NEWCASTLE UNIVERSITY

SEMESTER 1 2017/2018

PROGRAMMING AND DATA STRUCTURES

PART B

Total time allowed (for Parts A and B) - 3 Hours

Instructions to candidates:

Please read the Instructions to Candidates on the separate sheet carefully.

Answer ALL questions.

Marks shown for sub-sections are indicative only.

[Turn Over]

[CSC8001]

Question B1

A musician is producing a catalogue of sheet music (printed music) she has collected over a number of years. She is writing a java application to help her keep track of the origins and reference numbers she has allocated to each piece of music. The following is an incomplete class definition to represent a piece of sheet music.

```java
public class SheetMusic
{
 private String title;
 private String author;
 private String reference;

 public SheetMusic(String title, String author,
                     String reference)
 {
    this.title = title;
    this.author = author;
    this.reference = reference;
 }


 /**
   * search title for some words, return true
   * or false
   */
 public boolean titleMatch(String text)
 {
    // to be completed
 }
}
```

The class `SheetMusic` records details for a piece of music in the catalogue. The method `titleMatch` is incomplete.

a) Write appropriate accessor methods for the title, author and reference fields.   [3 marks]

b) Complete the body of the `titleMatch` method. The method should return **true** if the title of the music contains the `text` parameter, and **false** otherwise.   [4 marks]

A separate class, `Catalogue`, will maintain a list of `SheetMusic` objects together with the name of the person owning the catalogue. The class has been partially written, as follows:

```java
import java.util.ArrayList;

public class Catalogue
{

    private String name;
    private ArrayList<SheetMusic> tunes;

    // constructor to be completed

    public ArrayList<SheetMusic>
                    tunesMatching(String text)
    {
        // return list of tunes with title
        // containing text


    }
}
```

c) Write a constructor for the `Catalogue` class. The constructor should have a `name` initialised using a

parameter to the constructor, and the `tunes` field initialised to an empty list. [4 marks]

d) Write a method, `addTune`, to add a `SheetMusic` object to the list of tunes. [4 marks]

e) The `tunesMatching` method will search all tunes in the list for a title containing the given text, and return an `ArrayList` of tunes which contain the text in their title. Complete the body of the `tunesMatching` method. [10 marks]

Question B2

The timetabling program at the University of Outer Hebrides must handle information about lecture rooms (possibly with ReCap facilities) and computer clusters (equipped with computers running a specified operating system). All the available university rooms (computer clusters and lecture rooms) have different seating capacities. Implement the following:

a) A class `Room`, containing two variables specifying the room's name and seating capacity (choose appropriate names and types); values for those variables should be passed as parameters to a constructor. Your class solution should only contain an appropriate constructor and essential accessor methods. [3 marks]

b) Sub-classes `ComputerCluster` and `LectureRoom`, which extend class `Room`. Class `ComputerCluster` adds information about the type of an operating system installed on the cluster's computers (passed as a parameter to a constructor). Class `LectureRoom` adds an indicator showing whether there are ReCap facilities in the room or not (passed as a parameter to a constructor). Your sub-classes should only contain appropriate constructors and essential accessor methods. [8 marks]

c) A method called `suitableClusters`, which takes as parameters an array of `Room` objects (representing all the rooms in the university), the needed capacity of a cluster and the name of the required operating system, and returns an `ArrayList` whose elements are the *names* of potentially suitable clusters (a cluster is potentially suitable if its seating capacity is not lower than the needed capacity and its computers are running the required operating system). [14 marks]

END OF PART B