UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2022 – 3rd Year Examination – Semester 6

IT6206 – Software Quality Assurance

Structured Question Paper

(TWO HOURS)

To be completed by the candidate

BIT Examination Index No: ....

Important Instructions:

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **11 pages**.
- **Answer all questions.** All questions carry **equal** marks.
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.
- All kinds of electronic devices including calculators are **not** allowed.
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Questions Answered

Indicate by a cross (×), (e.g. ☒) the numbers of the questions answered.

	Question numbers				
To be completed by the candidate by marking a cross (×).	1	2	3	4	
To be completed by the examiners:					

1) (a) Briefly explain the terms **software errors, faults, and failures**.

(10 marks)

ANSWER IN THIS BOX

Errors:
Software error is an error made by software developers. It can be a grammatical error in one or more code lines or a logical error in carrying out one or more of the clients' requirements.

Faults:
Software faults (Software defects) is an error that causes improper functioning in the system or a part of the system. Not all errors become faults. Some software errors will be corrected or neutralized by subsequent code lines.

Failures:
A software fault becomes a software failure when a software user tries to apply the specific faulty application. When a program is executed, if the right conditions exist, a software fault may result in unexpected behavior. This is known as a software failure.

(b) What are the advantages of software testing in following two stages?

(i) Requirement Reviews, Refinement of user stories. (**5 marks**)

ANSWER IN THIS BOX

- Can detect defects before any designing or coding activities.
- Reduces the risk of an incorrect or untestable software being developed.

(ii) While coding the system. **(5 marks)**

ANSWER IN THIS BOX

- Increase each parties understanding of the code and how it should be tested.
- Reduce the risks of defects in the code.

(c) Consider the following scenario,

In a user registration form for an online streaming website, there is a field to enter the user's age in years. Accordion to the input the website categorizes the user in to following four groups.

Age range from 6 - 17: Miner
Age range from 18 to 64: Adult
Age range from 65 to 120: Senior Citizen

(i) Identify the equivalent ***valid*** and ***invalid*** partitions in the above scenario **(2 marks)**

ANSWER IN THIS BOX

0 - 5: invalid
6 - 17: valid
18 - 64: valid
65 - 120: valid
Larger than 121: invalid

(ii) Identify boundary values for the above scenario **(3 marks)**

ANSWER IN THIS BOX

0 - 5: boundary values 0, 5
6 - 17: boundary values 6, 17
18 - 64: boundary values 18, 64
65 - 120: boundary values 65, 120
Larger than 121: boundary values 121

2) (a) Explain **Two (2)** differences between *Component Integration Testing* and *System Integration Testing*? **(5 marks)**

ANSWER IN THIS BOX

- Component Integration Testing focuses on the interactions and interfaces between integrated components and System Integration Testing focuses on interactions and interfaces between systems, packages and micro-services.
- CIT is performed after component testing and SIT may performed after system testing or in parallel with ongoing system test activities.
- CIT is often the responsibility of developers and SIT is often the responsibility of testers.

(b) Explain what is an **entry criteria** and an **exit criteria** with regard to Software Testing Life Cycle. Give the entry and exit criteria for Test Closure phase.

(10 marks)

ANSWER IN THIS BOX

Entry Criteria

- Conditions or documents required to begin a particular phase of STLC.
- Conditions that allow a task to perform and in case of their absence, the task will not be performed.

Exit Criteria

- Items/documents/actions/tasks required to be completed before concluding a STLC phase and moving on to the next phase.
- A set of expectations from a particular phase.

Test Closure phase

Entry criteria:

- Execution of the test case is complete
- Test results are available
- Defects report is available

Exit criteria:

- Provision of test closure reports
- Preparation of matrices (to be signed by the clients)

(c) List down and briefly describe the states of a Software Defect Life Cycle.

(10 marks)

ANSWER IN THIS BOX

- **New:** Potential defect that is raised and yet to be validated
- **Assigned:** Defect that is assigned to a development team to be checked
- **Active:** The Defect is being addressed by the developer and investigation is under progress. Possible outcomes are deferred or rejected
- **Test/Fixed/Ready for Retest:** Defect is fixed and ready for testing
- **Verified**: The defect that is retested and the test has been verified by QA.
- **Closed**: The final state of the defect that can be closed after the QA retesting or can be closed if the defect is duplicate or considered as NOT a defect.
- **Reopened**: Unfixed defect that is reactivated or reopened by the QA.
- **Deferred**: When a defect cannot be addressed in that particular cycle it is deferred to future release.
- **Rejected:** A defect can be rejected for any of the three reasons – duplicate defect, NOT a Defect, Non-Reproducible.

3) (a) (i) Track corrective action to closure is one of the main objectives of test monitoring and control.
List **Two (2)** other main objectives of test monitoring and control.

(2 marks)

ANSWER IN THIS BOX

Monitor the test plan and schedule and keep on track.
Monitor the key project parameters.
Conduct progress and milestone reviews to determine the actual status. – Re-plan as appropriate.
Monitor risks and take appropriate action.
Analyse issues and change requests and take appropriate action.
Monitor resources and manage any resource issues.
Report the test status to management.

(ii) Briefly explain the difference between the Schedule timeliness metric and the effort timeliness metric for testing

(4 marks)

ANSWER IN THIS BOX

The effort estimation chart is similar to the schedule estimation chart, except that the schedule metric is referring to time as recorded in elapsed calendar months, whereas the effort estimation chart refers to the planned number of person months required to carry out the work, and the actual number of person months that it actually took

(b) Choosing the right testing tool is crucial for successful test automation.

(i) Briefly explain **Two (2)** key factors to consider when selecting a testing tool.

(3 marks)

ANSWER IN THIS BOX

- Compatibility with your platforms and technologies. This includes considering the operating systems, application types, and mobile platforms you need to test.
- User-friendliness and flexibility for testers of all skill levels. This includes assessing whether the tool supports keyword testing or if scripting expertise is required.
- Look for tools that offer a range of features such as record-and-playback and checkpoint verification to make test creation and execution easier.
- Ability to create maintainable and reusable tests that can adapt to changes in UI. Ensure that the tests you create will remain effective even if there are changes in the application's user interface.
- Integration with your existing ecosystem. Ensure the tool integrates seamlessly with your CI/CD pipeline, test management framework, defect-management system, and source control.
- Ability to test enterprise applications. Consider whether the tool provides support for testing packaged applications such as SAP, Oracle, Salesforce, and Workday.

(ii) Compare and contrast Manual Testing and Automation Testing with respect to Accuracy and Cost efficiency.

(3 marks)

ANSWER IN THIS BOX

The likelihood of human errors in manual testing results in reduced accuracy. Computer-based automation testing eliminates the possibility of human errors, resulting in increased accuracy. Manual testing is more costly since it involves the hiring of experts to perform testing. Automation testing is Less costly since once the software infrastructure is in place, it works for a long time.

(c) (i) XPath in Selenium is an XML Path used for navigation through the HTML structure of the page.
Briefly explain the difference between Absolute XPath and Relative XPath.

(2 marks)

ANSWER IN THIS BOX

Absolute XPath is the complete path to an element on a web page starting from the root node. Relative XPath is a shorter, more flexible path to an element on a web page that starts from an element in the DOM, rather than from the root node.

(ii) Sample XML structure for employee records is given below.

```
<root >
     <employees>
          <employee id="1">Nimal Perera</employee>
          <employee id="2">Sunil Perera</employee>
          <employee id="3">Kamal Fernando</employee>
          <employee id="4">Amal Silva</employee>
          <employee id="5">Nimal Silva</employee>
     </employees>
</root>
```

Write the absolute Xpath to get the employee record with id “4”.

(3 marks)

ANSWER IN THIS BOX

/root/employees/employee[@id = '4']

(iii) Write the relative Xpath to get all the employee records that have ‘Perera’ in their names.

(3 marks)

ANSWER IN THIS BOX

//*[contains(text(), 'Perera')]

(d) (i) Choosing the right architecture for automated testing is crucial to ensure that the testing is effective and efficient.
Briefly explain the **advantages** and **disadvantages** of Record and playback architecture.

(2 marks)

ANSWER IN THIS BOX

This is one of the most commonly used architectures. Here, the testing tool records the user's interactions with the web application and generates automated tests based on those interactions. The tests can then be played back to simulate the same interactions in subsequent testing runs. This architecture is simple and easy to use, but it can be brittle and may not work well with complex web applications.

(ii)
```
WebElement hoverable = driver.findElement(By.id("hover"))
        new Actions(driver)

            .moveToElement(hoverable)

            .perform();
```

What is the action performed by the *moveToElement* method given in the above code segment?

(3 marks)

ANSWER IN THIS BOX

shift the mouse pointer to the center of the element

4) (a) (i) Briefly describe the Jenkins Master-Slave Architecture focusing on the major responsibilities of the Master and Slave components.

(04 marks)

ANSWER IN THIS BOX

An architecture to handle multiple machines and distribute the workload automatically. Can create different build sections to support all necessary building and testing environments. --------(For the basic idea - 02 marks)

Responsibilities

- Master - Schedule build jobs and dispatch to the slaves for job executions — (01 mark)

[Acceptable answers - Monitoring slaves and recording results]

- Slave - Execute the build jobs given by the Master — 01 mark

(ii) Consider the following Jenkins Pipeline Script with a single stage called “Test”.

```
pipeline {
       agent any
       stages {
           stage("Test") {
               steps {
                   sh 'make check || true'
                   junit '**/target/*.xml'
               }
           }
       }
}
```

What is the purpose of the steps given in part (A) and part(B) below?

(A). `sh 'make check || true'`

(02 marks)

ANSWER IN THIS BOX

This step executes the shell command “make check” within the Jenkins environment. The “|| true” part ensures that even if the “make check” command fails (returns a non-zero exit status), it does not cause the pipeline to fail.

(B). `junit '**/target/*.xml'`

(02 marks)

ANSWER IN THIS BOX

This step publishes JUnit test results by specifying the path to the JUnit XML report files. It uses the glob pattern **/target/*.xml to match XML files in any subdirectory of the "target" directory.

Acceptable answers: It captures and associates the JUnit XML files matching the inclusion pattern **/target/*.xml

(iii) You are working on a Git repository called "bitproject" that contains the following files: "index.html", "styles.css", and "script.js". Perform the following tasks by writing the appropriate Git commands.

(A). Initialize a new Git repository called `"bitproject"`

(01 mark)

ANSWER IN THIS BOX

git init bitproject

(B). Add all the files in the repository to the staging area and commit the change with the message "`Initial Commit`".

(02 marks)

ANSWER IN THIS BOX

git add —-------- 01 mark
git commit -m "Initial Commit" —------------ 01 mark

(C). Create a branch called "`feature`" and switch to the "`feature`" branch.

(02 marks)

ANSWER IN THIS BOX

git branch feature —--------- 01 mark
git checkout feature —------ 01 mark

(b) (i) Briefly describe the *Behaviour Driven Framework* and *Data Driven Framework* in relation to test reporting frameworks.

(04 marks)

ANSWER IN THIS BOX

Behavior Driven Framework

- Tests are written in descriptive style in a way that even business stakeholders can understand those. Tests are in terms of behaviors and user-focuses scenarios. —----- 02 marks

Data Driven Framework

- Focuses on executing a test with different input data. There is a clear separation of test scripts and input data. Hard coding of data within scripts is avoided. —------- 02 marks

(ii) What is the purpose of UIAutomator in Appium for Android?

(04 marks)

ANSWER IN THIS BOX

- UIAutomator is a native UI automation framework of Android that allows you to run Junit test cases directly into the device using command line. Although it uses Java programming language, Appium allows it to run it from any WebDriver supported language.

Other Acceptable Answers

- To facilitate the automation of user interactions with the Android User interface.
- Provide a set of APIs that help tests to interact with UI elements, perform actions such as clicking buttons, entering text, etc.

(iii) Briefly describe the differences between Native mobile applications and Browser-based mobile applications.

(04 marks)

ANSWER IN THIS BOX

Native app is an app developed for a particular mobile device or platform (Android, iOS, Windows). Can run in both online mode as well as in offline mode. Tied to the mobile OS it has been developed so, hence can't run on other OS. —02 marks

Browser-based apps are accessed over a mobile browser. Served from a server, not stored offline anywhere on the device. Has a common code base. Might lack in native specific features like GPS, Camera, etc. —02 marks

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