BSc Computer Science: Software design and development mock exam.

PART A

Candidates should answer all parts of question 1 in Part A.

Question 1

(a) Which of the following are true?

Select ALL that apply [4]

  i. Secure software development is based solely on engineering techniques
  ii. Static testing is similar to debugging
  iii. Dynamic testing is similar to debugging
  iv. Exception handling should be used to check program inputs received from a user
  v. In C++ development, the compiler will force you to catch any exceptions that are thrown
  vi. Python will stop the program if an assertion fails

(b) Which of the following are true about accessiblity and usability?

Select ALL that apply [4]

  i. Less than 1% of the population of the UK can potentially have accessiblity problems, based on the number of reported disabilities
  ii. Running an accessibility tool against your website and passing the test proves it is accesible
  iii. The system usability scale consists of three simple questions that the user must answer
  iv. Nielsen's 10 usablity principles recommend that you help the user to recover from error conditions

(c) Which of the following are true about unit testing?

Select ALL that apply [4]

  i. The three laws of unit testing state that you should complete each cycle within two hours
  ii. A set of unit tests can be considered as a specification for a piece of software

iii. Unit tests can be written using the mocha library in the Python language

iv. Unit tests will slow your program down because it will be tested every time a user runs the program

v. You have to write some production code before you write a unit test

(d) Consider the following code. What is the result of running the code?

```python
import unittest

def i_return_0(input):
    return input % 10

class TestSetForOneModule(unittest.TestCase):

    def test_give_it_5(self):
        self.assertEqual(i_return_0(5), 0)

unittest.main()
```

Select ALL that apply   [4]

i. The code compares zero to zero

ii. The test will fail

iii. The test will not run as the test_give_it_5 function is not called anywhere

iv. The code compares five to zero

v. The test will pass

(e) Which of the following are true about testing?
Select ALL that apply   [4]

i. Test procedures specify inputs, outputs and conditions for a test

ii. Test cases specify inputs, outputs and conditions for a test

iii. Unit testing is an example of black box testing

iv. Unit testing is an example of white box testing

v. Requirements are more closely linked with test procedures than test cases are

vi. Requirements are more closely linked with test cases than test procedures are

(f) Which of the following are examples of EARS requirement types?

Select ALL that apply   [4]

  i. Optional requirement

  ii. Ubiquitous requirement

  iii. Event-driven requirement

  iv. State-driven requirement

  v. Conditional requirement

  vi. Case driven requirement

(g) Which of the following are true about git?

Select ALL that apply   [4]

  i. Github is an open source implementation of the git protocol

  ii. git commit is used to stage files

  iii. git push can result in uploading files to a remote repository

  iv. git uncommit is used to unstage files

  v. git branch branchname is used to switch to a new branch

  vi. git clone is used to create a new branch of a git repository

(h) Select the option below which places types of cohesion on a scale from acceptable to unacceptable:

Select ONE option   [4]

  i. functional sequential communicational procedural temporal logical coincidental

  ii. coincidental logical temporal procedural communicational sequential functional

  iii. coincidental procedural communicational logical temporal sequential functional

  iv. coincidental functional logical procedural communicational sequential temporal

(i) Debugging ...

Select ALL that apply [4]

    i. makes use of something called a conditional watch point to pause execution when the program hits a certain line

    ii. makes use of something called a conditional breakpoint to pause execution when the program hits a certain line and a variable is in a certain condition

    iii. has to be done with a debugger

    iv. is the process of using a specialised debugging tool to pause and analyse the state of the program

    v. is an example of static analysis

(j) According to Wheeler's secure programming HOWTO, which of the following should our programs do?

Select ALL that apply [4]

    i. Validate all input

    ii. Restrict Operations to Buffer Bounds

    iii. Avoid network access from insecure functions

    iv. Carefully call out to other resources

    v. Make use of the filesystem judiciously

PART B

Candidates should answer any **TWO** questions from Part B.

Question 2

(a) You are provided with the following requirement for a video streaming website:

"User can add items to a favourites list for later viewing"

Write out a step by step process using which a tester can test this requirement. [4]

(b) Write TWO related requirements that would be needed to support the favourites list activity using the EARS syntax. [4]

(c) The Amazon website has the following features, which require the user to have different access rights:

- 'user can create a public wish list that any other user can see'
- 'user can create a private wish list that only they can see'
- 'pro-user can post items for sale in their shop'.

Write out a matrix test plan to cover the THREE features and the THREE user types. [6]

(d) Describe THREE things a developer can do to improve the accessibility of a website. [6]

(e) Draw a diagram showing the process of test driven development. Make it clear in which order the steps are carried out. [3]

(f) Name and describe three methods of pausing a program when debugging. [3]

(g) Reflect on your experience carry out test driven development. Describe ONE positive and ONE negative experience. [4]

Question 3

(a) Create labelled diagrams to illustrate the following types of module coupling:

    i. Common environment coupling [3]

    ii. Control coupling [3]

    iii. Data coupling [3]

(b) Compare Python and C++ on the following points:

    i. Encouraging secure programming [3]

    ii. Encouraging robust programming [3]

    iii. Encouraging modular programming [3]

(c) You have been asked to run a static security audit on the codebase for a piece of software.

    i. What is the difference between a static and a dynamic security audit? [2]

    ii. Give TWO examples and descriptions of the kind of problems you would expect a static security audit to find in source code files. [4]

(d) During the course, you have used the bandit code analyser to detect problems in Python code. Present a code fragment which illustrates a problem that bandit can detect. [6]

Question 4

   (a) Explain the difference between assertion and exception handling. [2]

   (b) Considering assertion and exception handling, which do you think is a preferable technique to use in a safety critical context such as a car braking system? Justify your answer. [4]

   (c) Write code fragments with comments explaining how assertion and exception handling work. [6]

   (d) Describe TWO things it is possible to do with the git log command and why you might want to do these things. [6]

   (e) Explain the process of test driven development. [4]

   (f) You are talking to a developer friend who has never used test-driven development techniques before. State TWO reasons for and TWO reasons against using test driven development. [8]

END OF PAPER

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