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THE UNIVERSITY OF BAMENDA HIGHER TECHNICAL TEACHERS TRAINING COLLEGE COMMON ENTRANCE EXAMINATION JULY 2011 SESSION SECOND CYCLE PAPER: PROGRAMMING & ALGORITHM (MAJOR)

DEPARTMENT: COMPUTER SCIENCE (FUNDAMENTAL) DURATION: 3HRS COEF: 3

This paper has three independent questions the candidate is required to answer all the questions, all the algorithm should be written in C language

Question 1 (0.75 + 0.75 + 0.75 + 0.75)

Let us consider the following code written in c language. Answer the following

questions

```
#include<stdio.h>
int main(){
    int *p, i=5, j, k;
    p=&i;
    *p=*p+10;
    printf("the value of i is %\n", i);
    i=0x35;
    j=04;
    k=i&(j+021);
    i<<j;
    printf("i=%d and j=%d\n", i, j);
    return o;
    }
</pre>
```

- 1. Give the value of i displayed by the first printf statement
- 2. Give the value of I and j displayed by the second printf statement
- 3. What is the value of k at the end of program?

Question 2 (3 + 1 + 1 + 1 + 0.5 + 1 + 2 + 1)

A singly linked list is a data structure in which each node is linked to the next

by a pointer. The structures bellow define a node and the list.

typedef struct node{

int info;

struct node *next;

}node;

```
typedef struct list{
```

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node *pfirst;

}list;

list head;

head.pfirst=null;



The list be ordered into ascending order

- 1. Write a function that take an integer and insert it into the list such that the list should remain ordered void insert(list *head, int val)
- 2. Write a function that deletes an integer from the list. If the given integer is not in the list, an error message should be displayed
- 3. Write a recursive function that computes and returns the length or the number of elements of the list
- 4. Write a function that compute the average value of the list
- 5. Write a function that displays the list as it is
- 6. Write a recursive function that displays the list in reverse order that is from the last to the first element
- 7. Write a main program that reads a sequence of values from the keyboard, terminating by 0 and insert them into the list, then displays the length of the list, the average value if the list and the list itself
- 8. What is the complexity of the insert algorithm?

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Question 3 (1 +0.5 +1.5 +1 +1.5)

The Syracuse's conjecture stipulates that from an integer n greater than 0, we deduce others integers as follow

- If n is even, we divide by 2;
- If n is odd, we multiply it by 3 and 1
- \circ We restart with the new number and we stop when we obtain 1

The Syracuse's conjecture stipulates that for all integer n, one will reach 1.

(This is not actually demonstrated)

- The trajectory of n is the list of integers obtained, also referred to as steps
- We designate by flight duration of the integer n the number the number of integers obtained before reaching 1
- The maximum altitude designates the biggest integer of the trajectory
- The expansion factor is obtained by dividing the maximum altitude by the integer n.

Answer these questions

- 1. Compute these terms for the integers 9 and 32
- 2. What about the integer 2^k ?
- 3. Considering the hypothesis of the Syracuse's conjecture, write in C language the functions that determine
 - a. The flight duration
 - b. The maximum altitude
 - c. The expansion factor
- 4. Write a function that takes as parameter the integer n and display the trajectory of n
- 5. Write a program with the main function that reads an integer n, make sure that the read integer is greater than 0 the computes and displays the