>
<tr>
<td>---</td>
<td>------------</td>
<td>----------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>2</td>
<td>Login Page</td>
<td>When user Id passed &amp; password textbox is blank &amp; press login button</td>
<td>Invalid username &amp; password. Please try again</td>
<td>Invalid username &amp; password. Please try again</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>Login Page</td>
<td>When user Id textbox is blank &amp; password is passed &amp; press login button</td>
<td>Invalid username &amp; password. Please try again</td>
<td>Invalid username &amp; password. Please try again</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>Login Page</td>
<td>When value is passed in user Id textbox &amp; password textbox &amp; press login button</td>
<td>Invalid username &amp; password. Please try again</td>
<td>Logged In</td>
<td>Negative</td>
</tr>
<tr>
<td>5</td>
<td>Login Page</td>
<td>When value is passed in user Id textbox &amp;</td>
<td>Logged In</td>
<td>Logged In</td>
<td>Positive</td>
</tr>
<tr>
<td>Page</td>
<td>Description</td>
<td>User Id &amp; Password</td>
<td>Action</td>
<td>Action</td>
<td>Result</td>
</tr>
<tr>
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<tr>
<td>6</td>
<td>Validation Page</td>
<td>User Id &amp; Password are correct</td>
<td>Go to the course selection window</td>
<td>Go to the course selection window</td>
<td>Positive</td>
</tr>
<tr>
<td>7</td>
<td>Course Selection Page</td>
<td>If user doesn’t select course &amp; press start test button</td>
<td>Please select appropriate course</td>
<td>Please select appropriate course</td>
<td>Positive</td>
</tr>
<tr>
<td>8</td>
<td>Course Selection Page</td>
<td>If user select course &amp; press start test button</td>
<td>Question Page Came</td>
<td>Question Page Came</td>
<td>Positive</td>
</tr>
<tr>
<td>9</td>
<td>Question Page</td>
<td>Student Mark the answer of the given question &amp; press next button</td>
<td>Next Question Came</td>
<td>Next Question Came</td>
<td>Positive</td>
</tr>
<tr>
<td>10</td>
<td>Question Page</td>
<td>Student doesn’t Mark the answer</td>
<td>Next Question</td>
<td>Next Question</td>
<td>Positive</td>
</tr>
<tr>
<td>Question Page</td>
<td>When Student at last question &amp; doesn’t Mark the answer of it &amp; click next button to publish the result</td>
<td>Go to result page &amp; result is published</td>
<td>Go to result page &amp; result is published</td>
<td>Positive</td>
<td></td>
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<td>11</td>
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<td>12</td>
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</tr>
</tbody>
</table>

of the given question & press next button

Came

Came