



The University of the West Indies, St. Augustine
COMP 3607 Object Oriented Programming II
2019/2020 Semester 1
Coursework Test 1

Date: October 11, 2019 , 12:00 noon - 1:40 pm
Duration: 90 minutes Total: 40 marks

1. You have been asked to redesign the software architecture for a device emulator that models

- inkjet printers
- laser printers
- scanners
- multifunction printers

All printers can print documents. An inkjet printer allows fast prints. A laser printer is used for quality prints. Scanners are used to scan documents. Multifunction printers can print, scan and copy documents. Multifunction printers typically use the same technology and offer identical functionality as laser printers.

Suppose the approach shown in Figure 1 was used by a former developer.

```
public interface Device{
    boolean print();
    boolean scan();
    boolean copy();
}

public abstract class InkjetPrinter implements Device{
    boolean fastPrint(){ //code for 1 high speed print }
    boolean print(){ // code for 1 regular inkjet print }
    boolean scan() {return false;}
    boolean copy() {return false;}
}

public abstract class LaserPrinter implements Device{
    boolean qualityPrint(){ //code for 1 high quality print }
    boolean print(){ // code for 1 regular laser print }
    boolean scan() {return false;}
    boolean copy() {return false;}
}

public abstract class MultiFunctionPrinter implements Device{
    boolean qualityPrint(){//code for 1 high quality print }
    boolean print(){ // code for 1 regular laser print }
    boolean scan() { // code for 1 scan }
    boolean copy() { // code for copying and printing}
}

public abstract class Scanner implements Device{
    boolean print(){return false;}
    boolean scan() { // code for 1 scan }
    boolean copy() {return false;}
}
```

Figure 1

- (a) Identify three problem(s) with the approach shown in Figure 1, to specify the objects' behaviours in the scenario. (3 marks)
- (b) Which two SOLID object-oriented design principles are violated in Figure 1? (2 marks)
- (c) Suggest how the implementation in Figure 1 can be refactored to adhere to the principles identified in part (b). (3 marks)
- (d) Draw a UML class diagram to model a refactored solution for the domain in the scenario based on your answers in part (c). You may use the method signatures in Figure 1 and rename classes/ interfaces as necessary. (14 marks)
- (e) The MX350 is a Multifunction printer. Draw a sequence diagram to illustrate the interactions when a user scans a document and prints 5 copies: 1 high quality and 4 regular laser prints. (6 marks)

Total Marks: 28 marks

Please turn over