AQA Computer Science A-Level

4.1.2 Programming Paradigms

Past Paper Questions

Additional Spec Qs Paper 1

0 3   Three different types of relationship that can exist between objects in object-orientated programming are **aggregation**, **composition** and **inheritance**.

0 3 . 1   State **one** reason why many programmers follow the design principle "favour composition over inheritance".

[1 mark]

An object-oriented program is being written to store details about clients at an estate agency. Clients can be either sellers or prospective buyers.

A class `Client` has been created and two subclasses, `Seller` and `Buyer` are to be developed. A `Location` class has been created to store details about an address (eg postcode and street name)

The `Client` class has data fields `Name`, `Address` and `DOB`.

Part of the class definition for `Client` class is:

```
Client = Class {
  Private:
    Name: String
    Address: Location
    DOB: Date
  Public:
    Function GetName
    Function GetDOB
    Function GetAddress
    Procedure SetDetails
}
```

A `Buyer` has the following additional data fields:
- `NoOfBedroomsRequired`: stores the minimum number of bedrooms that the buyer requires in the house they purchase.
- `OffStreetParking`: stores a value indicating if the buyer requires off-street parking or not.
- `AreaDesired`: the name of the town/village/estate that the buyer is looking to purchase a house in.

| 0 3 | . | 2 | Write the class definition for `Buyer`.

[4 marks]

| 0 3 | . | 3 | Describe the relationships **aggregation** and **composition**, making it clear what the difference between the two is.

[2 marks]

| 0 3 | . | 4 | Explain how the `Client` class uses aggregation and why it was considered more appropriate to use this type of relationship than composition.

[2 marks]

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7   An object-oriented program is being written to store details of the hardware devices that are connected to a computer network in a college. This will be used by the network manager to perform an audit of the equipment that the college owns.

Two different types of devices are connected to the network. They are printers and computers. The computers are categorised as being laptops, desktops or servers.

A class **Device** has been created and two subclasses, **Printer** and **Computer** are to be developed. The **Computer** class will have three subclasses: **Laptop**, **Desktop** and **Server**.

7 (a)   Draw an inheritance diagram for the six classes.

(3 marks)

7 (b)   The **Device** class has data fields **MACAddress**, **DeviceName** and **Location**.

The class definition for **Device** is:

```
Device = Class
            Public
                Procedure AddDevice
                Function GetMACAddress
                Function GetDeviceName
                Function GetLocation
            Private
                MACAddress: String
                DeviceName: String
                Location: String
        End
```

The **Computer** class has the following additional data fields:

- **ProcessorName**: Stores the name of the company that manufactured the processor.
- **RAMCapacity**: Stores the capacity of the RAM installed in the computer, in gigabytes.
- **HDDCapacity**: Stores the capacity of the Hard Disk Drive installed in the computer, in gigabytes.

Write the class definition for **Computer**.

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(4 marks)

7 (c)   The **Laptop** class has the additional data field **BluetoothInstalled**. This field will indicate whether or not the laptop is fitted with a Bluetooth module.

Write the class definition for **Laptop**.

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(2 marks)