UNIVERSITY EXAMINATIONS

UNIVERSITEITSEKSAMENS

UNISA university of south africa

CSCP1DB

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C++ AS SECOND PROGRAMMING LANGUAGE

Duration 2 Hours

75 Marks

EXAMINERS
FIRST MRS P LE ROUX
SECOND MR CL PILKINGTON

Closed book examination

This paper consists of 15 pages and 7 questions
Please ensure that you have all 15 pages with the 7 questions

INSTRUCTIONS:

- Answer all the questions
- Do all rough work in the answer book
- The mark for each question is given in brackets next to the question
- Please answer the questions in the correct order If you want to do a question later, leave enough space
- Number your answers and label your rough work clearly
- Marks are awarded for part of an answer, so do whatever you are able to in each question

GOOD LUCK!

[TURN OVER]

QUESTION 1 **[1 mark each = 20 MARKS]**

Write the letter of the choice that best completes the statement or answers the question next to the question number in your answer book; e g

1 a
2 b

1 Consider the following code segment that finds the maximum value stored in an array named `grade` of size `NUMELS` What is the missing line of code indicated by the blank line?

```
// insert line here
for (i = 1, i < NUMELS, i++)
  if (grade[i] > maximum)
    maximum = grade[i],
```

a `maximum = grade[0],`
b `maximum = grade[1],`
c `maximum = 100,`
d `maximum = grade[NUMELS],`

2 Consider the following declarations

```
const int ARRAYSIZE = 7,
double length[ARRAYSIZE] = {7 8, 6 4, 4 9, 11 2},
```

What is the value of `length[1]` and `length[4]`?

a 7 8 and 11 2, respectively
b 6 4 and 11 2, respectively
c 6 4 and 0, respectively
d 7 8 and 0, respectively

3 Which of the following function header lines is valid for a function called `findMax` that finds and returns the maximum value stored in an array of integers that is passed in as an argument?

a `int findMax(int [])`
b `int findMax(int vals[])`
c `int findMax(int)`
d `int findMax([])`

4 Assuming the following declarations

```
const int NUMROWS = 3,
const int NUMCOLS = 4;
int val[NUMROWS][NUMCOLS] = {8,16,9,52,3,15,27,6,14,25,2,10},
```

Which of the following loops correctly outputs each element of the array in row order?

a
```
for (i = 0; i < NUMROWS, i++)
{
    for (j = 0, j < NUMCOLS, j++)
            cout << setw(4) << val[i][j],
    cout << endl,
}
```

b
```
for (i = 0, i < NUMROWS, i++)
{
     cout << setw(4) << val[i][j],
     cout << endl,
}
```

c
```
for (i = 0, i < NUMCOLS, i++)
{
    cout << setw(4) << val[i][j],
    cout << endl,
}
```

d
```
for (i = 0, i < NUMROWS*NUMCOLS, i++)
{
    cout << setw(4) << val[i][j],
    cout << endl,
}
```

5 The following function performs a binary search on an array of integers If the `key` is found, the location of it in the array is returned If it isn't found, the value -1 is returned What is the condition for the while loop, indicated by the ____?

```
int binary_search(int list[], int size, int key)
{
  int left, right, midpt,
  left = 0,
  right = size - 1,
  while ( ____ )
  {
    midpt = (int) ((left + right) / 2),
    if (key == list[midpt])
    {
      return midpt,
    }
    else if (key > list[midpt])
      left = midpt + 1,
    else
      right = midpt - 1,
  }
  return -1,
}
```

a `left <= right`
b `right < = left`
c `key != midpt`
d `key != list[midpt]`

6 If c is a pointer, ____ means the variable whose address is stored in `numAddr`

a `numAddr`
b `&numAddr`
c. `*numAddr`
d `->numAddr`

7 Given the following declarations and initialization

```
const int ARRAYSIZE = 5,
int grade[ARRAYSIZE] = {98, 87, 92, 79, 85},
int *gptr,
gptr = &grade[0],
```

How can we refer to the second element of the grade array?

a `*gptr + 1`
b `*(gptr + 1)`
c `*(gptr + 2)`
d `*gptr`

8 Consider the following C++ code segment, which computes the total of all elements in an array

```
int main()
{
  const int NUMS = 5,
  int nums[NUMS] = {16, 54, 7, 43, -5},
  int i, total = 0, *nPt,
  nPt = nums,

  for (i = 0, i < NUMS, i++)
    _______ // Missing statement goes here

  cout << "The total of the array elements is " << total << endl;

  return 0,
}
```

Which of the following statements, when included as the missing statement in the above code, correctly computes the total of all the array elements?

a `total = total + *nPt++,`
b `total = total + *++nPt,`
c `total = total + nPt,`
d `total = total + nums,`

9 Given the following function header line:

```
void swap(double *nm1Addr, double *nm2Addr)
```

Which of the following code segments correctly implements the swap function?

a.
```
double temp,
*temp = *nm1Addr,     // save firstnum's value
*nm1Addr = *nm2Addr, // move secnum's value in firstnum
*nm2Addr = *temp,
```

b
```
double *temp,
temp = *nm1Addr,      // save firstnum's value
*nm1Addr = *nm2Addr, // move secnum's value in firstnum
*nm2Addr = temp,
```

c
```
double temp,
temp = nm1Addr,      // save firstnum's value
nm1Addr = nm2Addr,  // move secnum's value in firstnum
nm2Addr = temp,
```

d
```
double temp,
temp = *nm1Addr,      // save firstnum's value
*nm1Addr = *nm2Addr, // move secnum's value in firstnum
*nm2Addr = temp,
```

10 Given the following declaration

```
int nums[2][3] = { {16,18,20},{25,26,27} },
```

What is the value stored at the location pointed to by `*(nums[1] + 1)`?

a 18
b 20
c 25
d. 26

11 Given the following class declaration

```
class Test
{
  private
    int idNum,
    double *ptPay,
```

```
public
    Test(int, double *),
    void setVals(int, double *),
    void display(),
},
```

Which of the following code segments correctly instantiates a `Test` object and stores 12345 for the employee's ID and 456 20 for the employee's pay?

a
```
Test emp,
double pay = 456 20,
emp setVals(12345, &pay),
```

b
```
Test emp(12345, 456 20),
```

c.
```
Test emp,
emp setVals(12345, 456 20),
```

d
```
Test emp,
double pay = 456 20,
emp setVals(12345, pay),
```

12 Given the following class declaration

```
class Book
{
  private
    char *title,

  public
    Book(char *),
    void showtitle();
},
```

Which of the following definitions correctly implements the assignment operator for this class?

a
```
void Book .operator=(Book& oldbook)
{
  *title = *oldbook title,
}
```

b
```
void Book  operator=(Book& oldbook)
{
  title = oldbook title,
}
```

c
```
void Book  operator=(Book& oldbook)
{
  if (oldbook title != NULL)
    delete(title),
  title = new char[strlen(oldbook title) + 1],
  strcpy(title, oldbook title),
}
```

d
```
void Book  operator=(Book& oldbook)
{
  title = new char[strlen(oldbook title) + 1];
  strcpy(title, oldbook title),
}
```

13 Given the following declarations

```
string filename = "prices dat",
ifstream inFile,
```

Which of the following statements correctly connects the file stream object `inFile` with the external file `prices dat`?

a `inFile open("filename"),`
b `inFile.open(filename),`
c `inFile open("filename c_str()"),`
d `inFile open(filename c_str()),`

14 Given the following C++ statement

```
ofstream outFile("prices dat"),
```

Which of the following statements correctly writes the character 'a' to `outFile`?

a `cout outfile << 'a',`
b `outfile << 'a',`
c `outfile >> 'a',`
d. `outfile cout >> 'a',`

15 Given the following C++ statements

```
ifstream inFile("prices dat"),
char ch,
```

Which of the following statements correctly extracts the next character in the file stream object `inFile` and stores the character in `ch`?

a `cin get(ch),`
b `inFile get(ch),`
c `ifstream get(ch);`
d `get(ch),`

16 Given the following base class declaration

```
class Circle
{
  protected
    double radius,
  public
    Circle(double r = 1 0)  radius(r) {}
    double calcval(),
},
```

The following derived class declaration

```
class Cylinder   public Circle
{
  protected
    double length,
  public
    Cylinder(double r = 1 0, double l = 1 0)   Circle(r), length(l)
    {}
    double calcval(),
},
```

And the following instantiations

```
Circle CircleOne,
Cylinder CylinderOne(3,4);
```

What is the value of the radius data member for `CircleOne` after the following assignment?

```
  CircleOne = CylinderOne,
```

a 1
b 3
c. 4
d The assignment is illegal

17 Given the following base class declaration and implementation

```
class One
{
  protected
    double a,

  public·
    One(double);
    double f1(double),
    double f2(double);
},

// methods implementation section for class One
One· One(double val = 2)
{
  a = val,
}
double One  f1(double num)
{
  return(num/2),
}
double One  f2(double num)
{
  return( pow(f1(num),2) ),
}
```

The following derived class declaration and implementation

```
class Two . public One
{
  public
    double f1(double),
},

// methods implementation section for class Two
double Two  f1(double num)
{
  return(num/3),
}
```

And the following instantiations

```
One objectOne,
Two objectTwo,
```

What is the output from the following statements?

```
cout << objectOne f2(12) << endl,
cout << objectTwo f2(12) << endl,
```

a
```
36
16
```
b
```
16
36
```
c
```
36
36
```
d
```
144
144
```

18 Given the following class declaration

```
class One
{
  protected
    double a,
  public
    One(double);
    virtual double f1(double),
    double f2(double),
},
```

Which of the following method header line is correct for `f1()` in the above implementation file?

a. `virtual double One  f1(double num)`
b `double One. f1(double num)`
c. `friend double f1(double num)`
d `void One  f1(double num)`

19 Given the following class declaration

```
class Date
{
  private
    int month,
    int day,
    int year,
  public
    Date(int = 7, int = 4, int = 2007);
    void showDate(),
},
```

And the following constructor definition

```
Date  Date(int mm, int dd, int yyyy)
{
  month = mm,
  day = dd;
  year = yyyy,
}
```

Which of the following is an equivalent definition for the `Date` constructor?

a
```
Date  Date(int mm, int dd, int yyyy)
 {
   this month = mm,
   this day = dd,
   this year = yyyy,
 }
```

b
```
Date  Date(int mm, int dd, int yyyy)
 {
   (*this) month = month,
   (*this) day = day,
   (*this) year = year,
 }
```

c
```
Date ·Date(int mm, int dd, int yyyy)
 {
   month = (*this) mm,
   day = (*this) dd,
   year = (*this) yyyy,
 }
```

d
```
Date :Date(int mm, int dd, int yyyy)
 {
   (*this) month = mm,
   (*this) day = dd,
   (*this) year = yyyy,
 }
```

20 Given the following class declaration

```
class Customer
{
  public·
    Customer() {cout << "\n**** A new Customer has
                        been created ****"<<endl;};
    ~Customer(){cout << "'' This Customer object has
                        been deleted ''"<<endl,},

    int arrive() {return(1 + rand() % 15),},
    int gallons() {return(3 + rand() % 18),},
},
```

and the following instantiation

```
Customer *anotherCust;
```

What is the screen output from the statement `delete anotherCust,`?

a `'' This Customer object has been deleted ''`
b `**** A new Customer has been created ****`
c `delete`
d Nothing is outputted to the screen

QUESTION 2 **[2 marks each = 10 MARKS]**

Give the output after each of the following code fragments has been executed

2 1
```
#include <iostream>
using namespace std,
int main()
{
      int x = 5,
      int Quotient = 5,
      Quotient  /= ++x
      cout << "x = " << x << "Quotient = " << Quotient << endl,
      return 0,
}
```

2 2
```
#include <iostream>
using namespace std,
int main(){
      int Answer = 1,
      int Counter = 2,
      do
      {
            Answer *  Counter,
            Counter += 3,
      } while (Counter <= 10),
      cout << "Answer = " << Answer << endl,
      return 0,
}
```

2 3
```
#include <iostream>
using namespace std,
int main()
{
      int i, n = 20,
      for (i = 0, i <=  n; )
      {
            ++n,
            i +=  4,
      }
      cout << i << endl,
      return 0,
}
```

2.4
```
#include <iostream>
using namespace std,
int main()
{
      #define X
      int x = 0,
      #ifndef X
      int x = 1,
      #define X
      #endif
      cout << "X=" << x,
}
```

2.5
```
#include <iostream>
using namespace std,
void f(int i)
{
      if (i > 1)
      {
            f(i/2),
            f(i/2),
      }
      cout << "*",
}
int main()
{
      f(4),
      return 0,
}
```

QUESTION 3 **[5 MARKS]**

A bookshop gives discounts to customers as follows

- Students get 10% discount
- Book dealers get 12% discount
- Pensioners get 15% discount
- All other customers get 10% discount only if their total purchases is more than R200

Write down ONLY the necessary C++ statements to calculate and display the final amount that is due, after the discount is applied

Do NOT write a complete program Use the following variables

```
float amount,        // The total purchase amount due before discount
char customerType,   // The type of customer  'S' (student) or
                     // 'D' (dealer) or 'P' (pensioner) or 'O'(other)
```

Assume that values have been assigned to `amount` and `customerType` already

You may also need the following variables

```
float discount, finalAmount,
```

QUESTION 4 **[8 MARKS]**

4 1 Write a function `isSquare()` that determines whether a given integer number is a square number The square root of a number is that number which, when multiplied by itself will produce the number you started out with For example, the square root of 9 is 3 because 3*3 is equal to 9 The C++ library `math h` has a function `sqrt` which given an integer number will return the square root of that number The first ten square numbers are 1, 4, 9, 16, 25, 36, 40, 64, 81 and 100 (4)

4 2 Write a test program that will display the number followed by a message For example (4)

If `1` is entered, the message displayed is `1 is a square`
If `5` is entered, the message displayed is `5 is not a square`

QUESTION 5 **[10 MARKS]**

Develop a program that displays the contents of a vector named `myVector` by following the steps below

- Includes the vector definition that is in library `vector`
- Declares `myVector` of base type `int`
- Declares an iterator `intVecIt` for vector of base type `int`
- Add 5 elements to the vector `myVector`
- Loop through the vector using the iterator and display the content of the vector named `myVector`

QUESTION 6 **[10 MARKS]**

You are required to create a hierarchy of classes to represent a fleet of vehicles, consisting of cars and trucks Create the interfaces only, no implementation (only the `.h` files) Create a base `Vehicle` class to store registration number, make and model (year)

Create the `Truck` and `Car` classes, which must inherit all the characteristics of `Vehicle` In addition, the `Truck` class must contain additional data on the number of axles and the tonnage The `Car` class must contain additional data on the number of seats

Create a `Bakkie` class that inherits from both the `Truck` and `Car` classes

The `Vehicle` class must have a method, `display()` overloaded in the derived classes which displays all the characteristics of a particular vehicle e g

```
Truck
      Registration:    1234323G
      Make:            Toyota
      Model            1996
      Axles            6
      Tonnage          7
```

QUESTION 7 **[12 MARKS]**

Consider the class specification (interface) for the class `Student` below

```
class Student
{
   public
        Student (),
        Student (string stdName, string stdNr),
        string getName()const,
        string getStdNumber()const,
        void setName(string stdName),
        void setStdNumber(string stdNr),
        void displayStdInfo( ) const, //display data members for class

   private:
        string name,
        string stdNumber,
}
```

7 1 Derive a class `PostGradStd` from class `Student` This class has additional member variables `promoter` and `thesis` for the promoter and thesis. The class also has additional member functions `getPromoter()`, `getThesis()`, `setPromoter()`, and `setThesis()` The class should override member function `displayStdInfo()` to display the student's name, student number, promoter and thesis

Provide only the interface of class `PostGradStd` in terms of a header file The header file should contain compiler directives to prevent multiple definitions Assume that the interface of class `Student` is contained in an interface file called `Student h` (8)

7 2 Implement the overloaded constructor for the class `PostGradStd` by invoking the base class constructor (4)