# University of Swaziland Department Of Computer Science Supplementary Examination JULY 2014 

| Title of paper: | C under Unix |
| :--- | :---: |
| Course number: | CS344 |
| Time Allowed: | Three (3) hours |
| Instructions: |  |
|  | - |
|  | Answer question 1. |
|  | Answer any other 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

(a) State whether each of the following is true or false. If false explain [ 6 marks]
(i) All variables must be declared before they are used.
(ii) All variables must be given a type when they are declared.
(iii) $\mathrm{C}++$ considers the variables number and Number to be identical.
(iv) Variable declarations can appear almost anywhere in the body of a C++ program.
(v) The default case is required in the switch selection structure.
(vi) An array may store many different types of values.
(b) Write a $\mathrm{C}++/ \mathrm{C} \# / \mathrm{Java}$ statement(s) to accomplish each of the following
(i) Declare variables $\mathbf{c}$, thisnumber, $\mathbf{q} 234$ and number to be of type integer.

2 marks
(ii) Declare a double precision pointer y, set it to point to some arbitrary memory location, and initialize the value of this location to be $7.4 \quad 2$ marks
(iii) Print the value 333.546372 in a field of 15 characters with precision of 3 .

3 marks
(iv) Sum the odd integers between 1 and 99 using a for loop; 2 marks
(v) Declare an array of 10 integers called scores and initialize the first 5 components to $8,10,12,100,56 \quad 2$ marks
(vi) Print the sum of all elements of a floating-point array $\mathbf{c}$ of 100 elements.

4 marks
(vii) Determine and print the sum of all integers contained in array $\mathbf{w}$.

4 marks

## Question 2-25 marks

(a) Using a function template, write a function Min that takes two values and returns the largest value.

5 marks
(b) Write a function QualityPoints that takes an student's average and and returns 4 if average is $90-100,3$ if average is $80-89,2$ if average is $70-79,1$ if average is $60-69$ and 0 if average is lower than 60 . 10 marks
(c) Write a recursive Power function that computes and returns the value of $\mathrm{X}^{\mathrm{n}}$.

$$
\begin{array}{ll}
X^{n}= & \text { if } n=0 \\
X^{*} * X^{n-1} & \text { if } n>0 \\
1 / X^{-n} & \text { if } n<0
\end{array}
$$

$$
10 \text { marks }
$$

## Question 3-25 marks

A parking garage charges E2.00 minimum fee to park for up to three hours. The garage charges an additional E0.50 per hour for each hour or part thereof in excess of the three hours. The maximum charges for any given 24-hour period is E10.00. Assume that no car parks for longer than 24 hours at a time. Write a program that calculates and prints the parking charges of several customers who parked their cars in the garage yesterday. You should enter the hours parked for each customer. Your program should print the results in a neat tabular format and should calculate and prints the total of yesterday's receipts. The program should use the function CalculateCharges to determine the charge for each customer. Your outputs should appear in the following format.

| Car | Hours | Charge |
| :--- | :--- | :--- |
| 1 | 1.5 | E2.0 |
| 2 | 4.0 | E2.50 |
| 3 | 24.0 | E10.0 |
| TOTAL | 29.5 | E14.50 |

Show all your working from analysis to design and implementation.
20 marks

## Question 4-25 marks

(a) Write a C++ structure definition of a Single Un-Ordered Linked List.

3 marks
(b) Using your strucure definition in (i) above, write the suitable function definitions for the following

- init (L) - Initializes list L to an empty list.
4 marks
- IsEmpty ( $L$ ) - returns true if list $L$ is empty and false otherwise. 4 marks
- Insert (e,L)-inserts element e into list L. 7 marks
- Delete (e, $L$ )-deletes element e from list $L$. 7 marks


## Question 5-25 marks

(a) Define a name structure containing a string field for a name, an integer for feet, and another integer for arms. 5 marks
(b) Use the new structure to define an array of 6 items of the structure defined in (a) above.
(c) Write a function that will print out all the data in the array declared above in the following format (assuming appropriate assignments for, name, feet and arms, have been made for each data item in the array).

```
    A Human being has 2 legs and 2 arms
    A dog has 4 legs and 0 arms
```

$$
7 \text { marks }
$$

(d) Write code segments to illustrate how these values (human being, 2,2 ) would have been assigned to the corresponding variables by using a loop that reads all corresponding values (name, feet and arms) from standard input.

8 marks

## Question 6-25 marks

One of the useful applications of a stack is to check for matching brackets in a string.
Consider the following strings containing brackets:

$$
\begin{aligned}
& (\mathbf{X}+[\mathbf{Y} / \mathrm{Z}])-[\mathrm{Z} *\{\mathrm{X}+\mathrm{Y}\}] \\
& (([(\{0\}\}[])]])\}[]) \\
& \left(\left([(\mathbf{0}+\mathbf{1}) .0]^{\prime}+\mathbf{0}\right) .(\mathbf{1 + 1})\right.
\end{aligned}
$$

The first two (2) strings have matching brackets but the third string does not have matching brackets.

You may use a stack to check for matching brackets as follows. If you get an open bracket, ( or \{ or [, push it onto the stack. If you get a close bracket, ) or \} or ], pop a bracket off the stack. If they match, great, keep going. If they don't match (or the stack is empty) then the input string does not have matching brackets.

Assuming C++/C\#/Java class Stack is predefined (or use standard template/collection), with following member functions

- Stack() - Constructor, creates and initializes an empty stack.
- IsEmpty()-Returns True if stack is empty and false otherwise.
- IsFull()-Returns True if stack is full and false otherwise.
- Push (element)- Add new element onto the stack.
- Pop 0 - Removes topmost element from the stack.
- Top() - Returns value of topmost element on the stack.

Write a $\mathrm{C}++/ \mathrm{CH} / \mathrm{Java}$ program that reads an input string from input stream and uses a stack to determine if the string has matching brackets. 25 marks

