Practical No. 6

Aim: Finding the 2’s Complement of an 8-bit Number

Objective: To determine the 2’s complement of an 8-bit number using binary operations.

Theory:

The **2’s complement** of a binary number is obtained by:

1. **Finding the 1’s complement** (inverting all bits: 0 → 1 and 1 → 0).
2. **Adding 1** to the 1’s complement.

For example, if the given 8-bit number is **11010011**:

- **Step 1: Find 1’s complement → 00101100**
- **Step 2: Add 1 → 00101101** (Final 2’s complement)

2’s complement is widely used in binary arithmetic for representing negative numbers and performing subtraction operations.

Materials/Tools Required:

- Microprocessor/microcontroller (e.g., 8085/8051)
- Assembler/Simulator
- Computer system with programming software
- Binary calculator (optional)

Procedure:

1. **Initialize Registers**: Load the given 8-bit number into a register (e.g., A register in an 8085 processor).
2. **Find the 1’s Complement**: Invert all bits of the number (use the **CMA** instruction in an 8085 processor).
3. **Add 1 to the Result**: Perform binary addition of **1** to the 1’s complement.
4. **Store the Result**: The final 2’s complement is stored in memory or displayed on an output device.

Observations:

- The 2’s complement of a number is its negative equivalent in signed binary representation.
- If the number is positive, its 2’s complement represents its negative counterpart and vice versa.
- The 2’s complement method is commonly used in arithmetic operations to simplify subtraction.

Conclusion:

The 2’s complement of an 8-bit number is successfully determined by computing its 1’s complement and adding 1. This method is fundamental in digital arithmetic and microprocessor-based computations.

Applications (Optional):

- Used for representing negative numbers in binary form.

- Essential in microprocessor arithmetic operations, particularly subtraction.
- Applied in digital circuits for efficient mathematical computations.