

Candidate Name	Centre Number				Candidate Number			



**AS COMPUTER SCIENCE**

**COMPONENT 2**

**Practical Programming to Solve Problems**

**SPECIMEN PAPER**

**2 hours 15 minutes**



### **INSTRUCTIONS TO CANDIDATES**

Answer **ALL** of questions 1, 2 and 3.

Answer only **ONE** section of question 4. This must be the section which requires you to use the Integrated Development Environment (IDE) of your chosen programming language.

You will need to record all of your answers to questions 1, 2 and 3 in a word processed document.

### **INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

The total number of marks available is 60.

You will need a computer with an installed functional copy of the Integrated Development Environment (IDE) appropriate to your chosen programming language and word processing software.

Remember to save your work regularly.

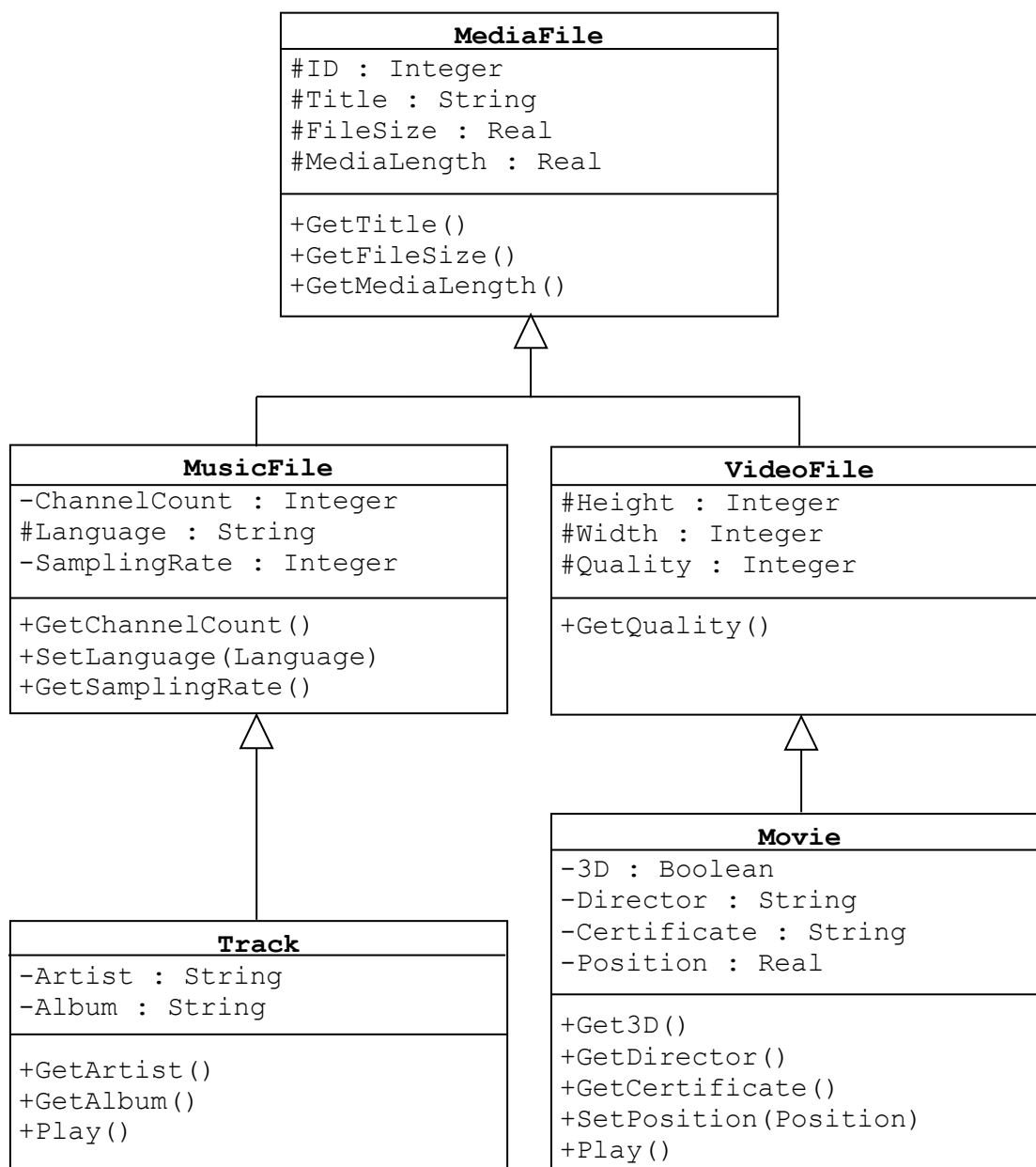
No certificate will be awarded to a candidate detected in any unfair practice during the examination.

**Scenario****MEDIA STREAMING**

**SmashHits** is a new online company that will provide digitally streamed media, such as movies and music, to its customers.

They intend to provide a media on demand service with instant access to movies and music, based around customers' preferences. For movies, these preferences could be favourite Director, Genre, or Lead Actor. In addition to this information other useful items of data such as movie title, duration (in minutes), release date, age rating, whether the film is available in 3D or not, need to be included. Once subscribed to the service, customers pay a flat monthly fee for access to the entire library of media. They have arranged copyright licences with the relevant rights holders to have access to the media, and have sub-contracted the streaming software out to technology experts. However, they do not have a fully functioning computer system that can provide the customisation and search facilities that they wish to offer.

1. The following class diagram represents the relationships between some of the classes that **SmashHits** have decided to create.



- (a) State the name of an identifier for a subclass. [1]
- (b) State the name of an appropriate identifier for a variable that is used to store the following:
- (i) TRUE [1]
  - (ii) 1080 [1]
  - (iii) 34.2 [1]
- (c) Explain the significance of the “-” in the property “-Album : String” in the class **Track** above. [2]
- (d) An object called **Track1** is instantiated from the class **Track**.

Applying the concept of inheritance, list **all** of the methods that would be contained within the the object **Track1**. [3]

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(e) An object called `Movie1` is instantiated from the class `Movie`.

Applying the concept of inheritance, list **all** of the attributes that would be contained within the object `Movie1`. [3]

(f) Explain why the method `SetPosition` is required within the class `Movie`. [2]

(g) Give an example from the class diagram above where a parameter is used.

Name and explain two different methods of passing this parameter to the method. [5]

2. Each **SmashHits** customer has a unique five digit account number. An initial attempt at calculating a check digit is shown below:

- The four digits are added together to produce a single or double digit number.
- The check digit is either:
  - the single digit produced, for example, 2124 gives the check digit 9
  - the last digit of the double digit number produced, for example, 2546 gives 17, so the check digit is 7.

(a) Find the check digit for the code 7546. [1]

(b) Giving examples, explain the problem with the check digit algorithm given above. [5]

(c) *Below is an improved algorithm which generates a check digit for a customer account number.*

```

1  declare A array(1...4) of integer
2  set CustomerNumber = 0
3  set i = 0
4  set Total = 0
5  set CheckDigit = -1
6
7  input CustomerNumber
8
9  A(1)= FirstDigit(CustomerNumber) {split CustomerNumber into array}
10 A(2)= SecondDigit(CustomerNumber)
11 A(3)= ThirdDigit(CustomerNumber)
12 A(4)= FourthDigit(CustomerNumber)
13
14 for i = 1 to 4
15
16   if i MOD 2 = 0 then
17     Total = Total + A(i)
18   else
19     Total = Total + (A(i) * 2)
20   end if
21
22 next i
23
24 CheckDigit = (Total * 9) MOD 10
25
26 output CheckDigit

```

Test data:

**CustomerNumber = 6748**

Copy and complete the table below to show how each variable changes when the algorithm is tested by dry-running the test data given above.

i	A[i]	Total	CheckDigit

[4]

3. **SmashHits** is concerned that their customers will be shown duplicate results on screen when searching for movies.

Using a recognised convention, design an algorithm that performs a search for duplicate consecutive integers in a pre-populated and sorted array. If a duplicate is found, the algorithm should output the location of the duplicate and the word "TRUE". If a duplicate is not found, the algorithm should output the word "FALSE". [11]

4. Select the programming language of your choice from section **a**, **b** or **c** and answer **all** questions in your chosen section.

(a) **Visual Basic**

**SmashHits** wants a computer system to be developed using **Visual Basic** that meets the requirements outlined below:

- The ability to store movie details
- The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
- The ability to store customer contact details
- The ability to search customer contact details.

- (i) Open the file `MovieGenres.sln`
- Read through the code and familiarise yourself with its contents
  - The file contains incomplete code that counts the number of movies with particular attributes.

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.sln`**

- (ii) Create a new form that will allow **SmashHits** to:
- Input customer details
  - Validate customer details
  - Store customer details on disc in a text file called `customerdetails.txt`
  - Confirm storage of customer details in a text file called `customerdetails.txt`
  - Retrieve specified customer details from disc.

[12]

**Save your new form and annotations as `CustomerDetails.sln`**

- (iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4a(ii) that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.sln`**

(b) **Java**

**SmashHits** wants a computer system to be developed using **Java** that meets the requirements outlined below:

- The ability to store movie details
  - The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
  - The ability to store customer contact details
  - The ability to search customer contact details.
- (i) Open the file `MovieGenres.java`
- Read through the code and familiarise yourself with its contents.
  - The file contains incomplete code that counts the number of movies with particular attributes

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.java`**

(ii) Create a new application that will allow **SmashHits** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called `customerdetails.txt`
- Confirm storage of customer details in a text file called `customerdetails.txt`
- Retrieve specified customer details from disc.

[12]

**Save your new application as `CustomerDetails.java`**

(iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4*b(ii)* that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.java`**



(c) **Python**

**SmashHits** wants a computer system to be developed using **Python** that meets the requirements outlined below:

- The ability to store movie details
  - The ability to count the number of movies with particular attributes, e.g. the total number of “Romance” films that are available
  - The ability to store customer contact details
  - The ability to search customer contact details.
- (i) Open the file `MovieGenres.py`
- Read through the code and familiarise yourself with its contents
  - The file contains incomplete code that counts the number of movies with particular attributes

**Complete this code.** [4]

**Remember to save the changes made to the file `MovieGenres.py`**

(ii) Create a new application that will allow **SmashHits** to:

- Input customer details
- Validate customer details
- Store customer details on disc in a text file called `customerdetails.txt`
- Confirm storage of customer details in a text file called `customerdetails.txt`
- Retrieve specified customer details from disc.

[12]

**Save your new application as `CustomerDetails.py`**

(iii) Using the internal facility of your chosen language, add annotated listings to your code from question 4c(ii) that would clearly explain the design of your program to another software developer.

[4]

**Save your annotations in the file `CustomerDetails.py`**