UNIVERSITI TUNKU ABDUL RAHMAN

ACADEMIC YEAR 2019/2020

JANUARY TRIMESTER INDIVIDUAL FINAL ASSESSMENT

UECS2354 SOFTWARE TESTING

BACHELOR OF SCIENCE (HONOURS) SOFTWARE ENGINEERING

DEADLINE: 11:00AM, 08 MAY 2020

Instructions to Candidates:

This assessment consists of **FOUR (4)** questions. Answer all questions.

Download the question paper and `Final_Assessment` project folder zip file from WBLE and open the project in Eclipse. Fill your name in each source file. Create the directory **C:\jars** and copy **JUnitParams-1.0.5.jar** and **Mockito-all-1.9.5.jar** into it. Configure **Build Path** to include jars files for **C:\jars**.
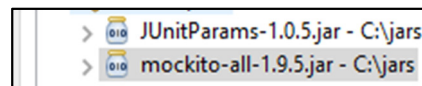
Submit the following items latest by **11am** on **08 May 2020 (Friday)**. You may submit your answer via WBLE OR you may email your answer to (UECS2354.LKCFES@utar.edu.my) on or before the deadline.

Create a **folder** and label it with your **name**, copy the following items to the folder and zip it before submission:

1. **Report**:
   - Use UECS2354 Answer Sheets.docx.
   - Fill in your details in the cover page and declaration form.
   - Your report should contain all the answers as stated in each question.
   - The application code and test code should be attached at the end of the documentation.
   - Your report must be in Microsoft Word file or a PDF file in A4 size format.
   - Your answer to this assessment MUST be limited to **10 pages with a maximum of 1500 words only** (**not including the cover page, declaration form of the answer sheet and the java codes**).

2. **Java project folder**:
   Archive of Eclipse **project folder** that contains source code for both the application code and the test code. The application code and test code should be placed in two separate source directories.

Please read the instructions carefully before you answer the questions.

This assessment consists of 6 questions on 3 printed pages.

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QUESTION 1

Consider the following scenario:

You are a developer in a software development company which only has development team without any testing team. The company recently hired a new developer and assigned him to develop a module in financial system which implements the new tax system. However, the company didn't send the developer to attend any training regarding the new tax system due to time and budget constraints. Also, after the developer completed the development, your manager decided to release the system to live environment. After the release of the system, the company received a lot of feedback and dissatisfaction from the customer because the calculation in the system does not follow the rules of the new tax system. Immediately, customer decided to terminate the contract with your company.

To do (Report):

(a)   Identify the root cause, defect and the effect in the above scenario and suggest at least **THREE(3)** corrective actions on how the above scenario should have been handled.

(6 marks)

(b)   In your opinion, should the company have a testing team? Explain the benefit and importance of testing to your management so that they can consider forming a test team in your organization.   (4 marks)

[Total : 10 marks]

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QUESTION 2

Consider the following requirements:

University decided to provide financial aids to students who are in need. The management decided to develop a system which can help them to decide whether to give a scholarship or financial assistance or both to the students. Below are the criteria for a student to get the financial aid:

- If the monthly household income is less than RM3000 and student has CGPA more than 3.0, the student is eligible to get both scholarship and financial assistance.
- Financial assistance only provided for students who already has PTPTN loan and with either monthly household income is less than RM3000 or CGPA more than 3.0.
- Scholarship will be provided for students who doesn't have PTPTN loan and with either monthly household income is less than RM3000 or CGPA more than 3.0.

To do (Report):

(a) Analyze the above requirements and create a decision table. List out the conditions and actions accordingly in the decision table. (5 marks)

(b) Decide whether if it is necessary to incorporate another testing approach such Boundary Value Analysis(BVA) and/or Equivalence Partitioning(EP) in the decision table. Explain your decision. (4 marks)

(c) Using the test case template below, create test cases for each of the rules identified in your decision table. (6 marks)

Test Case Number	Test Summary	Test Data	Expected Result

To do (Java Project Folder):

`FinancialAid.java` in `src/main` contains a method `checkStatus()` which implements the decision table. `TestFinancialAid.java` in `src/test` is an outline of the test class.

(d) Add additional code in the `checkStatus()` method to throw ***IllegalArgumentException*** for unacceptable values. (2 marks)

(e) Write a parameterized test method to test the `checkStatus()` method according to the **decision table (Q2 (a)**. (13 marks)

[Total: 30 marks]

This assessment consists of 4 questions on 7 printed pages.

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QUESTION 3

Study the following class provided in Project folder "`Final_Assessment`":

- `Employee.java` in `src/main` stores the employee details such as name, position, salary and sales amount. `EmployeeDetails()` method will check and return employee's position based on the name. `updatePosition()` method will update employee's position based on the sales amount. `getSalary()` method will return employee's salary.
- `EmployeeIncome.java` in `src/main` contains `calculateBonus()` method which calculates bonus based on sales amount, `updatePosition()` method which updates employee's position based on sales amount and `getRevisedSalary()` method to revise employee's salary based on the position.

Study the decision structure in the `calculateBonus()` method in the `EmployeeIncome.java`.

To do (Report):

(a)   Based on the decision structure, draw the partition table using **Equivalence Partitioning(EP)** and **Boundary Value Analysis(BVA)** approach. Your partition table should include valid and invalid range of data, test data chosen for each partition and the expected result.   (9 marks)

To do (Java Project Folder):

(b)   Add additional code in the `calculateBonus()` method to throw ***IllegalArgumentException*** for unacceptable values.   (2 marks)

`TestEmployeeIncome.java` in `src/test` is an outline of the test class.

(c)   Write necessary parameterized test methods in `TestEmployeeIncome` class to test `calculateBonus()` method by using **Equivalence Partitioning(EP)** and **Boundary Value Analysis(BVA)** approach. Use the test data identified in Q3 (a).   (5 marks)

QUESTION 3 (Continued)

There is a method called `EmployeeDetails()` in the `Employee` class. This method will return the employee's position based on the employee's name. The employee's position will be used by the `getRevisedSalary()` method on `EmployeeIncome` class to calculate a new salary.

(d)   Add the appropriate constructors in `EmployeeIncome` class so that mock object can be used for testing purposes.   (2 marks)

(e)   Write a parameterized test method to test the `getRevisedSalary()` method in `EmployeeIncome` class. Remember the employee's position is getting from the `EmployeeDetails()` method based on the employee's name in the `Employee` class. You may use Mockito to introduce test doubles here.   (6 marks)

(f)   Write a parameterized test method to test the `updatePosition()` method in `EmployeeIncome` class. The test must **verify** that the correct position (based on the sales amount) is passed to the `Employee`'s `updatePosition()` method. You may use Mockito to introduce test doubles here.   (6 marks)

[Total : 30 marks]
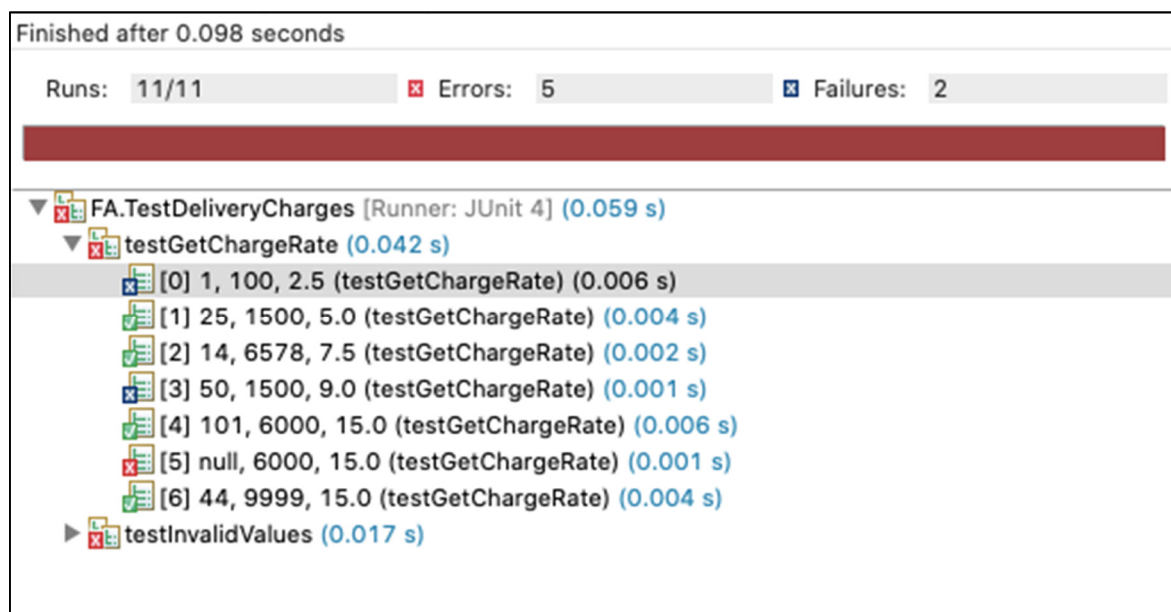
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QUESTION 4

Consider the following scenario:

You company is developing a system for a delivery company called DeliveryFast that provides document pickup and delivery service from and to destination within the state. The minimum distance can be 1 and the maximum distance is limited to 100. The minimum acceptable weight is 1 and maximum weight is 9999. The delivery charges are shown in the following table:

Distance (km)	Weight (grams)	Charge (RM)
1 - 29	1 – 999	2.50
	1000 – 4999	5.00
	5000 - 9999	7.50
30 - 100	1 – 999	4.50
	1000 – 4999	9.00
	5000 - 9999	15.00

`DeliveryCharges.java` in `src/main` has a method called `getDeliveryCharge()` which calculates the delivery charges based on the weight and distance.

You, as the tester for this project, has been assigned to test the `getDeliveryCharge()` method based on the charges as shown above. You have developed a test code `TestDeliveryCharges.java` under `src/test`. However, when you execute the test code, you received errors and failures as shown below:

Finished after 0.098 seconds

Runs: 11/11   ☒ Errors: 5   ☒ Failures: 2

▼ FA.TestDeliveryCharges [Runner: JUnit 4] (0.059 s)
  ▼ testGetChargeRate (0.042 s)
    [0] 1, 100, 2.5 (testGetChargeRate) (0.006 s)
    [1] 25, 1500, 5.0 (testGetChargeRate) (0.004 s)
    [2] 14, 6578, 7.5 (testGetChargeRate) (0.002 s)
    [3] 50, 1500, 9.0 (testGetChargeRate) (0.001 s)
    [4] 101, 6000, 15.0 (testGetChargeRate) (0.006 s)
    [5] null, 6000, 15.0 (testGetChargeRate) (0.001 s)
    [6] 44, 9999, 15.0 (testGetChargeRate) (0.004 s)
  ▶ testInvalidValues (0.017 s)

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QUESTION 4 (Continued)

To do (Report):

(a)   Analyse each error and failure shown in the failure trace and create an incident report for each of the errors and failures using the incident report template below. Also, propose a corrective action for each of these errors and failures.   (10 marks)

Bug Report #:	
Summary:	
Test Data:	
Expected Result:	
Actual Result:	
Impact:	
Description of corrective action:	

(b)   What happen after you produce the incident report? What are the next steps/actions should be taken?   (5 marks)

(c)   In an incident report, the tester makes the following statement, "When I perform step number 5 in test case #123, I expect to receive an error message. But the system displays an hourglass and terminates abnormally, giving timeout error. The responsible developer should fix this immediately, otherwise I will report this to management as this is an unacceptable error for a simple application".

In your opinion, will you accept this as a good incident report? Explain your answer.

(5 marks)

To do (Java Project Folder):

(d)   According to the proposed corrective action in Q4(a), modify the code in the `getDeliveryCharge()` method in `DeliveryCharges` class and modify the test code accordingly.   (10 marks)

[Total: 30 marks]