

University of Swaziland
Department Of Computer Science
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Title of paper: *C under Unix*

Course number: *CS344*

Time Allowed: *Three (3) hours*

Instructions:

- *Each question is worth 25 marks*
- *Answer Question 1*
- *Answer any three (3) questions from questions 2 to 6*

This paper may not be opened until permission has been granted by the invigilator

Question 1 - 25 marks

(compulsory)

Translate the following Pascal program into an equivalent C++ program.

```
program LinkedList;

type ptr = ^node;
   node = record
       data : integer;
       next : ptr;
   end;

   List = ptr;

var L : List;

procedure init (var L : List);
begin
    L := nil;
end;

procedure AddElement( e:integer; var L:List);
var NewNode : ptr;
begin
    new(NewNode);
    NewNode^.data := e;
    NewNode^.next := L;
    L := NewNode;
end;

procedure PrintList(L:List);
var P : ptr;
begin
    P := L;
    while (P <> nil) do
    begin
        write (P^.data:7);
        P := P^.next;
    end;
    writeln;
end;

begin
    new(L);
    init (L);
    AddElement(10, L);
    AddElement(60, L);
    AddElement(15, L);
    PrintList(L);
    writeln;
end.
```

Question 2- 25 marks

- i. Write C++ code segments to perform the following
- a. Using the array name as a pointer, display the value of the first element of array **A**. 2 marks
 - b. Write three different statements that decrements the value integer **x** by 1. 3 marks
 - c. Display the double value **x** in 9 spaces with 2 decimal places. 2 marks
 - d. Using a **do** statement, display all the elements in float array **B**, containing **N** values. 3 marks
 - e. A function template, **Swap (x , y)** , that takes two arguments and swaps the values of the arguments. 5 marks
- ii. Distinguish between the following
- a. Function template and template function. 2 marks
 - b. Public and Private inheritance. 2 marks
 - c. Abstract and Concrete class. 2 marks
 - d. A compiler and an interpreter. 2 marks
 - e. Call by value and call by reference. 2 marks

Question 3- 25 marks

- i. Write the C++ syntax and draw the activity diagram for the following statements.
- a. **switch** statement 3 marks
 - b. **do-while** statement 3 marks
 - c. **for** statement. 4 marks
- ii. Let **B[]** be an array of float values. Write a recursive C++ function, **void PrintArray (B, StartIndex, Endindex)**, that prints all the values in array **B** from **StartIndex** to **EndIndex**.

15 Marks

Question 4- 25 marks

- i. The following program has syntax errors. Identify the errors and correct them. On each successive line, assume that any preceding error has been corrected. (*Please note that the program lines are numbered for reference purposes*). 15 marks

```
1. #include <iostream>
2. const int PRIME = 11, 213;
3. const RATE = 15.6
4. int main()
5. {
6. int i, x, y, w;
7. x = 7;
8. y== 3;
9. x = x + w;
10. PRIME = RATE + Prime;
11. cout << PRIME << endl;
12. wages = RATE * 36.75;
13. cout << "Wages = " << wages << endl;
14. }
```

- ii. State whether the following statements are true or false. If False explain why it is false. 10 marks

- a. The data members of a class must be of the same type.
- b. All constructors must have parameters.
- c. A class may have more than one destructor function.
- d. The member functions of a class must be public.
- e. Private members of a base class are private to the base class.
- f. If **class A** is a friend of **class B**, this implies **class B** is a friend of **class A**.
- g. Inheritance is a "has a" relationship.
- h. The name of an array is a constant pointer to the last element of the array.
- i. The insertion operator (<<) cannot be overloaded.
- j. A function template provides overloaded template functions

Question 5- 25 marks

Write a C++ program that reads, from a file, the names of candidates in a local election and the number of votes received by each candidate. A sample input files is:

```
Khumalo 5000
Malinga 4000
Fakudze 6000
Duffy 2500
Robinson 1800
```

The program should then output each candidate's name, the number of votes received and the percentage of the votes received by the candidate. Your program should also output the total votes counted and the winner of the election. A sample output is:

```
Candidate      Votes Received  % of Total Votes
Khumalo        5000           25.91
Malinga        4000           20.73
Fakudze        6000           31.09
Duffy          2500           12.95
Robinson       1800           9.33

Total Votes    19300
```

The winner of the Election is Fakudze.

25 marks

Question 6- 25 marks

A point in the x-y plane is represented by its x-coordinate and y-coordinate. Using C++ notation, define a class **PointType** that can store and process a point in the x-y plane.

Your class definition should implement the following operation on a point.

- A constructor that initializes the data members of the class to 0 as default values.
- Set function to update the data members of the class.
- Get functions that return the values of the data members of the class.
- An insertion operator to print the values of the data members to an output stream in the form : (x,y)
- A function to compute the distance from one point to another using the

following formula: distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

25 marks

END OF EXAMINATION PAPER