CS214 Mid 472

Q1- Choose the correct answer for the following questions: [4 marks]

1- Which of the following is a logical data structure?

a) Array b) Linkedlist c) Stack d) None of them

2- What is key difference between static and dynamic data structures?

a) Easy implementation b) Speed c) Size flexibility d) None of them

3- Which is the best structure for frequent insertions and deletions?

a) Linkedlist b) Array c) Stack d) Queue

4- Choose the correct way to insert a new node at the begining of non-empty list.

a) NewNode = new Node; NewNode->next = NULL; head = NewNode;

b) NewNode = new Node; NewNode->next = head; head = NewNode;

c) NewNode = new Node; NewNode->prev = head; head = NewNode->next;

d) NewNode = new Node; NewNode->next = head; head = NewNode->prev;

Q2- Answer the following T/F questions : [4 marks]

5- Non-linear data structures are generally easier to implement than linear data structures.

a) True b) False

6- A Linked List is a Non-Primitive, Linear, and Static data structure.

a) True b) False

7- The insert() function in an array needs one argument, which is the index value.

a) True b) False

8- An array is an example of a primitive data structure.

a) True b) False

Q3- Calculate the memory address of the element 140 in the following array using Row Major Arrangement. [5 Marks]

```
int int array[4][5] = {
   {10, 11, 12, 13, 14},
   {20, 21, 22, 23, 24},
   {30, 31, 32, 140, 34},
   {40, 41, 42, 43, 44}
 };
```

Assume the base address is 1000.

Q4- Write a program that includes a function called int sumAllElements() which traverses a non-empty singly linked list, calculates the sum of its elements and the number of nodes, and then returns the average (sum ÷ count) at integer. The program should define a Node structure and a LinkedList class that contains a head pointer, along with insert and sumAllElements functions. In the main function, create a list with at least five elements, call sumAllElements, and display the average. [7 Marks]

Answers are on the next page

Answers

Question 1 answer:

1	**c**	**2**	**c**
3	**a**	**4**	**b**
5	**b**	**6**	**b**
7	**b**	**8**	**b**

Question 2 answer:

LOC(array[2][3]) = base_address + W (N * i + j)

base_address = 1000.
W = 4.
N = 5.
i = 2.
j = 3.

LOC(array[2][3]) = 1000 + 4 (5 * 2 + 3)
= 1000 + 4 (13)
=1000 + 52
= 1052

Question 4 answer:

Solution link

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Solution

Written solution is on the next page

```cpp
#include <iostream>
using namespace std;

struct Node
{
    int data;
    Node *link;
};

class LinkedList
{
    private:
        Node *head;

    public:
        LinkedList() : head(NULL) {}

        // Insert at the end of the list
        void insert(int num)
        {
            Node *temp, *r;
            if (head == nullptr)
            {
                temp = new Node;
                temp->data = num;
                temp->link = NULL;
                head = temp;
            }
            else
            {
                temp = head;
                while (temp->link != NULL)
                {
                    temp = temp->link;
                }
                r = new Node;
                r->data = num;
                r->link = NULL;
                temp->link = r;
            }
        }

        int sumAllIntegers()
        {
            if (head == NULL)
            {
                cout << "List is empty. Cannot compute average." << endl;
                return 0;
            }

            int sum = 0;
            int count = 0;
            Node *temp = head;

            while (temp != NULL)
            {
                sum += temp->data;
                count++;
                temp = temp->link;
            }

            int total = sum / count;
            return total;
        }
};

int main()
{
    LinkedList mylist;

    for(int i = 0; i < 5; i++)
    {
        mylist.insert(i + 1);
    }

    int avg = mylist.sumAllIntegers();
    cout << "The average of all integers in the list is: " << avg << endl;

    return 0;
}
```