Sample Exam – Answers

Sample Exam set A
Version 1.1

ISTQB® Improving the Test Process, part 1: Assessing the Test Process Syllabus Expert Level

Compatible with Syllabus version 1.0

International Software Testing Qualifications Board

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Document Responsibility

The ISTQB® Examination Working Group is responsible for this document.

This document is maintained by a core team from ISTQB® consisting of the Syllabus Working Group and Exam Working Group.

Acknowledgements

This document was produced by a core team from the ISTQB®: Gary Mogyorodi (Glossary WG), Klaus Skafte (Exam WG)

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Revision History

Sample Exam – Answers Layout Template used:	Version 2.7	Date: October 19, 2021

Version	Date	Remarks
1.1	February 17, 2022	Replacement of deprecated Keywords Update of template
1.0.1	June 4, 2021	Update of Copyright Notice
1.0	October 23, 2015	First version

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Introduction

Purpose of this document

The example questions and answers and associated justifications in this sample exam 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
- Providing training providers and exam candidates with examples of exam questions

These questions cannot be used as-is in any official examination.

Note, that real exams may include a wide variety of questions, and this sample exam ***is not*** intended to include examples of all possible question types, styles or lengths, also this sample exam may both be more difficult or less difficult than any official exam.

Instructions

In this document you may find:

- Answer Key table, including for each correct answer:
  - K-level, Learning Objective, and Point value
- Answer sets, including for all questions:
  - Correct answer
  - Justification for each response (answer) option
  - K-level, Learning Objective, and Point value
- Additional answer sets, including for all questions [does not apply to all sample exams]:
  - Correct answer
  - Justification for each response (answer) option
  - K-level, Learning Objective, and Point value

- *Questions are contained in a separate document*

Answer for Multiple Choice Questions

Answer Key

Question Number (#)	Correct Answer	LO	K-Level	Points
1	c	EITP-1.1.1	K2	1
2	c	EITP-1.2.1	K2	1
3	b	EITP-1.4.2	K2	1
4	b	EITP-1.5.1	K2	1
5	c	EITP-1.5.4	K2	1
6	a	EITP-1.5.5	K2	1
7	c	EITP-2.1.4	K2	1
8	d	EITP-2.3.1	K2	1
9	c	EITP-2.3.4	K2	1
10	d	EITP-2.3.8	K3	2
11	d	EITP-2.3.8	K3	2
12	a	EITP-2.3.9	K3	2
13	b	EITP-2.3.9	K3	2

Question Number (#)	Correct Answer	LO	K-Level	Points
14	b	EITP-2.4.2	K2	1
15	c	EITP-3.2.2	K2	1
16	b	EITP-3.2.5	K3	2
17	c	EITP-3.2.7	K4	3
18	a	EITP-3.4.1	K2	1
19	d	EITP-3.3.4	K2	1
20	b	EITP-3.3.2	K3	2
21	d	EITP-3.3.3	K3	2
22	d	EITP-4.1.1	K2	1
23	a	EITP-5.2.1	K2	1
24	b	EITP-5.2.2	K4	3
25	b	EITP-5.3.4	K2	1

Answers

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
1	c	Consider: i. The need to show compliance to applicable standards ii. Increasing the efficiency of writing software programs will have no real impact on testing iii. The requirement for organizations that provide third party support to meet client requirements for their suppliers to be at a particular capability level iv. Testing is not directly related to sales objectives v. The desire to reduce the costs of failure by improving testing Thus: a) Is not correct b) Is not correct c) Is correct d) Is not correct	EITP-1.1.1	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
2	c	a) Is not correct. These aspects are recommended, but part of the development process. Besides this, the aspects mentioned are processes themselves b) Is not correct. Dynamic testing and static testing can be performed at various test levels; however, this is largely based on processes. It does not consider infrastructure, organization and people issues c) Is correct. As stated in syllabus section 1.2, during test improvement, processes, infrastructure, organization, and people issues (tester's skills) can be addressed d) Is not correct. Risks are a main influence on how to run a test project. They can also be part of lessons learned that influence test process improvement. However, they are not an aspect that needs to be part of a test process improvement project	EITP-1.2.1	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
3	b	a) Is not correct. Both models can be applied broadly for process improvement, although the IDEAL improvement model was initially developed by the Software Engineering Institute to focus on software process improvement. IDEAL can also be applied to test process improvement but is not specifically focused on test process improvement b) Is correct. The Deming Cycle states that management is involved in defining targets but does not have a detailed management phase such as the IDEAL “Initiating” phase which addresses, for example, building sponsorship or setting up a project board c) Is not correct. Within the Deming Cycle after finishing the Act step, the Plan step is re-entered. During this step, feedback must be gathered from the stakeholders and thus the evaluation of improvement steps takes place d) Is not correct. Only in the Deming Cycle the use of statistical methods plays a role. There is no mention of statistical methods within the IDEAL improvement model	EITP-1.4.2	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
4	b	a) Is not correct. Not so effective in this case. A model-based improvement approach is effective when identifying improvements to a test process that should take place. The approach itself is much more generic b) Is correct. Analytical-based improvement provides a more focused approach for helping specific problems; in this case, it will be possible to analyze the defects being found during system testing and do a root cause analysis to identify root causes c) Is not correct. Not so effective in this case. A hybrid improvement approach can be applied in projects which have already been developed to a higher level of process maturity d) Is not correct. Not so effective in this case. The STEP methodology is based upon the idea that testing is a software development lifecycle activity that begins during requirements formulation and continues until retirement of the system	EITP-1.5.1	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
5	c	1. Test tools are implemented with the intention of increasing test efficiency, increasing control over testing, or increasing quality of deliverables 2. The process improver can use tools to aid in gathering, analyzing, and reporting data, including performing statistical analysis and process modeling 3. Improvement of the tool selection and implementation process, for example following the root cause analysis for problems during a tool implementation pilot". For example test management tools align working practices regarding the documentation of test cases and logging defects 4. The test improver can improve the tool selection and implementation process. For example, following the root cause analysis for problems during a tool implementation pilot 5. Is false because there is no absolute need for the use of any tool in improvement activities Thus: a) Is not correct b) Is not correct c) Is correct d) Is not correct	EITP-1.5.4	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
6	a	a) Is correct. Iterative development models such as scrum expect a continuous improvement loop as part of the normal project process input, with a retrospective meeting and improvement of processes (including the test process) at the end of each iteration b) Is not correct. Tools can make the test process more efficient (when used and implemented appropriately) but are not specific to an iterative development model c) Is not correct. Standards can help but are not specific to an iterative development model. Some iterative development models, e.g., Agile software development, are even standard adverse d) Is not correct. Some iterative development models strongly advocate unit testing, but unit testing should also be performed with other software development lifecycle models and is not specific to iterative development models	EITP-1.5.5	K2	1
7	c	a) Is not correct. This is much more the focus of analytical-based approaches, specifically root cause analysis b) Is not correct. This is a risk of model-based approaches, where people start following models without further thinking, so-called “model blindness” c) Is correct. In syllabus d) Is not correct. This is typical for analytical-based approaches and specifically when using the goal question metric (GQM) approach	EITP-2.1.4	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
8	d	a) Is not correct. TPI Next uses the term key area, not process, to cover specific aspects of test processes. There is no grouping of those, but a clustering of checkpoints according to the business goals of the assessed organizational unit. Moreover, TPI Next uses a continuous representation, not a staging representation. Therefore, the maturity of any key area can be achieved at several increasing levels b) Is not correct. TPI Next uses different checkpoints for each key area that are clustered to ensure a balanced process improvement. Maturity levels are a rating of each key area, and an overall maturity level may also be attributed to the whole test process after the assessment. Planning, acquisition, and measurements are the three groups of test activities in STEP c) Is not correct. Generic and specific goals are terms from TMMi (or CMMI). TPI Next uses the term key area to cover specific aspects of test processes. There is no grouping of those, but a clustering of checkpoints according to the business goals of the assessed organizational unit d) Is correct. TPI Next uses the term key area to cover specific aspects of test processes. Maturity levels are a rating of each key area, and an overall maturity level may also be attributed to the whole test process after the assessment	EITP-2.3.1	K2	1
9	c	a) Is not correct. This is a TMMi level 3 process area b) Is not correct. This is a TMMi level 3 process area c) Is correct. This is a TMMi level 2 process d) Is not correct. This is a TMMi level 4 process area	EITP-2.3.4	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
10	d	a) Is not correct. TPI Next is intended to be used as a whole; the various key areas are not totally independent of others b) Is not correct. the idea is first to assess the current state and only then possibly use improvements implicit in checkpoints (or explicit in improvement suggestions) c) Is not correct. TPI Next gives opportunity to weigh your approach towards your needs, so you should use the opportunity d) Is correct. here you recognize that you might not understand your problems fully and use the TPI Next model as it is meant to be used	EITP-2.3.8	K3	2
11	d	a) Is not correct. This is a quite a formal assessment, interviewing other project members and stakeholders, assessing all key areas, and having a look at previous releases b) Is not correct. TPI Next offers the opportunity to choose the key areas based on the business drivers, so based on the problem described, you can use the clusters for improving only the key areas needed for solving the problem. However, the approach taken here to also do documentation study involving stakeholders outside the test team is too formal for the assignment c) Is not correct. Based on business drivers and clusters it is possible not to assess all key areas but still do a formal assessment. The approach taken seems to reflect a more formal assessment than an informal low-cost assessment d) Is correct. This is an informal low-cost approach that can be done using TPI Next	EITP-2.3.8	K3	2

<table>
<tr>
<td>12</td>
<td>a</td>
<td>
Specific Goal 1. Establish a test policy. Score: 33% (Partly Achieved)
<table>
<tr><th>Specific Practice (SP)</th><th>Description</th><th>Justification</th></tr>
<tr><td>SP1.1</td><td>Define and maintain test objectives based on business needs and business objectives</td><td>Ok: Yes
Test objectives to be achieved are defined in cooperation with the business stakeholders</td></tr>
<tr><td>SP1.2</td><td>A test policy, aligned with the business (quality) policy is defined based on the test objectives and agreed upon by the stakeholders</td><td>Ok: No
Defined by the test manager but not agreed upon by the stakeholders</td></tr>
<tr><td>SP1.3</td><td>The test policy and test objectives are presented and explained to stakeholders inside and outside of testing</td><td>OK: No
Only explained to the test team</td></tr>
</table>
Specific Goal 2. Establish a test strategy. Score: 100% (Fully Achieved)
<table>
<tr><th>Specific Practice (SP)</th><th>Description</th><th>Justification</th></tr>
<tr><td>SP2.1</td><td>A generic product risk assessment is performed to identify the critical areas for testing</td><td>Ok: Yes
The test team performs a risk assessment workshop with all stakeholders. This is used to identify the critical areas for testing</td></tr>
</table>
</td>
<td>EITP-2.3.9</td>
<td>K3</td>
<td>2</td>
</tr>
</table>

SP2.2	A test strategy is defined that identifies and defines the test levels	Ok: Yes There is a test strategy which fully describes all the test levels		
SP2.3	The test strategy is presented and discussed with the stakeholders inside and outside of testing	OK: Yes Explained to the test team first and then presented to the stakeholders		

Specific Goal 3. Establish test performance indicators. Score: 0% (Not Achieved)

Specific Practice (SP)	**Description**	**Justification**
SP3.1	The test performance indicators are defined based on the test policy and test objectives including a procedure for data collection, storage, and analysis	Ok: No Test performance indicators are not defined
SP3.2	Deploy test performance indicators and provide measurement results addressing the identified test performance indicators to stakeholders	Ok: No Test performance indicators are not defined

Legend:

Not Achieved: the percentage of achievement scores in the range from 0 to 15%

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
		Partly Achieved: the percentage of achievement scores in the range from 16% to 50% Largely Achieved: the percentage of achievement scores in the range from 51% to 85% Fully Achieved: the percentage of achievement scores in the range from 86% to 100% Thus: a) Is correct b) Is not correct c) Is not correct d) Is not correct			
13	b	a) Is not correct. See correct answer b) Is correct. With TMMi the lowest score rating determines the overall rating. Since Test Environment is Not Applicable (most likely out of scope), the lowest is for Test Policy and Strategy being rate as Partly Achieved c) Is not correct. See correct answer d) Is not correct. See correct answer	EITP-2.3.9	K3	2
14	b	a) Is not correct. This role is not identified within the STEP model b) Is correct. According to the STEP model, the test analyst performs detailed planning, lists test objectives, does the analysis, and performs test design and specification c) Is not correct. According to the STEP model, the test manager performs planning, coordination, and communication to stakeholders d) Is not correct. According to the STEP model, the tester performs the implementation of test cases, executes test cases, checks results, log tests and reports problems	EITP-2.4.2	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
15	c	a) Is not correct. Defect Analysis: is not about analyzing the defect itself. Generic Analysis: this is more about improvement in skills and processes b) Is not correct. Defect Analysis can be ok. Generic Analysis: This is not about analyzing trends in defects c) Is correct. In the syllabus d) Is not correct. Defect Analysis: ok. Generic Analysis is not about test trends	EITP-3.2.2	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
16	b	a) Is not correct. Investigating the accuracy of the test data used should not be the next activity. Test data have already been updated for the specific flight characteristics of the aircraft. It is possible but unlikely that this data is inaccurate b) Is correct. Investigating whether tests are being passed which should have failed is promising as the next activity. The pass / fail criteria used in the test cases are based on previous flight trials for similar aircraft, but not for this aircraft. We know the test data were updated for the specific aircraft (option A), but there is no mention that the pass/fail criteria were also updated. We also know that all tests passed, which would be a likely outcome if the pass/fail criteria were to be incorrect and allowing failures to go undetected c) Is not correct. Investigating the procedures used for the audits should not be the next activity. Test case coverage of requirements is quite likely to be satisfactory because of the audit. There is a possibility that faulty procedures were used in the audit which led to incomplete coverage of requirements by test cases. However, the likelihood of this is small, especially when compared to the correct answer d) Is not correct. Investigating configuration management procedures used for the test environment should not be the next activity because a production copy of the hardware and software is used for the test environment	EITP-3.2.5	K3	2

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
17	c	a) Is not correct. Although messages may be frequent, most likely the direct impact is limited, although over time, users may move to another website for ordering books b) Is not correct. Although it is always good to look back at the test process, e.g., test environment problems, it does not relate to a production defect. However, as part the analysis done later, the test environment instability could be one of the causes for the current production problems since some features have possibly not been tested correctly c) Is correct. Unstable production system and loss of data seems to be frequent (most evenings) and has a high impact both in terms of revenue and customer satisfaction d) Is not correct. There is only one complaint (low frequency), and the impact of this problem may be a loss of revenue, but this is currently unclear. It could even be that the customer is looking for a book that is not part of the offering of the online bookstore	EITP-3.2.7	K4	3
18	a	a) Is correct. Both metrics will give insight in the efficiency of the test process b) Is not correct. Post-release defect rate is an effectiveness metric c) Is not correct. Defect detection percentage is an effectiveness metric d) Is not correct. Both metrics are effectiveness metrics	EITP-3.4.1	K2	1
19	d	a) Is not correct. This is part of the trial period that is performed before the kick-off session b) Is not correct. This is performed to explain the background to the measurements that will be collected and motivate those involved c) Is not correct. This is done during the feedback session, part of the interpretation phase d) Is correct. This is done during the beginning of the data collection phase	EITP-3.3.4	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
20	b	a) Is not correct. Q.3 is not "understanding" but the higher level "improving", M.06 is on level "controlling", M.12 on level "improving" b) Is correct. Q.1, Q.2, Q.4 and Q.6 directly refer to the given goal, M.01-M.05, M.07-M.08 M.10 answer these questions c) Is not correct. Q.3 is not "understanding" but the higher level "improving". Typically, several questions are needed to fulfill one goal, M.06 is on level (statistical) "controlling", M.12 on level "improving. M.09 is not dealing with only reusability; it could be the case that changed requirements during a projects' lifetime caused new revisions. Therefore, this is not a good metric to use. M.11 is a metric to answer Q.5 which is not related to reusability d) Is not correct. Answers to Q.5 and Q.7 do not help in fulfilling the given goal	EITP-3.3.2	K3	2
21	d	a) Is not correct. This is part of the analysis plan, not of the measurement plan b) Is not correct. An important aspect within GQM when defining goals, but not so much when defining the detail metric c) Is not correct. The environment may well be an attribute to be considered. This depends on the actual real-life situation. However, answer d. is considered more important for the measurement process d) Is correct. It is important at the start to consider which factors could influence the metrics and their type of impact on the hypothesis. When collecting the data these factors should be documented to allow analysis at a later stage	EITP-3.3.3	K3	2
22	d	a) Is not correct b) Is not correct c) Is not correct d) Is correct. Specifically stated in the syllabus	EITP-4.1.1	K2	1

Question Number (#)	Correct Answer	Explanation / Rationale	Learning Objective (LO)	K-Level	Number of Points
23	a	a) Is correct. 1. set context and establish sponsorship, 3. Identify stimulus for improvement and 4. Establish an improvement infrastructure (i.e., organization) are high-level activities of the IDEAL improvement model b) Is not correct. see correct answer c) Is not correct. see correct answer d) Is not correct. see correct answer	EITP-5.2.1	K2	1
24	b	a) Is not correct. You should not change test improvement goals on your own. The development manager has provided you with the task to look at productivity goals, with the idea that someone else will be working on the other goals b) Is correct. As the syllabus says you should derive test objectives from corporate level goals e.g., use a balanced scorecard to focus your work properly c) Is not correct. Same as b. You should not focus on your own goals. You are asked for the productivity goals for a reason. It is not your responsibility to look at the whole business, but just to look at the productivity issue of testing with the context of the software development business unit d) Is not correct. You are to produce realistic goals. It is good to aim high, but you need to be realistic as well. Stick to the testing part and your responsibility	EITP-5.2.2	K4	3
25	b	a) Is not correct. Solution analysis focuses on the specific problems found during assessment b) Is correct. This is the overall definition of solution analysis c) Is not correct. This might happen as a small part of solution analysis but does not summarize the approach d) Is not correct. this would be called assessment, and the following analysis of results	EITP-5.3.4	K2	1

Answer for Essay Questions

Answers

Question #1
EITP-2.3.10 (K5) Assess a test organization using either the TPI Next or TMMi
EITP-5.3.2 (K6) Plan and perform assessment interviews using a particular process or content-based model in which an awareness of interview style and interpersonal skills are demonstrated

Grading Criteria:

Question 1

The candidate should describe enough TMMi structure to show an understanding of the improvement model and how to use it.

1. Mention staged model and its purpose – need to start from lower levels, and all the process areas at those levels
2. Mention the need to cover all level 2 Process Areas – to complete a level, several process areas are needed, even though one process area would be in the focus. TMMi provides evolutionary improvements based on meeting all obligatory process area goals on a level. The process areas at a certain level are a coherent set. The candidate should preferably mention the five level 2 process areas. Also, it does not make much sense to go beyond TMMi level 2, since the company is not fully CMMI level 2
3. Describe the Test Design and Execution Process Area – this should be a special focus as this area includes coverage measurement as part of test design
4. Describe the Test Planning process area – this should in addition to Test Design and Execution in special focus since with Test Planning there are specific goals on doing product risk assessment and defining the test approach
5. Good arguments on which Process Areas to use – good analysis skills should be shown regardless which Process Area the candidate mentions

Maximum 5 points for each area listed above, 25 points in total.

Question 2

1. Roles to be interviewed – minimum of five (5) from the following list: tester, test manager, developer, project manager, business owners, business analysts (domain experts), specialists such as environment manager, defect manager, release manager, and automation specialists
2. Reasoning about interviewee choices:
    a. Reasoning about who would know about coverage and should thus be interviewed
    b. Reasoning why it is important to look outside the test team, especially if some people suspect the improvements and the root cause would be in some other teams for the problem at hand

Maximum 1 point for each identified role and an additional point for a good reasoning, (maximum 10 points total).

Question 3

What subjects to discuss with different roles – outline for discussion with each role (see also item 2 listed above). The subjects could be derived from the specific goals and specific practices of the identified process area.

Maximum 7 points (1 point for a reasonable set of subjects listed per role, 2 additional points if the lists are linked to TMMi

Question 4

The candidate should demonstrate knowledge of interviewing, especially in a difficult situation, where interpersonal skills become particularly important. Sensitivity should be shown about the potentially conflicting interests of different teams.

Motivating interviewees – minimum three out of list of the following:

1. Confidentiality is ensured
2. Recognition for improvement ideas is given
3. No fear of punishment or failure exists
4. Understand how the information given will be used

Maximum 8 points, 1 point for each motivating criterion listed (maximum 3 points) and an additional 5 points for the reasoning and explanation.

Question #2

EITP-3.2.6 (K5) Recommend and select test process improvement actions based on the results of a root cause analysis

EITP-5.3.3 (K6) Create and present a summary of the conclusions (based on an analysis of the findings) and findings from an assessment

EITP-5.3.5 (K5) Recommend test process improvement actions based on assessment results and the analysis performed

Grading Criteria:

Task 1 "Recommendations based on TPI Next assessment"

Maximum 20 points

Make 5 recommendations based on the results of the TPI Next assessment. Enter your answers in Table 3.

Each recommendation must clearly state what should be done and what the positive impact will be on the business objectives of the CGF Company regarding testing.

Scoring:

- 2 points for each justified and plausible recommendation
- 2 points for linking the recommendation correctly to one or more business objectives

Use the tables provided below to support the scoring. Allow for other well-reasoned recommendations.

Key area	**CLUSTER A: Checkpoint Number / Checkpoint**	**Scoring Notes**
Stakeholder commitment	1. The principal stakeholder is defined (not necessarily documented) and known to the testers	OK
Degree of involvement	1. The test assignment, scope and approach are negotiated early with the principal stakeholder as one of the first test activities	OK
Test strategy	1.The principal stakeholder agrees with the documented test strategy	Transparency: they are not involved
	2. The test strategy is based on a product risk analysis	Test management practices: no risks considered
Test organization	1. People involved know where to find the persons (or department) responsible for test services	OK
Test reporting	1. The reporting contains aspects of time and/or costs, results, and risks	Transparency: no reporting
Test process management	1. At the start of the test project a test plan is created. The test plan includes at least the test objectives, the test scope, the test planning, the roles, and responsibilities	OK

Key area	CLUSTER A: Checkpoint Number / Checkpoint	Scoring Notes
	2. The test plan is agreed to by the principal stakeholder	Transparency: they are not involved
Defect management	1. The defect lifecycle is defined (including a retest) and applied	OK
	2. The following items are recorded for each defect: unique ID, related test case ID (if applicable), person reporting the defect, date, severity, description (the actions to reproduce the defect, expected and observed result) and defect status	OK
Test design	1. The test cases are recorded on a logical level	Effectiveness of test cases reduced
	2. The test cases consist of a description of: a) initial situation, b) change process = test actions to be performed, c) predicted result	Effectiveness: Test cases are incomplete

Table 1: Checkpoints for TPI Next cluster A – Scoring Notes

Key area	CLUSTER B: Checkpoint Number / Checkpoint	Scoring Notes
Stakeholder commitment	2. Budget for test resources is granted by and negotiable with the principal stakeholder	OK
	3. Stakeholders deliver the committed resources	OK
Degree of involvement	2. Test activities are started early, timely before test execution, with the goal of keeping the test activities of the project's critical path	OK
Test strategy	3. There is a differentiation in test levels, test types, coverage, and test depth, depending on the analyzed risks	Test management practices: no risks considered
Communication	1. Every team member is aware of decisions being made and of internal progress	Transparency within the test team is poor
Test process management	3. Each test activity is monitored and when necessary, adjustments are initiated	Test management practices; no monitoring and control
	4. The test plan is agreed with the relevant stakeholders	Transparency: they are not involved
Estimating and planning	1. For test effort estimation, simple techniques are used such as ratios	Test management practices: no estimates
	2. For each test activity there is an indication of the period in which it runs, the resources required and the products to be delivered. Activities to be identified are test planning and management, defining test cases and executing test cases	OK

Key area	CLUSTER B: Checkpoint Number / Checkpoint	Scoring Notes
Defect management	3. For further handling of defects the responsibilities are defined	OK
Testware management	1. The test basis, the test object and all testware are identified by name and version	OK
	2. Each test case is related to a test basis in a transparent way	OK

Table 2: Checkpoints for TPI Next cluster B – Scoring notes

The following table shows possible recommendations based on the TPI Next Matrix. The answers provided by candidates should be identifiable from those shown in the table below. Allow for other recommendations if they are well justified.

Problem area	Recommendation	Positive impact on business objective
Test design: no test cases	Ensure that test cases are created at the logical level and that the contents of those test cases include at least the three main steps: set initial state – perform actions – expected result	**Test effectiveness** will be improved by specifying test cases with the minimum contents. There is a greater chance that software defects will not be found in testing (assuming that experience-based testing is not performed)
	Ensure that test cases are linked to the test object (user story, requirement, etc.) and that coverage can be shown to the stakeholders	**Transparency** will be increased by having documented test cases and showing coverage to stakeholders
No agreements made with the stakeholders	Establish a stronger working relationship with the principal stakeholder which allows important test documentation such as test plans and test strategy to be agreed at an early stage in the software development lifecycle	**Transparency** will be improved by obtaining agreement of the test plan and test strategy with the principal stakeholder **Test management practices** are improved by establishing a good working relationship with the principal stakeholder
No consideration of product risks	Create a risk management process which starts with a consideration of product risks	**Test management practices** are improved by establishing a risk-based test strategy. Priorities can be set in a transparent way and coverage of risk by tests can be provided
	Consider product risks together with the stakeholders	**Transparency** will be improved by enabling the principal stakeholders to contribute to the identification of product risks
Communication	The test manager shall conduct regular team meetings at which 1. decisions made regarding testing are discussed and 2. the team are provided with information	**Transparency** within the test team will be improved by making decisions known and allowing for discussion **Test management practices** are improved by keeping up motivation levels

Problem area	Recommendation	Positive impact on business objective
	about internal progress (e.g., as a burndown chart or status report)	in the team and giving the test team information about status
Test estimation	The test manager shall establish a methodology for estimating test effort for various test activities. This may be a simple ratio (e.g., % of development budget assigned to testing) until useful metrics are available to make estimates more accurate	**Test management practices** are improved by ensuring that estimates of test effort are available and accurate Communication of reliable estimates will have a positive impact on **transparency** within the test team and stakeholders
No monitoring and control of test process	The test manager shall ensure that planned test activities, test estimates, test strategy and risks are regularly monitored. Differences between planned and actual/predicted values shall be identified and appropriate actions taken to correct them (actions shall be discussed during the test team meeting mentioned above)	**Test management practices** are improved by ensuring that an appropriate response is made to changes in planned activities, estimates, risks, and test strategy **Transparency** will be improved by taking the most current information into account and communicating this to the test team and stakeholders (e.g., in reports)

Table 3: Recommendations based on the results of the TPI Next assessment

Task 2: "Defect analysis"

Maximum 10 points

Propose two improvement recommendations. Each recommendation must clearly relate to an analysis of the root-cause information shown below. It must state what should be done and what the positive impact will be on the business objectives of CGF.

Scoring:

- 3 points for each recommendation based on a correct and plausible analysis of the root-cause analysis shown in Table 4
- 2 points for each recommendation that is clearly and correctly linked to one or more business objectives

Use the table provided below to support the scoring. Allow for other well-reasoned recommendations.

Galaxy product	Galaxy-TX	Galaxy-Go	Galaxy-Self	Galaxy-App
Defects				
Number of defects	30	20	30	50
% high severity	67%	20%	0%	10%
% medium severity	17%	60%	50%	10%
% low severity	16%	20%	50%	80%

Top three root causes				
Testing not completed as planned	80%	60%	0%	10%
Poor release management	10%	30%	10%	80%
Stakeholder expectations not fulfilled	10%	20%	90%	10%

Table 4: Results of Root Cause Analysis for defects affecting the Galaxy product range

The following table shows possible recommendations based on the root cause analysis. The answers provided by candidates may show some similarities with those proposed for task 1 (TPI Next matrix).

Allow for other recommendations if they are justified based on the root cause data shown.

Analysis, justification, and recommendations	Positive impact on business objective(s)
Analysis and justification (shown in green): • The largest number of high severity defects were reported in the Galaxy-TX product (20 out of 30 defects) • These defects were primarily caused by incomplete testing • The Galaxy-Go product also experienced some medium severity defects relating to this root cause • This is an indication of inadequate test process management for mainframe-based applications Recommendations: • It is recommended to update plans and estimates on a regular basis and make any necessary adjustments • It is recommended to prioritize according to product risk if it becomes clear that planned testing activities may not be achievable	**Test management practices** are improved by monitoring planned test activities and identifying risks that they may not be completed in time. **Test management practices** are improved by establishing a test strategy which focuses on the main "pain point", which is the Galaxy-TX product. **Transparency** is increased when clear priorities are set which target the pain points.
Analysis and justification (shown in blue): • The Galaxy-Self product has many defects of medium or low severity which were caused by the expectations of stakeholders not being fulfilled • This may be an indication that the expectations of end users of this web application were not considered when gathering requirements and testing Recommendations: • Perform validation of requirements from the perspective of the end user • Implement a beta test phase which enables end users to providing feedback regarding their user experience	**The effectiveness of testing** will be improved by involving end users in beta testing. It is anticipated that many of the medium and low severity defects reported in web applications will be identified at this stage. **Transparency** of testing will be improved by involving end users

Analysis and justification (shown in yellow): • Many low severity defects have occurred in the Galaxy-App. The overall quantity of defects is likely to have a negative impact on the company for users of the mobile App • These defects were primarily caused by poor release management Recommendations: • It is recommended to discuss the release management process regarding the development and testing of mobile Apps • This is a dependency on the test process and cannot be directly resolved by improving the test process by itself	**Test management practices** will be indirectly improved if the software releases are better coordinated and communicated. This will provide a more reliable basis for test planning

Table 5: Recommendations based on the results of the root cause analysis

Task 3: "Summary of conclusions"

Maximum 20 points

The following table shows some typical statements. These are provided for guidance. It is not expected that the candidate's answer includes these statements word for word.

Each statement must achieve the following criteria:

1. Is understandable for senior management (plain English, no complex statements, no technical terms)
2. Addresses company objectives
3. Relates to findings
4. Clearly states what actions management needs to take

Scoring scheme:

- Score 1 point for achieving each of the 4 criteria shown above

Current test process maturity:
• The testing at CGF is currently not able to contribute fully to achieving the business goals • A relatively low level of test process maturity is achieved, based on a model of testing best practices • There are some areas, however, where testing practices are showing encouraging signs of higher maturity, although their impact on business objectives is not high • To achieve more test process maturity, it is recommended that management considers the areas for improvement highlighted below and set up a test improvement plan together with an external consultant
Area for improvement: Business objective "Improve the effectiveness of testing"
• We need to improve our test cases so that they find more defects before products go into production • The assessment showed this is a particularly weak area in our testing • By writing down our test cases in a standard and complete way, our test effectiveness will be improved. We would expect to find more defects for the money spent

• We should make test cases a mandatory part of our testing. It will help if we improve our know-how in this area by taking more training and getting some tool support
Area for improvement: Business objective "Improve transparency of testing to stakeholders"
• The assessment showed that we need to get the relevant people more involved in testing issues and make testing generally more transparent • Our stakeholders should be involved to our test planning and estimating meetings so we can agree on what our testing should achieve and how we should achieve it • For our web-based systems, such as Galaxy-Self, we should get end users more involved in testing before the applications go live • We should improve the exchange of information about testing to our stakeholders and within the test team. This will mean writing concise test reports • Management should decide on which stakeholders shall be invited to our test planning meetings and decide on which stakeholders will receive reports • Management should contact an agency to help us identify representative end users
Area for improvement: Business objective "Improve test management practices"
• Several issues were found in the assessment and the analysis of defects which highlighted the need to improve our test management practices • In the future, we need to consider the risks in our Galaxy range of products more thoroughly when planning our tests and make our estimates more reliable • Once we have agreed upon test plans and test estimates we should update them regularly and make any changes needed. This will ensure we are up to date and avoid the testing shortfalls we experienced in Galaxy-TX and Galaxy-Go • Management should identify and train staff to perform the test manager role
Priorities for improving test process maturity

• The model used for the assessment suggests that the top three priorities for improving test process maturity are in the following areas:
  ○ More stakeholder involvement for better transparency
  ○ Creating test cases for more effective testing
  ○ Using a risk-based approach to our testing as an essential test management practice
• The defect analysis shows that we should initially prioritize our efforts on mainframe projects, such as Galaxy-Go and Galaxy-TX

Question #3
EITP-2.3.7 (K5) Recommend which is appropriate in each scenario, either TPI Next or TMMi

EITP-4.1.2 (K6) Recommend a test process improvement approach in a specific scenario and for a given improvement scope

Grading Criteria:

Question 1

You have been asked by management to recommend a test improvement model for the project

- Identify the two major test process improvement models (2 points)
  TPI Next and TMMi are the two leading test process improvement models in the world. (1 point for each model correctly identified)
- Identify 4 criteria that can be used to compare the models (4 points)
  The syllabus lists several criteria that can be used to compare the models. Typical criteria to be identified are:
  - Type of model (representation)
  - Test technique relationship
  - Relationship to SPI model
  - Focus
  - Overall improvement approach
  - Terminology

Although some criteria are often perceived more important than others, all can be identified by the candidate as being relevant. Type of model is a leading criterion and must be mentioned (1 point). Allow for three more points for each additional criterion that is mentioned from the list. Note they may be stated in other terms.

a. Evaluate both models against the defined criteria in the context of this project (maximum 16 points)

The syllabus provides an overview comparison of the two models against the defined criteria. (see table 1).

Allow one point for each correct description (per model) against criteria (maximum 8 points).

Allow 1 additional point when the description (per model) is correctly linked to the context of the ATM project. (Expectations for this are provided in table in italic text.)

Criteria	TPI Next	TMMi
Type	Continuous model - this is more flexible in use and since there are no long-term objectives this may be perfect to be used on a project basis	Staged model - this is more milestone oriented with long-term strategy. This does not seem to be the case for the bank
Test techniques	Uses generic TMap (Next) practices as terms of reference, since a standard technique does not yet exist, TMap could be an ideal add-on to be implemented. It may also be too much depending on the size of the project	Test technique independent - this fits with the current approach of the organization, which is to have a test process using several best practices. TMMi could provide a structure for this

Criteria	TPI Next	TMMi
Terminology	Based on TMap – there is no need for a standard international terminology within the organization, thus using TMap terminology is as good as any	Based on standard test terminology – since development and testing is organized internally there is no real need to adopt an international testing terminology. Any terminology is ok if it is standard across the organization
Software Process Improvement (SPI)	No formal relationship to a specific SPI model but mapping possible – TPI Next seems to fit with the fact that the organization does not have a model for process improvement and that there is no constraint here	Highly correlated to CMMI – although TMMi can also be used independent of CMMI, there is a clear link between the two models. The organization has no history on process improvement whatsoever thus, the correlation to CMMI does not have an added value. In fact, it could turn out to have a small negative impact
Focus	An overview across the entire test process is achieved with 16 key areas with close-up view per key area. - having the entire test process within scope provides flexibility to focus on those things that matter most for the banking organization	Detailed focus on limited number of process areas per maturity level - in general, this is a good thing, however the testing issues for this project may well go across other maturity levels as well. There is a risk in applying TMMi that other maturity levels are then out of scope
Approach	Thorough, business-driven and test engineering approach - business driven matches with the fact that there is a clear problem (product quality) on the project. An engineering-based approach to tackle the most important testing issues is needed	Strong focus on management commitment - TMMi looks at management commitment and long-term strategies. There is already management commitment for test improvement on this project and no real need (for now) for a long-term strategy. In this context the philosophy of TPI Next seems to have a better match

Table 1: Comparison TPI Next and TMMi

- Make a substantiated management recommendation which one of test improvement models is probably best to be used in this context. (3 points)

Allow 1 point for choosing TPI Next as the best choice for this situation. Two additional points can be given if this is well reasoned (see above part a.) for reasons). Note that no additional points should be given if the recommendation to management is too technical. It needs to be high-level and related to the test improvement objective.

Question 2

You have now visited a leading test conference where you listened to a presentation discussing analytical-based improvement. This was totally new to you but seems very interesting and you've been inspired.

a. Identify and explain 4 reasons why an analytical-based approach could be beneficial to the bank (and ATM project). (maximum 16 points)

- Specific problems need to be targeted; A large percentage of the defects that are being found after release seem to be somehow related. Root cause analysis is a perfect mechanism to target specific problems that keep reoccurring or a major failure that occurred in production. For these types of problems, using a model (either process-based or content based) is typically not the way to go. The specific problems are often context dependent, and this is where analytical-based approaches are strong; they focus on the specifics of the project or organization
- Metrics (defect data) are available; The defect data (well-documented) from previous projects is stored in a defect management system. With all this information available for free, starting to analyze the available data is an easy way forward. The data can be transformed into metrics and analyzed to enable recommendations for (test) process improvement to be established
- The root cause of the problem is not necessarily within the test process; With the bank situation it is not clear in which area the problem lies. Using a test process improvement model does not help to solve problems that originate outside of testing. Doing root cause analysis that shows that the root cause is somewhere other than within the test process can help to raise awareness and make the problem area more visible
- A small-scale improvement project is budgeted for; Within the bank there is not a huge budget allocated for the test process improvement activities, so it is needed to be focused. If there are few resources available for improvements, then using full-blown reference models is often not helpful. You can focus on one or two critical issues. Using analytical-based approaches can reveal these one or two critical issues and test process improvement recommendations can be identified based on the analysis

(1 point for each correctly identified reason, 1 point for correctly linking the problem to the bank and 2 points for correctly explaining the reason, maximum 4 points per reason and a total maximum of 16 points)

b. In case an analytical-based approach is going to be used, which analytical-based approach would you use and why? Also briefly explain the analytical-based approach that you have chosen. (5 points)

Root cause analysis is the analytical-based approach to be used and much preferred over a GQM or a metrics-based approach, which would require a higher investment and long-term commitment. (1 point if root cause analysis is selected)

Main reasons:

- A large percentage of the defects seem related, which would indicate there is a common root cause to be found. This would be uncovered by root cause analysis
- There is a defect management database that can be used as a basis for a root cause analysis
- Root cause analysis is focused on solving today's problems and does not necessarily require a long-term strategy, which seems to be the case for the bank

(maximum 2 points, 1 point per well identified and described reason)

Root cause analysis consists of the following steps:

1. Selecting item for root cause analysis, e.g., using Pareto analysis and/or defect categorization
2. Gathering and organizing information, e.g., using cause effect diagrams or mind maps
3. Identify root causes
4. Drawing conclusions

(0.5 points for each step identified and briefly explained, maximum 2 points)

c. As part of the project, to justify the (small) investment and measure the effect of the activities a test process improvement indicator (metrics) needs to be identified. Which metrics would you choose and why? Also briefly explain the metric. (4 points)

The business objective for the test process improvement project is a higher level of product quality. This implies that the test objective for the project would be to improve test effectiveness (1 point if this reasoning is stated).

The most popular test effectiveness metrics are defect detection percentage and post-release defect rate. An alternative would be mean time between failures). (2 points if one of these metrics has been selected and 1 additional point if it is well explained)

The candidate may also have selected a coverage metric, e.g., requirements coverage. (allow 1 point if a coverage metric has been selected and 1 additional point if it is well explained). A coverage metric is indirectly related to the objective and usually less suitable for management communication.