



Winter Winning Camp

ASSIGNMENT – 7

Student Name: Ishan Jain

UID: 22BCS13653

Date of Submission: 23/12/2024

Branch: BE-CSE

Section/Group: 615-B

DAY – 7

#include <iostream>

```
#include <vector>

#include <string>

#include <unordered_map>

#include <stack>

#include <algorithm>

#include <cmath>

#include <queue>

#include <limits.h> using

namespace std;
```

// Q1: Fibonacci Series Using Recursion

```
int fibonacci(int n) {    if (n <= 1) return n;

return fibonacci(n - 1) + fibonacci(n - 2);

}
```

// Q2: Factorial Of Number Using Recursion

```
int factorial(int n) {    if (n ==

0 || n == 1) return 1;    return

n * factorial(n - 1);

}
```

// Q3: Sum of Natural Number Using Recursion

```
int recur_sum(int n) {    if (n

== 0) return 0;    return n +

recur_sum(n - 1);

}
```

// Q4: Sum of Array Elements Using Recursion

```
int sumArray(int arr[], int n) {    if (n <=
0) return 0;    return arr[n - 1] +
sumArray(arr, n - 1);
}
```

// Q5: To Find Reverse Of String Using Recursion

```
string reverseString(string str) {    if (str.empty()) return "";
return str.back() + reverseString(str.substr(0, str.size() - 1));
}
```

// Easy Questions

// Q1: Merge Two Sorted Lists

```
struct ListNode {
    int val;
    ListNode *next;
    ListNode(int x) : val(x), next(NULL) {}
};
```

```
ListNode* mergeTwoLists(ListNode* l1, ListNode* l2) {
    if (!l1) return l2;    if (!l2) return l1;    if
(l1->val < l2->val) {        l1->next =
mergeTwoLists(l1->next, l2);
        return l1;    } else {        l2->next =
mergeTwoLists(l1, l2->next);
        return l2;
    }
}
```

```
}
```

// Q2: Remove Linked List Elements

```
ListNode* removeElements(ListNode* head, int val) {  
    ListNode dummy(0);    dummy.next = head;  
    ListNode* current = &dummy;    while (current-  
>next) {        if (current->next->val == val) {  
current->next = current->next->next;  
        } else {            current =  
current->next;  
        }  
    }  
    return dummy.next;  
}
```

// Q3: Reverse Linked List

```
ListNode* reverseList(ListNode* head) {  
    ListNode* prev = NULL;  
    ListNode* current = head;    while  
(current) {  
        ListNode* nextTemp = current->next;  
current->next = prev;        prev = current;  
current = nextTemp;  
    }    return  
prev;  
}
```

// Q4: Power Of Three

```
bool isPowerOfThree(int n) {  
    if (n <= 0) return false;    while  
    (n % 3 == 0) n /= 3;    return n  
    == 1;  
}
```

// Q5: Palindrome Linked List

```
bool isPalindrome(ListNode* head) {  
    if (!head) return true;    ListNode  
    *slow = head, *fast = head;    while  
    (fast && fast->next) {        slow =  
    slow->next;        fast = fast->next-  
    >next;  
    }  
    ListNode* prev = NULL;  
    while (slow) {  
        ListNode* nextTemp = slow->next;  
        slow->next = prev;        prev = slow;  
        slow = nextTemp;  
    }    while (prev) {        if (head->val !=  
    prev->val) return false;        head = head-  
    >next;        prev = prev->next;  
    }    return  
    true;  
}
```

// Q6: Find the K-th Character in String Game

```
char findKthCharacter(int k) {    string
word = "a";    while (word.length() < k) {
string newWord = "";        for (char c :
word) {            newWord += (c == 'z') ?
'a' : c + 1;
        }
        word += newWord;
    }    return word[k
- 1];
}
```

// Medium Questions

// Q1: Add Two Numbers

```
ListNode* addTwoNumbers(ListNode* l1, ListNode* l2) {
    ListNode dummy(0);
    ListNode* current = &dummy;
    int carry = 0;    while
(l1 || l2 || carry) {        int
sum = carry;        if (l1)
{            sum += l1->val;
l1 = l1->next;
        }        if (l2) {
sum += l2->val;
l2 = l2->next;
        }
```

```

        carry = sum / 10;    current->next =
new ListNode(sum % 10);    current =
current->next;

    }

    return dummy.next;
}

```

// Q2: Elimination Game

```

int lastRemaining(int n) {    bool
leftToRight = true;    int remaining = n, step
= 1, head = 1;    while (remaining > 1) {
if (leftToRight || remaining % 2 == 1) {
head += step;
    }

    remaining /= 2;    step
*= 2;    leftToRight =
!leftToRight;
    }    return
head;
}

```

// Q3: Predict The Winner bool

```

PredictTheWinner(vector<int>& nums) {
    int n = nums.size();    vector<vector<int>>
dp(n, vector<int>(n, 0));    for (int i = 0; i < n;
i++) {        dp[i][i] = nums[i];
    }
}

```

```

        for (int len = 2; len <= n; len++) {
            for (int i = 0; i <= n - len; i++) {
                int j = i + len - 1;
                dp[i][j] = max(nums[i] - dp[i + 1][j], nums[j] - dp[i][j - 1]);
            }
        }
        return dp[0][n - 1] >= 0;
    }

```

// Q4: Find The Winner Of Circular Game

```

int findTheWinner(int n, int k) {
    if (n == 1)
        return 1;
    return (findTheWinner(n - 1, k) + k - 1) % n + 1;
}

```

// Q5: Minimum non-zero product of an Array Elements

```

int minNonZeroProduct(int p) {
    const int MOD = 1e9 + 7;
    long long maxNum = (1LL << p) - 1;
    long long result = pow(maxNum, (maxNum - 1) / 2, MOD);
    return (result * (maxNum % MOD)) % MOD;
}

```

// Hard Questions

// Q1: Regular Expression Matching

```

bool isMatch(string s, string p) {
    int m = s.size(), n = p.size();
    vector<vector<bool>> dp(m + 1, vector<bool>(n + 1, false));
    dp[0][0] = true;
}

```



```

    for (int j = 1; j <= n; j++) {
if (p[j - 1] == '*') {
dp[0][j] = dp[0][j - 2];
    }
    } for (int i = 1; i <= m; i++) { for (int j = 1; j <= n; j++) { if (p[j -
1] == s[i - 1] || p[j - 1] == '.') { dp[i][j] = dp[i - 1][j - 1]; } else if
(p[j - 1] == '*') { dp[i][j] = dp[i][j - 2] || (dp[i - 1][j] && (s[i - 1] == p[j -
2] || p[j - 2] == '.')); }
    }
    }
    return dp[m][n];
}

```

// Q2: Reverse Nodes in k-Group

```

ListNode* reverseKGroup(ListNode* head, int k) {
    ListNode dummy(0);    dummy.next = head;

    ListNode* prevGroupEnd = &dummy;

    while (true) {

        ListNode* kGroupStart = prevGroupEnd->next;

        ListNode* kGroupEnd = prevGroupEnd;

        for (int i = 0; i < k; i++) {

            kGroupEnd = kGroupEnd->next;            if

            (!kGroupEnd) return dummy.next;

        }

        ListNode* nextGroupStart = kGroupEnd->next;
        kGroupEnd->next = nullptr;    prevGroupEnd->
        next = reverseList(kGroupStart);    kGroupStart-
    }
}

```

```

>next = nextGroupStart;    prevGroupEnd =
kGroupStart;

    }

}

```

// Q3: Wildcard Matching

```

bool isMatchWildcard(string s, string p) {    int m = s.size(), n
= p.size();    vector<vector<bool>>> dp(m + 1, vector<bool>(n
+ 1, false));    dp[0][0] = true;    for (int j = 1; j <= n; j++) {
if (p[j - 1] == '*') {        dp[0][j] = dp[0][j - 1];
    }

    }    for (int i = 1; i <= m; i++) {        for
(int j = 1; j <= n; j++) {            if (p[j - 1] ==
s[i - 1] || p[j - 1] == '?') {                dp[i][j] =
dp[i - 1][j - 1];            } else if (p[j - 1] == '*')
{                dp[i][j] = dp[i][j - 1] || dp[i - 1][j];
            }

        }

    }

    return dp[m][n];
}

```

// Q4: Permutation Sequence

```

string getPermutation(int n, int k) {
vector<int> nums;    for (int i = 1;
i <= n; i++) {
nums.push_back(i);
    }
}

```

```

    k--; // Convert to 0-based index
string result;    int factorial = 1;    for
(int i = 1; i < n; i++) {        factorial *=
i;    }    for (int i = n; i > 0; i--) {
int index = k / factorial;        result +=
to_string(nums[index]);
nums.erase(nums.begin() + index);
k %= factorial;        if (i > 1) {
factorial /= (i - 1);
        }    }
return result;
}

```

// Q5: Basic Calculator

```

int calculate(string s) {
stack<int> nums;
stack<char> ops;    int
num = 0;    char
lastOp = '+';    for
(char c : s) {
    if (isdigit(c)) {        num =
num * 10 + (c - '0');
    } else if (c == '+' || c == '-' || c == '(' || c == ')') {
if (lastOp == '+') nums.push(num);        else if
(lastOp == '-') nums.push(-num);        num = 0;
lastOp = c;        if (c == ')') {        int sum =
0;        while (!ops.empty() && ops.top() !=

```

```

'(') {
    sum += nums.top();
    nums.pop();
}

if (!ops.empty()) ops.pop(); // Remove '('

nums.push(sum);
} else if (c == '(') {
    ops.push(c);
}

}

}

if (lastOp == '+') nums.push(num);
else if (lastOp == '-') nums.push(-num);

int result = 0; while (!nums.empty()) {
    result += nums.top();
    nums.pop();
} return
result;
}

```