National University of Computer and Emerging Sciences, Lahore Campus



Course Name:	Data Structures	Course Code:	CS2001
Degree Program:	BS (CS, SE, DS)	Semester:	Fall 2022
Exam Duration:	60 Minutes	Total Marks:	20
Paper Date:	28-Sept-2022	Weight	15
Section:	ALL	Page(s):	6
Exam Type:	Midterm-I		

Student: Name. 1

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Section: >

Instruction/Notes: Attempt all questions. Answer in the space provided. You can ask for rough sheets but will not be attached with this exam. Answers written on rough sheet will not be marked. Do not use pencil or red ink to answer the questions. In case of confusion or ambiguity make a reasonable

assumption.

Question1:

(Marks: 10)

Your task is to write a C++ function "deleteSubSequence" that removes a desired subsequence from a singly linked list of integers that store binary digits such that each node either stores zero or one. This function must delete all the sub lists / sequences containing binary representation that are positive power of 2 ($2^0=1$ is not included). For Example, $2^1=10$,

 $2^2 = 100$ so on. Below is a table that contains sample inputs and outputs.

2'- 10 $2^2 = 100$

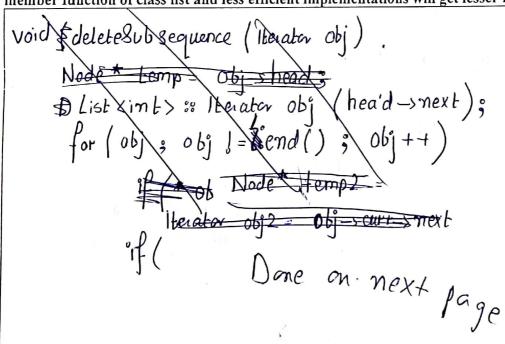
1->1->0->0/>1->0->1 Input:

0->1->1->1

Output:

1->0->0->1->1->0 null 0->1->1->1

Assume that the singly linked list has dummy/sentinel head and tail nodes. Traverse the list using an iterator (BDS-3A and BDS-3B can do it without iterator) and remove the required subsequences. Write down the time complexity of your function. If you need any helper function, write down their definition as well. Note that this function is a member function of class list and less efficient implementations will get lesser reward.



(Marks: 5) Compute the time complexity of the function funcl. First write the time complexity expression and then compute the big-oh of the time complexity function. Compute the tight bounds

```
void func2(int arr[], int I, int m, int r){
         int i, j, k;
```

```
\rightarrow int n1 = m - l + 1; (1)
\sim int n2 = r - m;
```

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```
int *L= new int[n1], *R=new int[n2];
for (i = 0; i < n1; i++)
```

```
L[i] = arr[l + i];
for (j = 0; j < n2; j++)
          R[j] = arr[m + 1 + j]:
```

```
i = 0;
          j = 0;
                    k = 1:
while (i < n1 \&\& j < n2){
```

```
if (L[i] \leq R[i])
```

arr[k++] = L[i++];else

arr[k++] = R[j++];

while (i < n1)

arr[k++] = L[i++];

while (j < n2)

arr[k++] = R[j++];

delete []L; delete []R

```
void func1(int arr[], int n){
int curr size;
int left_start;
                      1092n+1
for (curr_size=1; curr_size<=n-1; curr_size = 2*curr_size)
        for (left_start=0; left_start<n-1; left_start += 2*curr_size)
            (ST) int mid = min(left_start + curr_size - 1, n-1);
               //assume it returns the min of two numbers
                 int right end = min(left start + 2*curr size - 1, n-1);
                 func2(arr, left_start, mid, right_end);
                                         12
```

Question3:		(Marks: 5)
We have an implementation of unsorted doubly LinkedI (i.e., pointers to the first node of linked list) only. Which	list. Suppose it has its implement of the following can be implement.	citiation with head
Justify your answer.	. 0.1	Maria
a) Insertion at the end of LinkedList		
b) Deletion of the last node of LinkedList		