



**Vendor:** ISEB

**Exam Code:** ISEB-SWT2

**Exam Name:** ISTQB-ISEB Certified Tester Foundation Level

**Version:** 15.041

### QUESTION 1

Which one of the following is true of software development models?

- A. There are always four test levels in the V-model.
- B. In a Rapid Application Development (RAD) project, there are four test levels for each iteration.
- C. In Agile development models, the number of test levels for an iteration can vary depending on the project.
- D. There must be at least four test levels for any software development model.

**Answer: C**

### QUESTION 2

Four testers have each submitted an incident report in which each reported a problem with the User log-on process. User log-on is a critical component of the system. The table below describes the four defect reports submitted.

Tester ID	Incident description	Inputs/Expected and Actual results	Business Priority (1 high 2 medium 3 Low)
Tester 1	User log-on validation error	Entered User id of J SMITH and password of ABC01 but got an error message	1
Tester 2	Log-on does not meet requirement	Inputs: Entered valid user id and password Expected result - Main menu screen to be displayed Actual result: Error saying incorrect password	2
Tester 3	Log-on Password validation error	Inputs: User id = J SMITH, password = ABC01 Expected result - Main menu screen Actual result: Error message EM008 'Invalid password' This test has worked many times before	2
Tester 4	Password validation error	Inputs: User id = J SMITH, password = ABC01 Expected result - Main menu screen Actual result: EM008 'Invalid password' N.B the same inputs worked yesterday, before code release 1.2 was delivered	1

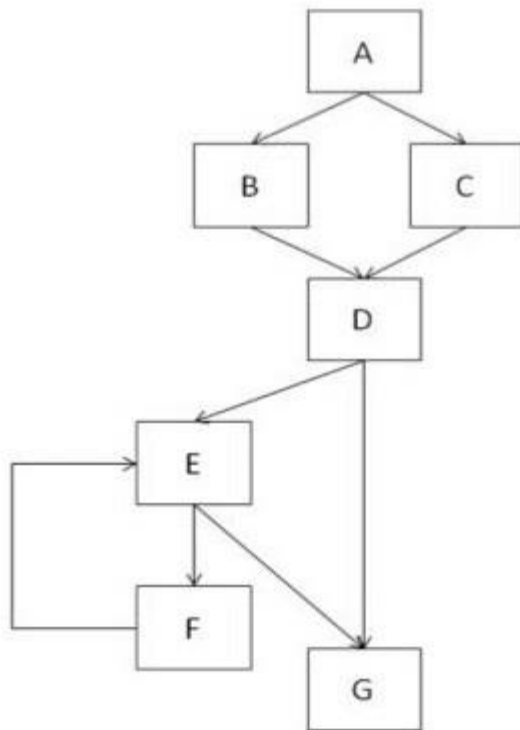
Which Tester has reported the incident MOST effectively, considering the information and priority they have supplied?

- A. Tester 3
- B. Tester 1
- C. Tester 2
- D. Tester 4

**Answer: D**

### QUESTION 3

The flow graph below shows the logic of a program for which 100% statement coverage and 100% decision coverage is required on exit from component testing.



The following test cases have been run:

- Test Case 1 covering path A, B, D, G
- Test Case 2 covering path A, B, D, E, F, E, F, E, F, E, G
- Test Case 3 covering path A, C, D, E, F, E, G

Which of the following statements related to coverage is correct?

- A. Statement coverage is 100%; decision coverage is 100%.
- B. Statement coverage is less than 100%; decision coverage is 100%.
- C. Statement coverage is 100%; decision coverage is less than 100%.
- D. Statement coverage and decision coverage are both less than 100%.

**Answer: A**

#### QUESTION 4

Which of the following is a purpose of the review kick off activity?

- A. Explain the objectives
- B. Select the personnel group
- C. Document results
- D. Define entry and exit criteria

**Answer: A**

**QUESTION 5**

Which of the following types of defect are typically found in reviews rather than in dynamic testing?

- a. Deviations from standards.
- b. Defects in interface implementation.
- c. Poor maintainability of code.
- d. Poor performance of the system.
- e. Defects in requirements.

- A. a, c and e.
- B. a, b and d.
- C. b, d and e.
- D. a, c and d.

**Answer: A**

**QUESTION 6**

During which activity of the Fundamental Test Process test process do you review the test basis?

- A. Evaluating exit criteria and reporting.
- B. Test implementation and execution
- C. Test analysis and design
- D. Test planning and control

**Answer: C**

**QUESTION 7**

How is the scope of maintenance testing assessed?

- A. Scope is related to the risk, size of the changes and size of the system under test
- B. Scope is defined by the size and type of system being changed
- C. Scope is defined by the size and type of system being changed
- D. Scope is related to the number of system users affected by the change.

**Answer: A**

**QUESTION 8**

Which of the following BEST describes a data-driven approach to the use of test execution tools?

- A. Monitoring response times when the system contains a specified amount of data
- B. Manipulation of databases and files to create test data
- C. Using a generic script that reads test input data from a file
- D. Recording test scripts and playing them back

**Answer: C**

**QUESTION 9**

From a Testing perspective, what are the MAIN purposes of Configuration Management?

- a. Identifying the version of software under test.
- b. Controlling the version of testware items.
- c. Developing new testware items.
- d. Tracking changes to testware items.
- e. Analysing the need for new testware items.

- A. b, d and e.
- B. b, c and d.
- C. a, b and d.
- D. a, c and e.

**Answer: C**

**QUESTION 10**

What is the USUAL sequence for performing the following activities during the Fundamental Test Process?

- a. Analyse the test basis documents.
- b. Define the expected results.
- c. Create the test execution schedule.
- d. Establish the traceability of the test conditions

- A. d, a, c, b
- B. a, d, b, c
- C. a, b, c, d
- D. a, b, d, c

**Answer: B**

**QUESTION 11**

Which of the following statements is true?

- A. Testing cannot prove that software is incorrect.
- B. Testing can prove that software is either correct or incorrect.
- C. Testing cannot prove that software is correct.
- D. Testing can prove that software is correct.

**Answer: C**

**QUESTION 12**

Which ADDITIONAL test level could be introduced into a standard V-model after system testing?

- A. System Integration Testing
- B. Acceptance Testing
- C. Regression Testing
- D. Component Integration Testing

**Answer: A**

### QUESTION 13

The above table shows 6 test procedures (P to U) that must now be entered into a test execution schedule. Business severity is regarded as the most important element in determining the sequence of the test procedures, but other dependencies must also be taken into consideration. Regression testing can only be run once all other tests have completed. Which of the following represents the MOST effective sequence for the test execution schedule (where the first entry in the sequence is the first procedure to be run, the second entry is the second to be run and so on)?

Test procedure ID	Business Severity (1 = High 2 = Medium 3 = Low)	Dependencies on other test procedures	Other dependencies
P	1	Cannot start until R has completed	
Q	1	None	Regression Testing only
R	2	None	None
S	2	None	None
T	3		Delivery of the code for this part of system is running very late
U	3	None	None

- A. Q, P, S, R, U, T.
- B. R, S, U, P, Q, T.
- C. R, P, S, U, T, Q.
- D. P, Q, R, S, U, T

**Answer: C**

### QUESTION 14

Which of the following are the typical defects found by static analysis tools?

- a. Variables that are never used.
- b. Security vulnerabilities.
- c. Poor performance.
- d. Unreachable code.
- e. Business processes not followed.

- A. b, c and d are true; a and e are false
- B. a is true; b, c, d and e are false
- C. c, d and e are true; a and b are false
- D. a, b and d are true; c and e are false

**Answer: D**

### QUESTION 15

Which ordering of the list below gives increasing levels of test independence?

- a. Tests designed by a fellow-member of the design team.
- b. Tests designed by a different group within the organisation.
- c. Tests designed by the code author.
- d. Tests designed by different organisation.

- A. c, a, b, d.
- B. d, b, a, c
- C. c, a, d, b.
- D. a, c, d, b.

**Answer: A**

**QUESTION 16**

Which of the following is a review process activity?

- A. Individual preparation
- B. Writing test conditions
- C. Developing a test plan
- D. Executing test scripts

**Answer: A**

**QUESTION 17**

Which one of the following provides the BEST description of test design?

- A. Identification of the features which should be tested
- B. Specification of the test cases required to test a feature
- C. Specification of the order in which test cases should be executed
- D. Creation of a test suite

**Answer: B**

**QUESTION 18**

A wholesaler sells printer cartridges. The minimum order quantity is 5. There is a 20% discount for orders of 100 or more printer cartridges. You have been asked to prepare test cases using various values for the number of printer cartridges ordered. Which of the following groups contain three test inputs that would be generated using Boundary Value Analysis?

- A. 5, 6, 20
- B. 4, 5, 80
- C. 4, 5, 99
- D. 1, 20, 100

**Answer: C**

**QUESTION 19**

Which of the following matches the activity (i to iv) to its most suitable type of tool (p to s)?

- i) Analysis of code structure.
- ii) Generation of test cases.
- iii) Simulation of the environment in which a component is run.
- iv) Analysis of test metrics.

- p) Test management.
- q) Test design tool.
- r) Static analysis tool.
- s) Test harness.

- A. i-s, ii-p, iii-r, iv-q
- B. i-r, ii-q, iii-s, iv-p
- C. i-r, ii-s, iii-p, iv-q
- D. i-q, ii-r, iii-s, iv-p

**Answer: B**

#### QUESTION 20

A candidate sits an exam with 40 questions. To pass, the candidate must answer at least 25 questions correctly. To gain a distinction, a mark of 32 or above must be achieved. Which of these groups of exam scores would fall into three different equivalence classes?

- A. 32, 36, 40
- B. 0, 27, 36
- C. 0, 24, 32
- D. 25, 32, 40

**Answer: B**

#### QUESTION 21

Consider the following state table:

	A	B	C	D
S1	S2/R1	S3/R2	S1/N	S4/R6
S2	S2/N	S2/N	S3/R3	S4/R4
S3	S4/R5	S2/R3	S2/R6	S2/N
S4	S4/N	S4/N	S2/N	S1/R7

Which of the following would result in a change of state to S2 with an action of R6?

- A. From state S1, input A
- B. From state S2, input B
- C. From state S3, input C
- D. From state S4, input D

**Answer: C**

#### QUESTION 22

Which of the following are true of software development models?

- a. Component Integration testing is present in all good development models.
- b. Acceptance testing can take place before system testing starts.



- c. Acceptance testing should only start when system testing is complete.
- d. There may be fewer than four test levels in a V-model.

- A. b and d
- B. a and b
- C. b and c
- D. c and d

**Answer: A**

### QUESTION 23

The below table shows 6 test procedures (P to U) that must now be entered into a test execution schedule. Business severity is regarded as the most important element in determining the sequence of the test procedures, but other dependencies must also be taken into consideration. Regression testing can only be run once all other tests have completed.

Test procedure ID	Business Severity (1 = High 2 = Medium 3 = Low)	Dependencies on other test procedures	Other dependencies
P	3	None	Delivery of the code this part of system is running very late
Q	1	None	Regression Testing only
R	1	Requires S to be run first	None
S	2	None	None
T	2	None	Regression Testing only
U	3	None	None

Which of the following represents the MOST effective sequence for the test execution schedule (where the first entry in the sequence is the first procedure to be run, the second entry is the second to be run and so on)?

- A. R, Q, S, T, U, P
- B. S, R, P, U, Q, T
- C. Q, R, S, T, P, U
- D. S, R, U, P, Q, T

**Answer: D**

### QUESTION 24

Which of the following statements describe why error guessing is a useful test design technique?

- a. It can help derive test cases based on analysis of specification documents.
- b. It can identify tests not easily captured by formal techniques.
- c. It can make good use of tester experience and available defect data.
- d. It is a cheaper alternative to more formal test design techniques.

- A. a and b
- B. b and c
- C. c and d

D. a and c

**Answer: B**

#### QUESTION 25

Four testers have each submitted an incident report in which each reported a problem with the User log-on process, a critical component of the system. The incident reports do not follow a prescribed template and the data needs to be entered into the project incident management tool.

Tester id	Incident details
Tester 1	Title: User log-on validation error Description: Entered User id of J SMITH and password of ABC01 but got an error message Priority:- important
Tester 2	Date: 20/05/10 Title: Log-on does not meet requirement Inputs: User id = J SMITH, password = ABC01 Expected result - Main menu screen to be displayed Actual result: Error saying incorrect password Priority = 1 (high)
Tester 3	Date: 20/05/10 Description: User Log-on Password validation error Inputs: User id = J SMITH, password = ABC01 Expected result - Main menu screen displayed Actual result: Error message EM008 'Invalid password' Attempts to repeat: Consistently successful until code release 1.2 was delivered last night. Problem now occurs with most user inputs so holding up testing (see screen shots) Priority: 1 (High)
Tester 4	Date: 20/05/10 Description: User Log-on Password validation error Inputs: User id = J SMITH, password = ABC01 Expected result - Main menu screen displayed Actual result: Error message EM008 'Invalid password' Attempts to repeat: This test has worked 12 times before. Priority: 2 (medium) - Has stopped me running my other tests.

Which tester has reported the incident most effectively to enable capture in the incident management tool, considering the information and priority they have supplied?

- A. Tester 3
- B. Tester 1
- C. Tester 2C. Tester 2
- D. Tester 4 D. Tester 4

**Answer: A**

#### QUESTION 26

Which of the following statements is true?

- A. A test condition specifies input values and expected results;

- a test case combines one or more test conditions
- B. A test condition may be derived from requirements or specifications;  
a test procedure specifies the sequence of action for the execution of a test
- C. A test case specifies the sequence of execution of test conditions;  
a test procedure specifies test pre-conditions and post-conditions
- D. A test case specifies input values and expected results;  
a test procedure may be derived from requirements or specifications

**Answer: B**

#### QUESTION 27

Which two of the following are common attributes of maintenance testing?

- a. It is carried out to ensure that the system will be reliable once in service.
  - b. It includes regression testing.
  - c. It requires the use of fully defined specifications.
  - d. It can include testing of a system after migration from one platform to another.
- 
- A. a and b
  - B. a and c
  - C. c and d
  - D. b and d

**Answer: D**

#### QUESTION 28

You have designed test cases to provide 100% statement and 100% decision coverage for the following

```
if width > length then
    biggest_dimension = width
else
    biggest_dimension = length
end_if
```

The following has been added to the bottom of the code fragment above.

```
print "Biggest dimension is" & biggest_dimension.
print "Width: " & width print "Length: " & length.
```

How many MORE test cases are required?

- A. One more test case will be required for 100 % decision coverage
- B. Two more test cases will be required for 100 % statement coverage, one of which will be used to provide 100% decision coverage
- C. None, existing test cases can be used
- D. One more test case will be required for 100% statement coverage

**Answer: C**

**QUESTION 29**

Which of the following is MOST likely to be an objective of a pilot project to introduce a test tool?

- A. To assess if the test tool brings benefits at reasonable cost
- B. To ensure that developers will use the test tool
- C. To ensure that the time spent testing and the cost of testing is reduced
- D. To assess if everyone in the organisation can be trained prior to roll-out

**Answer: A**

**QUESTION 30**

Place the stages of the Fundamental Test Process in the usual order (by time).

- a. Test closure activities.
- b. Analysis and design.
- c. Planning and control.
- d. Implementation and execution.
- e. Evaluating exit criteria and reporting.

- A. c, b, d, e, a
- B. c, b, e, d, a
- C. c, b, d, a, e
- D. b, c, d, e, a

**Answer: A**

**QUESTION 31**

Which of the following statements about functional testing is correct?

- A. Functional test cases are derived from specifications
- B. Functional test cases are derived from an examination of the code
- C. Functional testing ensures error free software
- D. Functional testing should be done before the Inspection process

**Answer: A**

**QUESTION 32**

Which of the following defects would NORMALLY be identified by a static analysis tool?

- A. The response time for the search function exceeded the agreed limit
- B. The design specification had many grammatical errors
- C. The component code had variables that were used but had not been declaredThe component? code had variables that were used but had not been declared
- D. The component was found to be the source of the memory leak

**Answer: C**

**QUESTION 33**

Which of the following activities would improve how a tool is deployed within an organisation?

- a. Roll out the tool across the organisation as quickly as possible to all users.
- b. Conduct periodic lessons learnt reviews with tool users.
- c. Provide technical support to the test team for each type of tool.
- d. If a tool is not being used, withdraw it and look for an alternative.
- e. Make sure processes are improved to reflect a new tool.

- A. a, b and c
- B. a, c and d
- C. c, d and e
- D. b, c and e

**Answer: D**

**QUESTION 34**

Given the following sample of pseudo code:

```
Read A, B, C:
If A > B then
    Print Primary ratio is ?& A / B;
End If
If A > C then
    Print Secondary ratio is ?& A / C;
End If.
```

Which of the following test cases would achieve 100% statement coverage?

- A. A = 5, B = 10 and C = 2
- B. A = 10, B = 10 and C = 10
- C. A = 10, B = 5 and C = 2
- D. A = 2, B = 5 and C = 10

**Answer: C**

**QUESTION 35**

Which of the following would TYPICALLY be carried out by a test leader and which by a tester?

- a. Creation of a test strategy.
  - b. Creation of a test specification.
  - c. Raising of an incident report.
  - d. Write a test summary report.
- 
- A. a and b would be carried out by a test leader, whilst c and d would be carried out by a tester
  - B. b and c would be carried out by a test leader, whilst a and d would be carried out by a tester
  - C. a and d would be carried out by a test leader, whilst b and c would be carried out by a tester
  - D. a and c would be carried out by a test leader, whilst b and d would be carried out by a tester

**Answer: C**

**QUESTION 36**

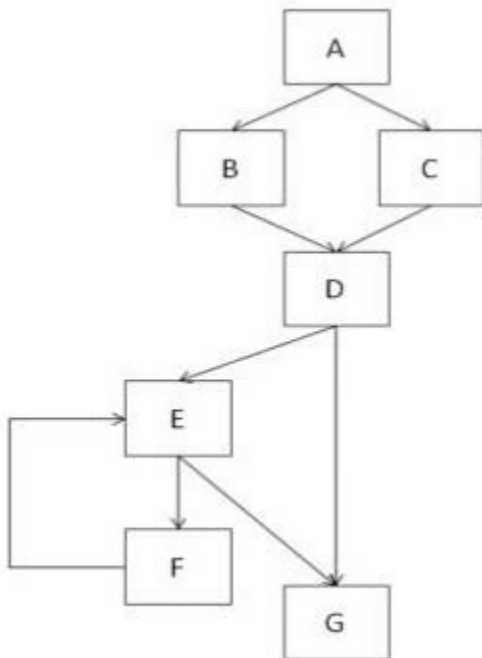
Which of the following account for most of the failures in a system?

- A. They will be found in the smallest modules
- B. They will be evenly distributed among all modules
- C. They will be found in the largest modules
- D. They will be found in a small proportion of modules

**Answer: D**

**QUESTION 37**

The flow graph below shows the logic of a program for which 100% statement coverage and 100% decision coverage is required on exit from component testing.



The following test case has been run:

Test Case 1 covering path A, B, D, G

Which of the following ADDITIONAL test cases would need to be written to provide the required coverage?

- A. Test Case 2 covering path A, C, D, E, F, E, G
- B. Test Case 3 covering path A, B, D, E, G
- C. Test Case 4 covering path A, C, D, E, G. Test Case 4 covering path A, C, D, E, G
- D. Test Case 5 covering path A, C, D, G D. Test Case 5 covering path A, C, D, G

**Answer: A**

**QUESTION 38**

Which characteristics BEST describe a walkthrough?

- A. Documented, includes peers and experts
- B. Formal process collects metrics
- C. Defined roles, led by trained moderator
- D. Led by the author, may be documented

**Answer: D**

**QUESTION 39**

Where may functional testing be performed?

- A. At system and acceptance testing levels only
- B. At all test levels
- C. At all levels above integration testing
- D. At the acceptance testing level only

**Answer: B**

**QUESTION 40**

Which of the following are white-box test design techniques?

- a. Decision table testing.
- b. Decision coverage.
- c. Boundary value analysis.
- d. Error guessing.
- e. Statement testing.

- A. a and e
- B. b and d
- C. b and e
- D. e and d

**Answer: C**

**QUESTION 41**

Which of the following activities should be considered before purchasing a tool for an organization?

- a. Ensure that the tool does not have a negative impact on existing test processes.
- b. Produce a business justification examining both costs and benefits.
- c. Determine whether the vendor will continue to provide support for the tool.
- d. Introduce tool deployment activities into the testing schedule.

- A. a and d

- B. b and c
- C. c and d.
- D. a and c

**Answer: B**

**QUESTION 42**

Which of the following would NOT NORMALLY be considered for a testing role on a project?

- A. System operator
- B. Developer
- C. Configuration manager
- D. Performance specialist

**Answer: C**

**QUESTION 43**

Which statement is a valid explanation as to why black-box test design techniques can be useful?

- A. They can help to derive test data based on analysis of the requirement specification
- B. They can help derive test cases based on analysis of a component code structure
- C. They can help to derive test conditions based on analysis of a system internal structure
- D. They can help to reduce testing costs

**Answer: A**

**QUESTION 44**

Why should expected results be defined before execution?

- A. To assist in test automation
- B. To improve test efficiency
- C. To reduce the possibility of incorrect results
- D. To improve design of the software

**Answer: C**

**QUESTION 45**

Which of the following software work products would NOT TYPICALLY be examined using static analysis techniques?

- a. Design specification.
- b. Component code.
- c. Software model.
- d. Test procedure.
- e. Non-functional requirements specification.

- A. a, c and d
- B. a, d and e
- C. b, c and d



D. a, b and e

**Answer: B**

**QUESTION 46**

A system holds information about an employee; Mike Berry. Which of the following is Mike Berry an example of?

- A. An attribute.
- B. An object.
- C. A class.
- D. An operation.

**Answer: B**

**QUESTION 47**

Which of the following statements is TRUE?

- A. The IRR of every project is based on it achieving a Net Present Value of zero.
- B. It is preferable for the calculated IRR of a project to be below bank interest rates,
- C. Discounted cash flows do not usually take into account the time value of money.
- D. When comparing two projects, the one with the lower NPV should be preferred.

**Answer: A**

**QUESTION 48**

Which stage of the Requirements Engineering process is concerned with tracking requirements from inception to implementation?

- A. Requirements documentation
- B. Requirements management
- C. Requirements validation.
- D. Requirements analysis.

**Answer: B**

**QUESTION 49**

A process model has been produced which includes diamond-shaped symbols. What does this diamond-shaped symbol represent in the model?

- A. A document.
- B. An event.
- C. A manual process.
- D. A decision.

**Answer: D**

**QUESTION 50**

Which of the following statements describe why exploratory testing is a useful test design technique?

- a. It can help derive test cases based on the internal structure of systems.
- b. It is useful when there are limited specification documents available.
- c. It is useful when there testing is constrained due to time pressures.
- d. It is a cheaper alternative to more formal test design techniques.

- A. b and c
- B. a and c
- C. b and d
- D. c and d

**Answer: A**

#### **QUESTION 51**

What is the purpose of configuration management in testing?

- a. To choose and implement a suitable configuration management tool.
- b. To identify unique items of testware and their related developed software.
- c. To provide traceability between items of testware and developed software.
- d. To enable managers to configure the software.
- e. To control the versions of software released into the test environment.

- A. a, c and e
- B. a, b and d
- C. b, c and d
- D. b, c and e

**Answer: D**

#### **QUESTION 52**

Which of the following is MOST clearly a characteristic of structure based (white-box) techniques?

- A. Test cases are independent of each other
- B. Test cases can be easily automated
- C. Test cases are derived systematically from the delivered code
- D. Test cases are derived systematically from specifications

**Answer: C**

#### **QUESTION 53**

Which of the following would be MOST USEFUL in estimating the amount of re-testing and regression testing likely to be required?

- a. The purchase of an automated test execution tool.
- b. Time allocated for acceptance testing.
- c. Metrics from previous similar projects.
- d. Impact analysis.

- A. a and b
- B. b and c
- C. a and d
- D. c and d

**Answer: D**

**QUESTION 54**

Which one of the following BEST describes the purpose of a priority rating in an incident report?

- A. To show which parts of the system are affected by the incident
- B. To show how quickly the problem should be fixed
- C. To show how much it would cost to fix the defect
- D. To show progress of testing

**Answer: B**

**QUESTION 55**

Which of the following are characteristics of good testing in any life cycle model?

- a. Every development activity has a corresponding test activity.
- b. Testers review development documents early.
- c. There are separate levels for component and system integration test.
- d. Each test level has objectives specific to that level.
- e. Each test level is based on the same test basis.

- A. a, d and e
- B. b, c and e
- C. a, c and d
- D. a, b and d

**Answer: D**

**QUESTION 56**

A failure has occurred during system testing and incident report must be raised. The following attributes are available for the report:

- a. Tester name. Tester? name.
- b. Date raised.
- c. Priority (to fix).
- d. Severity (impact on the system).
- e. Expected Results.
- f. Actual Results.
- g. Test case specification identifier.
- h. Failing software function.

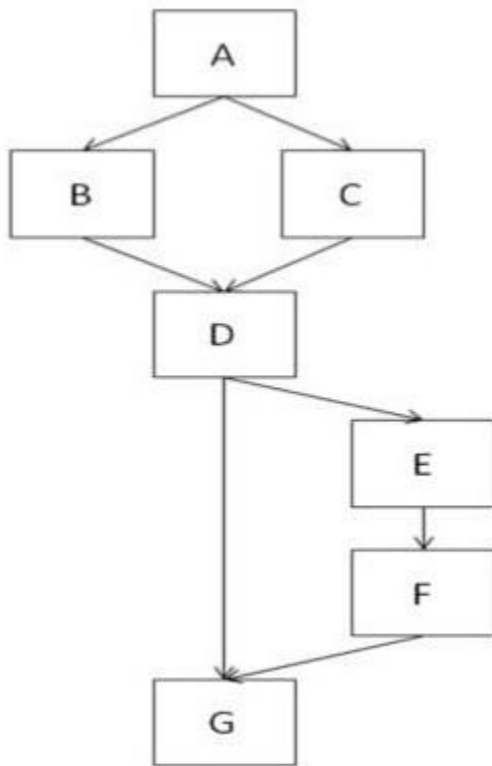
i. Tester recommendations.

- A. b, c, e, f, g
- B. a, b, d, h, i
- C. c, d, e, f, h
- D. c, d, e, g, i

**Answer: C**

**QUESTION 57**

A system requires 100% decision coverage at component testing for all modules. The following module has been tested with a single test case.



The test case follows the path A, B, D, E, F, G. What level of decision coverage has been achieved?

- A. 100%
- B. 50%
- C. 75%
- D. 90%

**Answer: B**

**QUESTION 58**

Arrive-and-Go airline wants to clarify its baggage handling policy, whilst maximising revenues, and will introduce the following tariffs for all baggage per individual customer (weights are rounded up to the nearest 0.1Kg):

The first 2Kg will be carried free of charge. The next 10 Kg will be carried for a flat charge of 0. An additional 15Kg will be charged a total charge of 7.

Luggage over this amount will be charged at ? per Kg, up to a maximum of 150Kg per person. No passenger may take more that 150Kg with them. Which of the following would constitute boundary values for baggage weights in the price calculation?

- A. 0, 5.0, 10.0, 17.0
- B. 2.0, 9.9, 15.0, 26.9
- C. 1.9, 12.0, 14.9, 150.0
- D. 2.0, 12.1, 27.0, 150.1

**Answer: D**

#### QUESTION 59

Which one of the following methods for test estimation rely on information captured from previous projects?

- A. Test point-based
- B. Expert-based
- C. Metrics-based
- D. Development effort-based

**Answer: C**

#### QUESTION 60

Given the following sample of pseudo code:

```
Input ExamScore
If ExamScore <= 75 then
    Print 羃andidate has failed
Else
    Print 羃andidate has passed
    If ExamScore >= 120 then
        Print 羃andidate has achieved a distinction
    EndIf
EndIf
```

What is the minimum number of test cases required to guarantee 100% decision coverage?

- A. 2
- B. 1
- C. 3
- D. 4

**Answer: C**

**QUESTION 61**

An automated air-conditioner is programmed to turn its heating unit on when the temperature falls below 17 and to turn its refrigeration unit on when the temperature exceeds 26. The air-conditioner is designed to operate at temperatures between -10 and +40. Given the above specification, the temperature exceeds 26. The air-conditioner is designed to operate at temperatures between -10 and +40?. Given the above specification, which of the following sets of values shows that the equivalence partition test design technique has been used correctly?

- A. -11, -11?, -1, -1?, 18, 18?, 27, 27?, 5151?
- B. -11, -11?, -1, -1?, 12, 12?, 18, 18?, 27, 27?, 5151?
- C. -11, -11?, 18, 18?, 5151?
- D. -1, -1?, 12, 12?, 18, 18?, 27 27?

**Answer: A**

**QUESTION 62**

Which of the following statements correctly describes the benefit of fault attacks?

- A. They are more effective at finding faults than formal test design techniques
- B. They are useful when there is limited experience in the test team
- C. They can evaluate the reliability of a test object by attempting to force specific failures to occur
- D. They are less structured than other experience-based techniques

**Answer: C**

**QUESTION 63**

A programme level Master Test Plan states that a number of best practices must be adopted for its project life cycle models, irrespective of whether a sequential or iterative-incremental approach is adopted for each project. Which of the following life cycle related best practices would you expect to see in the Master Test Plan?

- a. There should be a testing activity that corresponds to each development activity.
  - b. Each project should have four test levels if using a V-model.
  - c. Test personnel should ensure that they are invited to review requirements and design documents as soon as draft versions are available.
  - d. System testing must not be performed by the development teams.
- A. a and b
  - B. a and c
  - C. b and d
  - D. c and d

**Answer: B**

**QUESTION 64**

Given the following fragment of code, how many tests are required for 100% statement coverage?

```
If width > length then
    biggest_dimension = width
    If height > width then
        biggest_dimension = height
    Endif
Else
    biggest_dimension = length
    If height > length then
        biggest_dimension = height
    Endif
Endif
```

- A. 1
- B. 2
- C. 3
- D. 4

**Answer: B**

#### QUESTION 65

Which of the following statements is GENERALLY true of testing?

- a. Testing can show the presence of defects.
- b. Testing reduces the probability of uncovered defects.
- c. Testing can show that a previously present defect has been removed.
- d. Testing can prove that software is defect free.

- A. a, b and c
- B. a, b and d
- C. a, c and d
- D. b, c and d

**Answer: A**

#### QUESTION 66

What should be the MAIN objective during development testing?

- A. To cause as many failures as possible so that defects in the software are identified and can be fixed
- B. To confirm that the system works as expected and that requirements have been met
- C. To assess the quality of the software with no intention of fixing defects
- D. To give information to stakeholders of the risk of releasing the system at a given time

**Answer: A**

#### QUESTION 67

Given the following decision table:

	Rule 1	Rule 2	Rule 3	Rule 4
<b>Conditions</b>				
Existing medical condition	Yes	No	No	No
Smoker	Don't care	Yes	No	No
Skiing	Don't care	Don't care	No	Yes
<b>Actions</b>				
Insure	No	Yes	Yes	Yes
Offer Discount	Not applicable	No	15%	10%

What is the expected action for each of the following test cases?

- Joe is a smoker who will be skiing and has an existing medical condition.
- Sue is a non-smoker who does not ski and does not have an existing medical condition.

- A. Insure Joe offering no discount, insure Sue offering no discount
- B. Insure Joe, offering a 10% discount and insure Sue offering a 10% discount
- C. Do not insure Joe and insure Sue offering no discount
- D. Do not insure Joe and insure Sue offering a 15% discount

**Answer: D**

#### QUESTION 68

Which of the following is a TYPICAL objective of a pilot project for introducing a testing tool into an organisation?

- A. To assess whether the benefits will be achieved at a reasonable cost
- B. To identify the initial requirements of the tool
- C. To select the most suitable tool for the intended purpose
- D. To document test design and test execution processes

**Answer: A**

#### QUESTION 69

Which of the following best describes the purpose of non-functional testing?

- A. To measure characteristics of a system which give an indication of how the system performs its functions
- B. To ensure that a system complies with the quality standards set by ISO 9126
- C. To ensure that the system deals appropriately with software malfunctions
- D. To measure the extent to which a system has been tested by functional testing

**Answer: A**



**QUESTION 70**

Which of the following test activities are more likely to be undertaken by a test lead rather than a tester?

- a. Create test specifications.
  - b. Schedule tests.
  - c. Define metrics for measuring test progress.
  - d. Prepare and acquire test data.
- 
- A. c and d
  - B. a and b
  - C. b and d
  - D. b and c

**Answer: D**

**QUESTION 71**

The below table shows 6 test procedures (P to U) that must now be entered into a test execution schedule. Business severity is regarded as the most important element in determining the sequence of the test procedures, but other dependencies must also be taken into consideration. Regression testing can only be run once all other tests have completed.

Test procedure ID	Business Severity (1 = High 2 = Medium 3 = Low)	Dependencies on other test procedures	Other dependencies
P	1	Must be run after R	None
Q	2	Must be run after U	Regression only
R	1	Must be run after S	None
S	2	Must be run before P	None
T	2	None	Test environment required to support this procedure is likely to be delivered late
U	3	None	Regression only

Which of the following represents the MOST effective sequence for the test execution schedule (where the first entry in the sequence is the first procedure to be run, the second entry is the second to be run and so on)?

- A. S, R, P, T, Q, U
- B. P, R, T, Q, S, U
- C. R, P, S, T, Q, U
- D. P, Q, R, S, U, T

**Answer: A**

**QUESTION 72**

Which of the following pairs of factors is used to quantify risks?

- A. Impact and Cost
- B. Likelihood and Impact
- C. Product and Project
- D. Probability and Likelihood

**Answer: B**

**QUESTION 73**

A simple gaming system has been specified as a set of use cases. It has been tested by the supplier and is now ready for user acceptance testing. The system is assessed as low risk and there is pressure to release the software into the market as soon as possible. Which of the following test techniques would be most appropriate for this testing?

- A. State transition testing and decision testing
- B. Equivalence partitioning and statement testing
- C. Use case testing and exploratory testing
- D. Decision table testing and exploratory testing

**Answer: C**

**QUESTION 74**

Which of the following activities would improve how a tool is deployed within an organisation?

- a. Roll out the tool across the organisation as quickly as possible to all users.
- b. Provide technical support to the test team for each type of tool.
- c. Limit communication with the tool vendor to allow users to develop their own best practice.
- d. Make sure processes are improved to reflect a new tool.
- e. Regularly analyse how the tool is being used.

- A. a, b and c
- B. a, c and d
- C. b, d and e
- D. b, c and e

**Answer: C**

**QUESTION 75**

Which activity in the Fundamental Test Process creates test suites for efficient test execution?

- A. Implementation and execution
- B. Planning and control
- C. Analysis and design
- D. Test closure

**Answer: A**

**QUESTION 76**

The list below (a to e) describes one major task for each of the five main activities of the fundamental test process. Which option (A to D) places the tasks in the correct order, by time?

- a. Create bi-directional traceability between test basis and test cases.

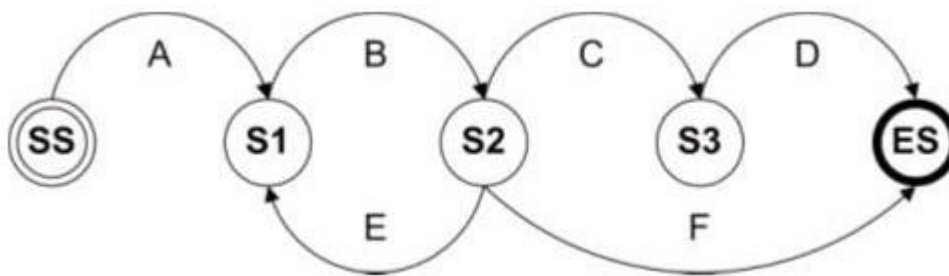
- b. Check test logs against exit criteria.
- c. Define the objectives of testing.
- d. Check planned deliverables have been delivered.
- e. Comparing actual results with expected results.

- A. a, c, b, e, d
- B. c, a, d, e, b
- C. c, a, e, b, d
- D. d, a, c, b, e

**Answer: C**

**QUESTION 77**

Given the following state transition diagram:



Which of the test cases below will cover the following series of state transitions?

SS S1 S2 S1 S2 ES

- A. A, B, E, B, F
- B. A, B, C, D
- C. A, B, E, B, C, D
- D. A, B, F

**Answer: A**

**QUESTION 78**

When in the lifecycle should testing activities start?

- A. As early as possible
- B. After the test environment is ready
- C. After the requirements have been reviewed
- D. Once the code is available to test

**Answer: A**

**QUESTION 79**

Which of the following is a MAJOR activity of test planning?

- A. Initiation of corrective actions

- B. Measuring and analysing results
- C. Determining the exit criteria
- D. Monitoring and documenting progress

**Answer: C**

**QUESTION 80**

Which of the following BEST describes a keyword-driven testing approach?

- A. Test input and expected results are stored in a table or spreadsheet, so that a single control script can execute all of the tests in the table
- B. Action-words are defined to cover specific interactions in system (e.g., log-on entries) which can then be used by testers to build their tests
- C. Keywords are entered into a test harness to obtain pre-defined test coverage reports
- D. The test basis is searched using keywords to help identify suitable test conditions

**Answer: B**

**QUESTION 81**

Retirement of software or a system would trigger which type of testing?

- A. Load testing
- B. Portability testing
- C. Maintenance testing
- D. Maintainability testing

**Answer: C**

**QUESTION 82**

During which activity of the Fundamental Test Process do you compare actual with expected results?

- A. Test closure activities
- B. Evaluating exit criteria and reporting
- C. Test analysis and design
- D. Test implementation and execution

**Answer: D**

**QUESTION 83**

Match the following formal review roles and responsibilities:

Roles

- 1) Moderator.
- 2) Recorder.
- 3) Reviewer.
- 4) Manager.

## Responsibilities

- P) The person chosen to represent a particular viewpoint and role.  
 Q) The person who decides on the execution of inspections and determines if the inspection objectives have been met.  
 R) The person who leads the inspection of a document or set of documents.  
 S) The person who documents all the issues, problems and open points.

- A. 1Q, 2S, 3P, 4R  
 B. 1R, 2S, 3P, 4Q  
 C. 1Q, 2P, 3S, 4R  
 D. 1R, 2P, 3S, 4Q

**Answer: B**

## QUESTION 84

Which of the following are key success factors to the review process?

- A. Review time is allowed in the test execution schedule, process improvement is recognised in the follow up meeting and the objective is always to find defects  
 B. Each review has a clear objective, the right people are involved, training is provided in the review technique and management fully support the process  
 C. Participants are trained, all review meetings are time boxed and moderators are project managers  
 D. Every team member will be involved, all review techniques are used on every work product and test managers control the review process

**Answer: B**

## QUESTION 85

Given the following state table:

	On	Off	Channel 1	Channel 2	Channel >2	Stby
Standby	Live	N	N	N	N	N
Live	N	Standby	Display Channel 1	Display Channel 2	N	Standby
Display Channel 1	N	N	N	Display Channel 2	Live	Standby
Display Channel 2	N	N	Display Channel 1	N	Live	Standby

Which of the following represents an INVALID transition (N)?

- A. Off from isplay Channel 1?  
 B. Channel 2 from Display Channel 1?  
 C. Stby from Live?  
 D. Channel 2 from Live?

**Answer: A**

**QUESTION 86**

In which activity of the Fundamental Test Process is the test environment set up?

- A. Test implementation and execution.
- B. Test planning and control
- C. Test analysis and design
- D. Evaluating exit criteria and reporting

**Answer: A**

**QUESTION 87**

Given the following decision table:

	Rule 1	Rule 2	Rule 3	Rule 4
<b>Conditions</b>				
Age	<21 yrs	21 - 29 yrs	30 – 50yrs	>50 yrs
Insurance Class	A	A or B	B, C or D	C or D
<b>Actions</b>				
Premium	£100	£90	£70	£70
Excess	£2,500	£2,500	£500	£1,000

Which of the following test cases and expected results is VALID?

- A. 23 year old in insurance class A Premium is ?0 and excess is ?,500.
- B. 51 year old in insurance class C Premium is ?0 and excess is ?00.
- C. 31 year old in insurance class B Premium is ?0 and excess is ?,500.
- D. 43 year old in insurance class C Premium is ?0 and excess is ?,000

**Answer: A**

**QUESTION 88**

Which of the following are characteristic of test management tools?

- a. They support traceability of tests to source documents.
- b. They provide an interface to test execution tools.
- c. They help to enforce coding standards.
- d. They manipulate databases and files to set up test data.

- A. a and c
- B. b and c
- C. a and b

**Answer: C**

**QUESTION 89**

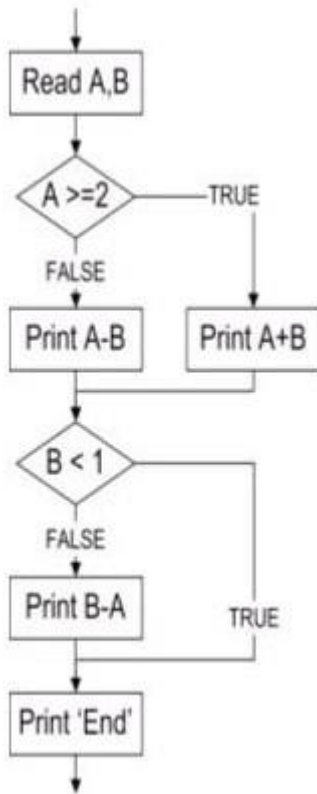
Which one of the following is a characteristic of good testing in any lifecycle model?

- A. Each test level has the same test objective.
- B. There should be more testing activities than development activities.
- C. Test design can only begin when development is complete.
- D. Testers should begin to review documents as soon as drafts are available.

**Answer: D**

**QUESTION 90**

Given the following flow chart diagram:



What is the minimum number of test cases required for 100% statement coverage and 100% decision coverage, respectively?

- A. Statement Coverage = 1, Decision Coverage = 3.
- B. Statement Coverage = 2, Decision Coverage = 3.
- C. Statement Coverage = 2, Decision Coverage = 2.
- D. Statement Coverage = 3, Decision Coverage = 3

**Answer: C**

**QUESTION 91**

Which of the following are structure-based techniques?

- a. Decision table testing
- b. Boundary value analysis
- c. Multiple condition coverage
- d. Use case testing
- e. Decision testing

- A. a and c.
- B. b and d.
- C. b and e.
- D. c and e.

**Answer: D**

**QUESTION 92**

The digital airbow Thermometer uses 7 colours to show the ambient temperature. Each colour spans a range of just 5, with an operating minimum and maximum of minus 5 and 30. Which of the following values is minimum and maximum of minus 5? and 30?. Which of the following values is LEAST likely to have been identified when applying the boundary value test design technique?

- A. 3030?
- B. 00?
- C. 8?8
- D. 15 15?

**Answer: C**

**QUESTION 93**

A system specification states that a particular field should accept alphabetical characters in either upper or lower case. Which of the following test cases is from an INVALID equivalence partition?

- A. Feeds
- B. F33ds
- C. FEEDS
- D. fEEDs

**Answer: B**

**QUESTION 94**

Which of the following is an example of a product risk?

- A. Software that does not perform its intended functions
- B. Failure of a third party
- C. Problems in defining the right requirements
- D. Skill and staff shortages



**Answer: A**

**QUESTION 95**

A system under development contains complex calculations and decision logic, and it is assessed as high risk because of the relative inexperience of the development team in the application domain. Which of the following would be the MOST appropriate choice of test design technique for component testing?

- A. Decision testing.
- B. Statement testing
- C. State transition testing
- D. Equivalence partitioning

**Answer: A**

**QUESTION 96**

Which of the following statements are true in relation to component testing?

- a. Stubs may be used.
- b. May cover resource behaviour (e.g. memory leaks).
- c. Tests the interactions between software components.
- d. Defects are typically fixed without formally managing these defects.

- A. a, c and d
- B. a, b and d
- C. b, c and d
- D. a, b and c

**Answer: B**

**QUESTION 97**

Which tasks would USUALLY be performed by a test leader and which by the tester?

- a. Adapt planning based on test results.
- b. Create test specifications.
- c. Plan tests.
- d. Write or review a test strategy

- A. c and d by the test leader; a and b by the tester
- B. a and b by the test leader; c and d by the tester.
- C. a and d by the test leader; b and c by the tester
- D. a, c and d by the test leader; b by the tester.

**Answer: D**

**QUESTION 98**

Pair the correct test design techniques (i to v) with the category of techniques (x, y and z):

- i) Exploratory Testing

- ii) Equivalence Partitioning
- iii) Decision Testing
- iv) Use Case Testing
- v) Condition coverage
- x) Specification-based
- y) Structure-based
- z) Experienced-based

- A. x = i and ii; y = iii and v; z = iv.
- B. x = i, ii and iv; y = v; z = iii
- C. x = ii and iv; y = iii and v; z = i.
- D. x = iii and iv; y = v; z = i and ii.

**Answer: C**

#### **QUESTION 99**

Which of the following activities should be performed during the selection and implementation of a testing tool?

- a. Determine whether the organisation existing test process needs to change.
- b. Conduct a proof of concept.
- c. Implement the selected tool on a project behind schedule to save time.
- d. Identify coaching and mentoring requirements for the use of the selected tool

- A. a, b and c.
- B. b, c and d.
- C. a, c and d.
- D. a, b and d.

**Answer: D**

#### **QUESTION 100**

Which statement about combinations of inputs and preconditions is true for a large system?

- A. It is easy to test them all in a short time
- B. It is not practically possible to test them all
- C. It is not possible to test any of them
- D. It is essential to test them all in order to do good testing

**Answer: B**

#### **QUESTION 101**

Which of the following is a MAJOR task of evaluating exit criteria and reporting?

- A. Writing a test summary report for stakeholders
- B. Logging the outcome of test execution
- C. Repeating test activities as a result of action taken for each discrepancy.

D. Evaluating testability of the requirements and system

**Answer: A**

**QUESTION 102**

Which statement BEST describes the role of testing?

- A. Testing ensures that the right version of code is delivered
- B. Testing can be used to assess quality.
- C. Testing shows that the software is error free.
- D. Testing improves quality in itself.

**Answer: B**

**QUESTION 103**

Under what circumstances would you plan to perform maintenance testing?

- a. As part of a migration of an application from one platform to another.
- b. As part of a planned enhancement release.
- c. When the test scripts need to be updated.
- d. For data migration associated with the retirement of a system

- A. a, b and c
- B. b, c and d
- C. a, b and d.
- D. a, c and d

**Answer: C**

**QUESTION 104**

Given the following sample of pseudo code:

```
01 Input number of male rabbits
02 Input number of female rabbits
03 If male rabbits > 0 and female rabbits > 0 then
04 Input Do you want to breed (Yes / No) 05 If breed = o?
05 If breed = ?o 06 Print deep male and female rabbits apart!?
06 Print deep male and female rabbits apart!
07 End if
08 End If.
```

Which of the following test cases will ensure that statement ?6?is executed?

- A. male rabbits = 1, female rabbits = 1, breed = Yes male rabbits = 1, female rabbits = 1, breed = Yes?
- B. male rabbits = 1, female rabbits = 1, breed = No male rabbits = 1, female rabbits = 1, breed = No?
- C. male rabbits = 1, female rabbits = 2, breed = Yes male rabbits = 1, female rabbits = 2, breed = Yes?
- D. male rabbits = 1, female rabbits = 0, breed = No male rabbits = 1, female rabbits = 0, breed = No?

**Answer: B**

**QUESTION 105**

Which of the following is a standard for test documentation?

- A. IEEE Std. 1028
- B. EEE Std. 1044
- C. ISO 9126.
- D. IEEE Std. 829

**Answer: D**

**QUESTION 106**

Which of the following statements describe why experience-based test design techniques are useful?

- a. They can help derive test cases based on analysis of specification documents.
- b. They can identify tests not easily captured by formal techniques.
- c. They make good use of tester knowledge, intuition and experience.
- d. They are an effective alternative to formal test design techniques.

- A. a and b.
- B. b and d
- C. c and d
- D. b and c.

**Answer: D**

**QUESTION 107**

Which of the following is a specification-based technique?

- A. Use Case Testing
- B. Error Guessing.
- C. Condition coverage
- D. Statement Testing.

**Answer: A**

**QUESTION 108**

Which of the following is LEAST likely to be included in an incident report?

- A. Suggestions for correcting the problem
- B. Degree of impact on stakeholder interests.
- C. Date the incident was discovered.
- D. Life cycle process in which the incident was discovered

**Answer: A**

**QUESTION 109**

Which of the following activities would improve how a tool is deployed within an organisation?

- a. Defining best practice guidelines for users.
- b. Roll out the tool across the organisation as quickly as possible to all users.
- c. Provide technical support to the test team for each type of tool.
- d. Introduce a system to monitor tool usage and user feedback.
- e. Ensure that the test process is not changed as result of the tool introduction.

- A. a, b and c.
- B. a, c and d.
- C. c, d and e.
- D. b, d and e.

**Answer: B**

#### **QUESTION 110**

Which of the following is a MAJOR activity of test control?

- A. Scheduling test analysis and design
- B. Implementing the test policy or strategy
- C. Making decisions based on information from test monitoring
- D. Determining the scope and risks

**Answer: C**

#### **QUESTION 111**

If a system has been tested and only a few defects have been found, what can we conclude about the state of the system?

- a. The system may be defect free but the testing done cannot guarantee that this is true.
- b. The system is defect free and further testing would therefore be a waste of resources.
- c. It depends what the system is designed to do.
- d. Further testing should be considered but this should be focussed on areas of highest risk because it would not be possible to test everything.
- e. Testing should be curtailed because it is yielding no value.

- A. a, c and d
- B. b, c and d
- C. a, d and e
- D. b, c and e

**Answer: A**

#### **QUESTION 112**

What is the MAIN benefit of designing tests early in the life cycle?

- A. It is cheaper than designing tests during the test phases
- B. It helps prevent defects from being introduced into the code
- C. Tests designed early are more effective than tests designed later
- D. It saves time during the testing phases when testers are busy

**Answer: B**

**QUESTION 113**

Which option BEST describes objectives for test levels within a life cycle model?

- A. Objectives should be generic for any test level
- B. Objectives are the same for each test level
- C. Each test level has objectives specific to that level
- D. Each test level must have different objectives

**Answer: C**

**QUESTION 114**

Which of the following activities would NORMALLY be undertaken during test planning?

- a. Scheduling test analysis and design.
  - b. Designing Test Conditions.
  - c. Monitoring test progress.
  - d. Identifying the objectives of testing.
  - e. Evaluating test tools.
  - f. Selecting test metrics for monitoring and control.
- 
- A. b, c and d
  - B. a, d and f
  - C. a, d and e
  - D. b, c and f

**Answer: B**

**QUESTION 115**

Which one of the following statements about approaches to test estimation is true?

- A. A metrics-based approach is based on data gathered from previous projects; an expert-based approach uses the knowledge of the owner of the tasks or experts
- B. A metrics-based approach is based on creating a work-breakdown structure first; an expert-based approach is based on input from estimation experts
- C. A metrics-based approach is based on data gathered from previous projects; an expert-based approach is based on a work-breakdown structure
- D. A metrics-based approach is based on an analysis of the specification documents; an expert-based approach is based on the opinion of the most experienced tester in the organisation

**Answer: A**

**QUESTION 116**

Which of the following is a project risk?

- A. There are non-standard implementations of some features
- B. We may not be able to get a contractor to join the test team as planned
- C. The response times of the software may not be fast enough
- D. The contract has a legal loophole which has affected the company profit The contract has a legal loophole which has affected the company? profit

**Answer: B**

**QUESTION 117**

During which activity of the Fundamental Test Process test process do you determine the exit criteria?

- A. Test analysis and design
- B. Evaluating exit criteria and reporting
- C. Test closure activities
- D. Test planning and control

**Answer: D**

**QUESTION 118**

For which of the following is Impact Analysis ESPECIALLY important?

- A. Maintenance Testing
- B. Unit Testing
- C. System Testing
- D. User Acceptance Testing

**Answer: A**

**QUESTION 119**

Given the following decision table:

	Rule 1	Rule 2	Rule 3	Rule 4
<b>Conditions</b>				
Frequent Flyer	Gold	Gold	Silver	Silver
Class	Business	Economy	Business	Economy
<b>Actions</b>				
Free Upgrade	First	Business	No	Business
Discounted Upgrade	N/A	First	First	None

What is the expected result for each of the following test cases?

- P) Gold frequent flyer, travelling in Economy class.  
Q) Silver frequent flyer, travelling in Business class.

- A. P. Offer free upgrade to Business and discounted upgrade to First. Q. Offer discounted upgrade to First  
B. P. Offer free upgrade to Business but cannot upgrade to First. Q. Offer discounted upgrade to First  
C. P. Offer free upgrade to First. Q. Cannot upgrade to First  
D. P. Offer discounted upgrade to First. Q. Offer free upgrade to First

**Answer: A**

#### **QUESTION 120**

Which one of the following best describes risk-based testing?

- A. Testing as much of the system as possible in the time available  
B. Targeting testing at the more critical areas of the system  
C. Making full use of formal test case design techniques  
D. Fixing as many defects as possible before go-live

**Answer: B**

#### **QUESTION 121**

Which one of the following BEST describes a test control action?

- A. Setting a completion date  
B. Reporting on poor progress  
C. Adding extra test scripts to a test suite  
D. Retesting a defect fix

**Answer: C**

#### **QUESTION 122**

Which of the following statements about black box and white box techniques is correct?

- A. Decision Testing, Equivalence Partitioning and Condition Coverage are all black box techniques  
B. Decision Table Testing, State Transition and Use Case Testing are all black box techniques  
C. Decision Testing, Equivalence Partitioning and Statement Testing are all white box techniques  
D. Boundary Value Analysis, State Transition and Statement Testing are all white box techniques

**Answer: B**

#### **QUESTION 123**

What does a test execution tool enable?

- A. Tests to be executed automatically, or semi automatically  
B. Tests to be written without human intervention  
C. Preparation of test data automatically  
D. Manage test assets such as test conditions and test cases

**Answer: A**



**QUESTION 124**

Which two of the following are attributes of structural testing?

- a. It is based on testing features described in a functional specification.
- b. It can include statement and decision testing.
- c. It can be carried out at all levels of testing.
- d. It can include debugging.

- A. a and b
- B. a and d
- C. b and d
- D. b and c

**Answer: D**