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1. (a) (i) Outline **four** characteristics of object oriented programming language. (4 marks)

(ii) Explain the term *abstract data type* as used in OOP. (2 marks)

(b) Distinguish between *header file* and *in-built function* as used in C++ programs. (4 marks)

(c) Joseph intends use OOP to develop his trade project. Explain **two** benefits he is likely to derive from this decision. (4 marks)

(d) Write a C++ program that implements a class named *triangle* with the following properties:

- has data members named base and height;
- a member function named calculate for inputting base and height, determining the area of triangle and outputting the area.

(6 marks)

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2. (a) Distinguish between *portability* and *machine independence* as used in programming. (4 marks)

(b) (i) Explain the following terms as used in OOP:

I. abstraction; (2 marks)

II. dynamic binding. (2 marks)

(ii) Outline **three** logical operators used in C++ programs. (3 marks)

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(c) Differentiate between *extension* and *combination* forms of inheritance as used in OOP. (3 marks)

(d) Interpret the following C++ program segment.

```
class student
{
     long  int rollno;
     private:
          int age;
          char sex;
          float  height;
     public :
          student();
          void getdata( );
          void  disinfo(void);
          int process(int age, int sex);
};
```

(6 marks)

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3. (a) Namu intends to design an application module based on object orientation. Explain **three** outcomes of the object design phase. (6 marks)

(b) (i) Explain the circumstance under which each of the following concepts are most applicable in C++ programs:

I. comments; (2 marks)

II. resolution operator. (2 marks)

(ii) Explain the term *declaration* as used in programming. (2 marks)

(c) Read the following extract and answer the question that follows.

When ordering new videotapes from a supplier, the store manager creates a purchase order, fills in the date, the supplier's name, address, and enters a list of videotapes to be ordered. The purchase order is added to a permanent list of purchases. When one or more video tapes are received from a supplier, a clerk locates the original purchase order and makes a record of each tape that was received. A record of the videotape is then added to the store's inventory. When all tapes listed on a particular purchase order have been received, the manager sends a payment to the supplier and the purchase order is given a completion date.

Identity **four** possible *classes* and **four** possible *methods* from the extract. (8 marks)

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4. (a) (i) Outline the general syntax of defining an inline function. (2 marks)

(ii) Explain the following terms as used in classes:

I. encapsulation; (2 marks)

II. instantiation. (2 marks)

(b) (i) With the aid of an example, describe *explicit type casting* as applied in C++ programs. (3 marks)

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(ii) Distinguish between *member* and *friend* functions as used in C++ programs. (4 marks)

(c) Write a C++ program that will initialize two objects as follows:

Rectangle 1 L = 10.5 and W = 8

Rectangle 2 L = 7 and W = 3.2

The program should then determine the perimeter of the objects through the use of a *friend* function and output appropriately. Use a constructor. (7 marks)

5. (a) With the aid of a C++ program segment, demonstrate function overloading. (4 marks)

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(b) Distinguish between *object pointer* and *object reference* as used in OOP. (4 marks)

(c) Explain the circumstance under which each of the following features are used in C++ programs:

(i) friend function; (2 marks)

(ii) destructor. (2 marks)

(d) Rachael intends to subtract Matrix A [2 3] from Matrix B[7 9]. Write a C++ program that could be used by Rachael to initialize the two objects and use operator overloading to determine the different. The program should output the values of the difference. (8 marks)

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6. (a) (i) Outline the stage at which the following objects are destroyed:

I. local object; (1 mark)

II. global object. (1 mark)

(ii) Constructors are essential during object oriented programming. Outline **four** rules that should be observed when using them. (4 marks)

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(b) Explain the following terms as used in OOP:

(i) pass object by value; (2 marks)

(ii) overriding. (2 marks)

(c) Figure 1 shows two objects; object 2 has been derived from object 1. Use it to answer the questions that follow.

Object 1 Object 2

Figure 1

(i) Write a C++ program that would initialize the values of a and b in object 1 to 7 and 5. The program should allow object 2 to derive the values of a and b but accept the values of c, determine and output the volume of object 2 through the use of a function. (8 marks)

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(ii) State the *form of inheritance* implemented in the program justifying your answer. (2 marks)

7. (a) Ben has been instructed by his project supervisor to use OOP. Explain **two** ways he could use to cope with emerging trends in OOP. (4 marks)

(b) (i) Define a file as used in OOP. (2 marks)

(ii) Outline **three** types of streams used in C++ files. (3 marks)

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(iii) Explain the term *opening a file* as used in C++ programs. (2 marks)

(c) Write a C++ program that will carry out the following:

- defines a class named *polygon* that has data members (*base, height)* and a member function named *set* which is used to initialize the values of data members;
- implements a polymorphic function named *area* which determines the area of a triangle and area of a rectangle;
- outputs the area of a triangle and area of a rectangle with base and height as 8cm and 4cm respectively.

(9 marks)

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8. (a) (i) Copy constructors are only applicable during initialization. Outline **three** situations where the constructors could be used during programming. (3 marks)

(ii) With the aid of an example in C++ programming language, describe a *constructor with arguments*. (3 marks)

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(b) Distinguish between *binary operator overloading* and *friend binary operator overloading*. (4 marks)

(c) Explain **two** values associated with the *open mode* in C++ files. (4 marks)

(d) With the aid of a C++ program segment, describe an *abstract base class* as used in OOP. (6 marks)