

2010 Paper 1 Question 7

Object-Oriented Programming with Java

(a) Give **three** differences between an interface and an abstract class in Java. [3 marks]

(b) A novice programmer writes the following code in order to be able to completely clone an object of type `Car`.

```
public class Tyre {
    private int treadRemaining;

    public void SetTread(int t) { treadRemaining=t; }
    public int GetTread() { return treadRemaining; }
}

public class Car extends Vehicle implements Cloneable {

    private Tyre tyres[] = new Tyre[4];

    public Car() {
        for (int i=0; i<4; i++) tyres[i] = new Tyre();
    }
    public Object clone() throws CloneNotSupportedException {
        Car c = new Car();
        c.tyres = this.tyres;
        return c;
    }
}
```

(i) Explain what it means for the `treadRemaining` field to be `private`. Explain why it is good programming practice for such fields to be `private`. [3 marks]

(ii) Identify the type of interface that `Cloneable` is. What is the defining characteristic of such interfaces? [2 marks]

(iii) Identify and explain **two** reasons why this code may not function as intended. [4 marks]

(iv) Rewrite the code to address the problems you have identified and allow `Car` objects to be fully cloned. [8 marks]