Long Answer Solutions - Computer Science Examination 2025

21. Explain runtime error with two examples.

A runtime error occurs when the program is running and encounters a problem that causes it to stop unexpectedly. These errors are not caught during compilation, and they only show up when the program is executed.

Examples:

1. Division by zero:

```cpp
int x = 5, y = 0;
int result = x / y;  // This will throw a runtime error, division by zero.
```

2. Array index out of bounds:

```cpp
int arr[3] = {1, 2, 3};
cout << arr[5];  // This will cause a runtime error, accessing an invalid array index.
```

22. Define two-dimensional array and show its implementation using a C++ program.

A two-dimensional array is an array of arrays. It can be visualized as a table or matrix with rows and columns. The elements are accessed by specifying two indices: one for the row and one for the column.

C++ Example:

```cpp
#include<iostream>
```

```
using namespace std;

int main() {
    int arr[3][3] = {
        {1, 2, 3},
        {4, 5, 6},
        {7, 8, 9}
    };

    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            cout << arr[i][j] << " ";
        }
        cout << endl;
    }
    return 0;
}
```

Output:

```
1 2 3
4 5 6
7 8 9
```

23. Write a C++ program to calculate the volume of a cube.

To calculate the volume of a cube, we use the formula: Volume = side^3

C++ Program:

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

int main() {
    double side, volume;
    cout << "Enter the side length of the cube: ";
    cin >> side;

    volume = side * side * side;  // Formula to calculate volume
    cout << "The volume of the cube is: " << volume << endl;

    return 0;
}
```

Output:

```
Enter the side length of the cube: 5
The volume of the cube is: 125
```

24. What are the differences between DBMS and RDBMS?

DBMS (Database Management System) is software that manages and stores data, but does not enforce relationships between tables. RDBMS (Relational Database Management System) is an advanced version of DBMS that enforces relationships between tables and uses SQL for querying.

Key Differences:

1. DBMS does not support relationships, while RDBMS supports relationships (e.g., foreign keys).

2. DBMS stores data in files, whereas RDBMS stores data in tables.

3. RDBMS supports SQL for complex queries, while DBMS generally does not.

25. Mention the different languages present in DBMS.

A DBMS uses the following types of languages:

1. **Data Definition Language (DDL):** Used for defining and managing the structure of the database (e.g., `CREATE`, `ALTER`, `DROP`).

2. **Data Manipulation Language (DML):** Used for manipulating data (e.g., `SELECT`, `INSERT`, `UPDATE`, `DELETE`).

3. **Data Control Language (DCL):** Used to control access to data (e.g., `GRANT`, `REVOKE`).

4. **Transaction Control Language (TCL):** Used to manage transactions (e.g., `COMMIT`, `ROLLBACK`).

26. Write a C++ program to implement a stack using an array with Push and Pop operations.

Here is an implementation of a stack using an array in C++ with `push` and `pop` operations:

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

class Stack {
    int arr[5];
    int top;
public:
```

```
    Stack() { top = -1; }
    void push(int x) {
        if (top < 4)
            arr[++top] = x;
        else
            cout << "Stack Overflow
";
    }
    int pop() {
        if (top > -1)
            return arr[top--];
        else
            cout << "Stack Underflow
";
    }
};

int main() {
    Stack s;
    s.push(10);
    s.push(20);
    cout << "Popped element: " << s.pop() << endl;
    return 0;
}
```