Name__________________________________________ Student ID________________________

1. Given the following code:
// Assume Engine and TurboEngine are both part of a Engines package (namespace in C++).
package Engines;
public class Engine { … }

package Engines;
public class TurboEngine extends Engine { … }

import Engines.*;
public class Car
{
    private Engine theEngine;
    …
public Car(Engine anEngine) { theEngine = anEngine; }
public Car(Car other)
    {
        if (other.theEngine instanceof TurboEngine)
            theEngine = new TurboEngine((TurboEngine)(other.theEngine));
        else
            theEngine = new Engine(other.theEngine);
    }
}

(a). Draw one UML diagram showing the relationship between the above classes [2 pts]

(b). Derive (show how you get these values) the value of I (the Instability value), the
value of A (the Abstraction value) and the value of D' (normalized distance from main
sequence = |A + I – 1|) for each package. Plot these values for the two packages on the
graph of A vs. I (I on x-axis). What is the average D’ value of the code above [3 pts].
(c) What principle is being violated in the above code? Explain [3 pts].

(d) How would you solve the above problem (Explain – no diagrams)[3 pts]? What patterns are used in your solution [2pts]? What principle is being applied in your solution [2 pts]?

(e) Now, draw one UML diagram showing your redesign. Feel free to add other packages, classes and interfaces/abstract classes, if necessary [4 pts].

(f) Derive the value of I, A and D’ for each package in your design. What is the average D’ value of your code [4 pts]?

Please answer only in space provided for each question

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2. In a language of your choice, give an example (code) of the use of RTTI which will be considered violation of OCP and give an example which will not be considered a violation of OCP [5pts]

3. When would you use Adapter pattern vs. Bridge Pattern [5 pts]?

4. What are the benefits and disadvantages of using Composite pattern [5 pts]?
5. Both proxy and object Adapter use an object that routes the call to another object. Mention three differences between these two patterns [5 pts].

(i) ........................................................................................................................................

(ii) ........................................................................................................................................

(iii) ........................................................................................................................................

6. Mention two construct in a language of your choice that promotes extensibility. Show sample of code that uses each. [2 pts]

7. Mention five recommendations from Extreme Programming [5 pts].

(i) ........................................................................................................................................

(ii) ........................................................................................................................................

(iii) ........................................................................................................................................

(iv) ........................................................................................................................................

(v) ........................................................................................................................................

Please answer only in space provided for each question