■ C Sorting & Recursion - Full Codes

■ Bubble Sort

```
#include <stdio.h>

void bubbleSort(int arr[], int n, int order) {
    for (int i = 0; i < n - 1; i++) {
        for (int j = 0; j < n - i - 1; j++) {
            if ((order == 1 && arr[j] > arr[j+1]) ||   // Ascending
                (order == 2 && arr[j] < arr[j+1])) {   // Descending
                int temp = arr[j];
                arr[j] = arr[j+1];
                arr[j+1] = temp;
            }
        }
    }
}

int main() {
    int arr[] = {64, 25, 12, 22, 11};
    int n = sizeof(arr) / sizeof(arr[0]);

    int order;
    printf("Choose order: 1=Ascending, 2=Descending: ");
    scanf("%d", &order);

    bubbleSort(arr, n, order);

    printf("Sorted array: ");
    for (int i = 0; i < n; i++) printf("%d ", arr[i]);
    return 0;
}
```

■ Selection Sort

```
#include <stdio.h>

void selectionSort(int arr[], int n, int order) {
    for (int i = 0; i < n - 1; i++) {
        int index = i;
        for (int j = i + 1; j < n; j++) {
            if ((order == 1 && arr[j] < arr[index]) ||   // Ascending
                (order == 2 && arr[j] > arr[index])) {   // Descending
                index = j;
            }
        }
        int temp = arr[index];
        arr[index] = arr[i];
        arr[i] = temp;
    }
}

int main() {
    int arr[] = {64, 25, 12, 22, 11};
    int n = sizeof(arr) / sizeof(arr[0]);
    int order;
```

```
    printf("Choose order: 1=Ascending, 2=Descending: ");
    scanf("%d", &order);

    selectionSort(arr, n, order);

    printf("Sorted array: ");
    for (int i = 0; i < n; i++) printf("%d ", arr[i]);
    return 0;
}
```

■ Insertion Sort

```
#include <stdio.h>

void insertionSort(int arr[], int n, int order) {
    for (int i = 1; i < n; i++) {
        int key = arr[i];
        int j = i - 1;
        while (j >= 0 && ((order == 1 && arr[j] > key) ||   // Ascending
                          (order == 2 && arr[j] < key))) {  // Descending
            arr[j + 1] = arr[j];
            j--;
        }
        arr[j + 1] = key;
    }
}

int main() {
    int arr[] = {64, 25, 12, 22, 11};
    int n = sizeof(arr) / sizeof(arr[0]);

    int order;
    printf("Choose order: 1=Ascending, 2=Descending: ");
    scanf("%d", &order);

    insertionSort(arr, n, order);

    printf("Sorted array: ");
    for (int i = 0; i < n; i++) printf("%d ", arr[i]);
    return 0;
}
```

■ Recursion - Factorial

```
#include <stdio.h>

int factorial(int n) {
    if (n == 0) return 1;   // base case
    return n * factorial(n - 1);
}

int main() {
    int n;
    printf("Enter a number: ");
    scanf("%d", &n);
    printf("Factorial of %d is %d\n", n, factorial(n));
    return 0;
}
```

■ Recursion - Fibonacci

```
#include <stdio.h>

int fibonacci(int n) {
    if (n <= 1) return n;   // base case
    return fibonacci(n - 1) + fibonacci(n - 2);
}

int main() {
    int n;
    printf("Enter number of terms: ");
    scanf("%d", &n);

    printf("Fibonacci series: ");
    for (int i = 0; i < n; i++) {
        printf("%d ", fibonacci(i));
    }
    return 0;
}
```