Sample Exam (Answer and Justification)
ISTQB® Expert Level
Test Automation - Engineering
2014

Version 1.1

International Software Testing Qualifications Board

ISTQB™

Expert Level Working Party: 2008 - 2014

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Revision History

Version	Date	Remarks
Version 1.1	2014/05/26	Version for voting
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Expert Level Test Automation - Engineering

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0. Introduction

0.1 Purpose of this document

This document contains a full sample exam following the rules described in the ISTQB Expert Level Exam Structure and Rules document.

The sample questions, answer sets and associated justifications in this document have been created by a team of subject matter experts and experienced question writers with the aim of assisting ISTQB® Member Boards and Exam Boards in their question writing activities as well as people planning to take the ISTQB Expert Level Test Automation - Engineering examination.

These questions cannot be used as-is in any official examination, but they should serve as guidance for question writers. Given the wide variety of formats and subjects, these sample questions should offer many ideas for the individual Member Boards on how to create good questions and appropriate answer sets for their examinations. Furthermore training providers can use these questions as part of their training to prepare participants for the examination.

0.2 Instructions

The question and answer sets are organized in the following way:
- Learning Objective and K-level
- Question - including any scenario followed by the question stem (The question is contained in a separate document – 'CTEL TA-E Sample Exam Questions')
- Answer Set (The answer set is contained in the document – 'CTEL TA-E Sample Exam Questions')
- Correct answer – including justification of the answers

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1. Test Automation - Engineering Sample Questions

Question 1

ELTA-E-1.1.1   (K2) Explain the objectives, advantages and limitations of test automation

Justification:
  A. Incorrect - This is a fact but is not necessarily an advantage to automation.
  B. Incorrect – This is listed as a disadvantage in the syllabus
  C. Incorrect – This is listed as a disadvantage in the syllabus
  D. Correct – per the syllabus

Point Value: 1

Question 2

ELTA-E-1.2.1   (K2) Identify technical success factors of a test automation project

Justification:
  A. Incorrect –The approach should target the most testable items first
  B. Correct - The Test Automation Architecture must be designed for maintainability, performance and learnability
  C. Incorrect – The old and new parts of the SUT may need to be approached differently in the Test Automation Strategy
  D. Incorrect – Traceability should be tracked within the Test Automation Framework.

Point Value: 1

Question 3

ELTA-E-3.2.1   (K4) Design the appropriate Test Automation Architecture for a given project

Justification:
  A. Incorrect – Scenario-based test generation is appropriate when use cases are the primary input.
  B. Incorrect – The question does not indicate that this is a data-based application
  C. Correct – You need to pick the tool you will use for test execution and you need to be sure it will work with the test generation approach.
  D. Incorrect - Although the TA-E should be contributing to the estimate, the overall estimate is the responsibility of the TA-M

Point Value: 3

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Question 4

ELTA-E-4.1.1 (K4) Analyze a given situation and identify TA-S deployment risks

Justification:
- **A.** Incorrect – An incremental roll out should be used.
- **B.** Incorrect – The syllabus advises an incremental rollout with licenses added as needed rather than paying for all the licenses at the beginning when they won't all be utilized.
- **C.** Correct – per the syllabus.
- **D.** Incorrect – using a trivial project will not provide enough information and even a successful implementation will not imply success in a larger project.
- **E.** Correct – per the syllabus.

Point Value: 3

Question 5

ELTA-E-4.2.1 (K3) Implement a test automation framework, including test tools, to ensure automated tests run efficiently and reliably

Justification:
- **A.** Incorrect – This is infeasible. One execution of the software will not find all unexpected errors.
- **B.** Incorrect - Just closing the dialog boxes is not the same as handling the error, and continuation of the script may not be possible depending on the error.
- **C.** Incorrect – It is a good idea and will help eliminate some of the error conditions, but not all of them, so there still needs to be a way to handle the unexpected ones.
- **D.** Correct - Specific scripts will need to be developed for the various error scenarios and it is particularly important that they handle the error and return the system and its environment to a known state.

Point Value: 3

Question 6

ELTA-E-6.1.1   (K4) Analyze factors relevant to determining the appropriate criteria for suitability of tests for automation

Justification:
- **A.** Correct - The updates to the database software may make the system unstable and may affect the automation.
- **B.** Incorrect - This can actually be a good opportunity for automation.
- **C.** Incorrect – There are open source tools available and there is no indication that open source would not be allowed.
- **D.** Incorrect – API automation is feasible and is often cost-effective.

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Question 7

ELTA-E-7.1.1   (K3) Apply validity checks to the automated test environment and test tool setup

Justification:
  A. Correct - It's important to make sure that the test cases that should fail do fail and that the test cases that should pass do pass.
  B. Incorrect - Upgrading might not be the right thing to do since it may require rework in the test automation software.
  C. Incorrect – A high level of intrusion is likely to be a negative rather than a positive.
  D. Incorrect - This is used to verify the automated test suite, not the environment

Point Value: 3

Question 8

ELTA-E-7.2.1   (K3) Verify an automated test suite

Justification:
  A. Incorrect – This should be part of verifying the environment, not the test suite
  B. Incorrect – Upgrading might not be the right thing to do since it may require rework in the test automation software.
  C. Incorrect – Tearing down and rebuilding the test automation solution is something you might do to verify the environment, but not the test suite itself.
  D. Correct – It's important to make sure that the test cases give consistent and repeatable results.

Point Value: 3

Question 9

ELTA-E-3.1.1   (K2) Explain the structure of the gTA-A

Justification:
  A. Incorrect – This is not a layer in the gTAA.
  B. Correct – This is the layer in which the tools exist to support creating the test data..
  C. Incorrect – This does not deal with creating test data.
  D. Incorrect – This does not deal with creating test data.

Point Value: 1

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Question 10

ELTA-E-6.2.1   (K2) Explain the steps needed to implement automation within regression testing

Justification:
  A. Incorrect – Regression tests should not be finding a large number of defects.
  B. Incorrect – There is nothing to indicate these tests are more complex than any other tests.
  C. Correct – Because they are executed frequently and tend to be stable, they provide a high return on the automation investment.
  D. Incorrect – There is nothing to indicate these tests are easily implemented with keyword-driven approaches. They might be, but they might not.

Point Value: 1

Question 11

ELTA-E-6.3.1   (K2) Explain the factors to consider in implementing automation within new feature testing

Justification:
  A. Incorrect – The question is asking about keywords.
  B. Incorrect – D should be done first.   Creating new keywords should only be done after evaluation of the existing keywords determines that they can't be expanded or reused for the new functionality.
  C. Incorrect – The question is talking about new features, not defect verification and prevention.
  D. Correct – This is the most cost-effective approach and helps to build maintainable software.

Point Value: 1

Question 12

ELTA-E-8.2.1   (K4) Analyze the test environment components, including tools, in order to understand where consolidation and updates need to be made following a given set of test environment changes

Justification:
  A. Incorrect – The big bang approach will be difficult to troubleshoot if any issues are found.
  B. Incorrect – If we always trusted everyone else to do the testing we wouldn't have anything to do! Seriously though, everyone makes mistakes and it is our job to test our own code as well as making sure we test the changes to the SUT and infrastructure.
  C. Incorrect – See B.
  D. Correct – Incremental testing is needed for this change as there could be database call issues from both the test code and the SUT code. Performance issues may have been introduced by the SAN, so that should also be tested.

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Question 13

ELTA-E-2.1.1   (K4) Analyze a system under test to determine the optimal automation solution

Justification:
   A. Correct –This is the biggest risk with code that has been specially written to provide interfaces to the software exclusively for the use by the test code.
   B. Incorrect – The existing hooks already have existing test code that can be expanded. This should be a lower development effort than starting over.
   C. Incorrect – A risk-based approach could still be used to prioritize which hooks to expand and which new hooks to create.
   D. Incorrect – Using the test hooks would preclude using the test automation tool that would not use the hooks. If you decided to use both, they would be separate efforts and you would not expect the tool to leverage those hooks.

Point Value: 3

Question 14

ELTA-E-5.4.1   (K2) Explain how a test execution report is constructed and published

Justification:
   A. Incorrect – While this may be effective in some organizations, per the syllabus, C is the most practical.
   B. Incorrect – While this may be effective in some organizations, per the syllabus, C is the most practical.
   C. Correct per the syllabus
   D. Incorrect – While this may be effective in some organizations, per the syllabus, C is the most practical.

Point Value: 1

Question 15

ELTA-E-5.3.1   (K4) Implement logging of test executions and test results (of both TA-A and SUT data)

Justification:
   A. Correct – This will give you the iteration number and the exact data used by the test case so you can see the frequency of failure and the data that may be causing it.
   B. Incorrect – This is not as good a choice because it will not include the data so the playback may not be helpful if the data is the cause of the issue.
   C. Incorrect – There is no indication that the failures are causing crashes on the SUT.
   D. Correct – This will give you the iteration number and the exact data used by the test case so you can see the frequency of failure and the data that may be causing it.
   E. Incorrect - This might be helpful, but we don't know if the data would appear in the UI or if the data is used somewhere else by the application other than as displayed input values.

Point Value: 3

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Essay 1

TA-E1	Contribute to the development of a plan to integrate automated testing within the testing process
TA-E5	Enable the transition of testing from a manual to an automated approach
TA-E7	Manage and optimize testing assets to facilitate maintainability and address evolving (test) systems

ELTA-E-4.4.1   (K5) Evaluate which factors support and affect TA-A maintainability
ELTA-E-8.1.1   (K6) Create the strategy for the test automation improvement of the TAA
ELTA-E-6.1.2   (K5) Conduct analysis of transition issues

Grading Criteria:
1. Any two of these is acceptable: Improvements should be investigated for the scripting approach to consider using keywords rather than just a data-driven approach; a standard verification method should be implemented for all scripts rather than having the verification method defined by the implementer; tool support could be improved, particularly in the reporting area; the test automation solution should be updated to cover the latest features (previously prohibited by budget constraints), then verified to ensure there have been no adverse effects on the existing test cases, and ensure the new functionality has been incorporated into the framework library. (20 pts, 10 for each response)
2. It will be important to bring the new people up to speed as quickly and effectively as possible. The training of the new people should explain the differences in automated vs. manual testing and how they will be involved in the automated effort. Since all these testers have good domain experience, it would make sense to involve them in understanding what a keyword is and that reusability is a goal. They should then be recruited both to create test data and to identify keywords. As they become more comfortable, and since they all have programming skills, they should move toward implementing the keywords, perhaps by being paired with experienced automators to ensure they are developing good and maintainable code. Peer reviews of the new automators' code should be conducted by the developers and the automators who are leaving to ensure high quality and provide training on what they have done and why they did it. (10 pts)
3. At a minimum, the answer should include examples for each of the maintenance types: preventive should be done to add code to verify the new interfaces and be sure all interfaces are covered; corrective should be conducted to resolve the issue with the AMEX cards; perfective should be conducted to fix the usability issues with the reporting of the automation software; adaptive should be conducted to update the software for the new regulatory requirements. Answer should demonstrate an understanding of the different types of maintenance. (20 pts, 5 pts for each type)

Possible Point Value: 50

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Essay 2

TA-E3	Create an approach and methodology for building a test automation architecture (TAA)
TA-E4	Design and develop (new or modified) test automation solutions that meet the business needs

ELTA-E-3.3.1 (K6) Construct a purpose-built Test Automation Architecture (TA-A) based on the Generic TA-A (gTA-A) using predefined components

ELTA-E-4.3.1 (K6) Devise mitigation strategies to address technical risks, including framework approach, that could lead to failure of the test automation project

Grading Criteria:
1. The Test Adaptation Layer would need the most customization. Customization would be required to handle the API tests for the services and communication to the emulator. It is important that the answer indicates an understanding that the Test Adaptation Layer handles the interaction between the test automation architecture and the SUT. The Test Generation Layer may need to be modified to handle the XML. The Test Definition and Test Execution layers should be usable as they are. (20 pts)
2. In this example, the technology compatibility and the tool compatibility will be important. The test automation solution should to be able to communicate with the SUT seamlessly (ideally), should be easy to use and should have the capability to adapt to future simulators/emulators. The tools must also be compatible so the test automation solution and SUT can be developed and tested together using common requirements and defect management tools. Process and Team compatibility can also be mentioned in the answer as long as they are well supported for this particular SUT. (10 pts)
3. Any of the following risks can be identified for this project: Typical technical risks and mitigation strategies include:
   - Data-driven: data tables become too large/complex/cumbersome
     - Mitigation strategy: split tables apart by functional area or some other logical method, put the data into a database rather than in spreadsheets, ensure a unified data strategy is being used
   - Staffing issues: getting the right people to maintain the code base
     - Form a strict interviewing process, provide training as needed, get people who are familiar with test automation
   - Dependency of the test automation solution to use certain operating system DLLs or other components that may not be available in all the target environments of the SUT
     - Identify the target environments and pre-validate that the necessary components work in those environments. Concentrate initial testing on one confirmed environment.
   - New SUT deliverables may cause the test automation solution not to operate correctly
     - Create a deliver process that will include a build acceptance test so that new deliveries do not destabilize the test environment.
   - Potential test interfaces may pose security risks
     - Identify and disable the suspect test interfaces   (20 pts (10 for risks, 10 for mitigations))

Possible Point Value: 50

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Essay 3

TA-E2	Evaluate tools and technology for automation best fit to each project and organization
TA-E6	Create automated test reporting and metrics collection

ELTA-E-2.2.1   (K6) Report technical findings and create recommendations from the analysis of test automation tools

ELTA-E-5.1.1   (K6) Devise methods for implementing automated metrics collection and report generation for technical and test management requirements.

Grading Criteria:

1. <u>Unified reporting</u> – since the tool is already purchased, it would be good to see if the vendor supplies an interface to the existing test management tool or if it would be possible to write (and maintain) code that could handle the communication. Community forums might also be useful. If there is not a viable solution, see if the current test management tool offers a suite that includes a test automation solution. Alternatively, it would be worth investigating if the test management tool can be replaced with a tool that will provide an interface.
   <u>GUI objects</u> – Work with development to check if some of the objects can be re-defined. Check if the objects can be handled by using tool-defined objects that are similar. Investigate if there's a way to add code to define the objects. Ask the vendor/community for advice.
   <u>Complex tool</u> - Investigate training opportunities for the team. Check if there is better documentation available. Check if the interface of the tool can be configured to be more simple.
   <u>SUT effects</u> – Work with the developers to identify the intrusion effect this tool is having. Simplify the tests to try to troubleshoot the issue. Check with the vendor/community for similar issues. This may be a problem that can't be worked around so a new tool may have to be considered.
   <u>Gullible management</u> - This is the most difficult problem. Incorporating good metrics will help educate management. A good automation class could help. This is an education issue and if the TA-E can't do it, maybe formal education could help. This education must dispel common automation myths, including why 100% automation is inefficient (high script maintenance, difficulty automating some areas with low payback, diminishing payback with the higher automation percentages, etc.). Another effective approach might be to educate management in a one-to-one setting, seeking support and making an official proposal for what can be done.

   5 pts for each issue, 25 pts total.

2. The six defined metrics should include:
   a. Effort to build automated tests
   b. Effort to maintain automated tests
   c. Time to execute automated tests (compared to manual tests)
   d. Number of defects found by automated tests (automation benefits)
   e. Number of automated tests
   f. Code coverage
   The list may be a bit different, but each of these items should be covered. It's particularly important that the emphasis be on the metrics that will help management understand the time it takes to build the automation and the effectiveness of the automation. There should not be emphasis on pointing out the flaws in the automation code (false positives, etc.) because that is unlikely to convince management that the automation is effective. (2.5 pts for each metric for a total of 15 pts)

   Reasonable goals should be based on increasing the amount of manual test effort saved, reducing time to perform regression testing, executing more tests per cycle, finding faults that

are difficult to find with manual testing, etc. Real numbers may be fabricated in the answer since there are no numbers supplied in the question, but the important items here are to increase coverage and maximize the benefits of the automation. 100% automation is not a reasonable goal and points should be deducted if that is assumed to be the goal. (10 pts)

Possible Point Value: 50