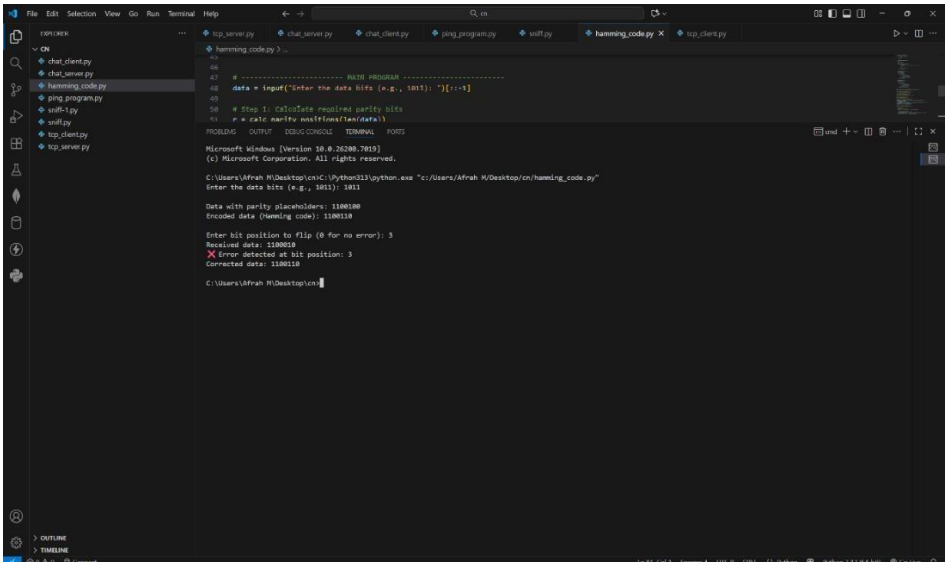


Result

A program to implement the Hamming Code was successfully written. The program demonstrated the ability to detect and correct a single-bit error in the transmitted data stream.

EXP:07	**Flow control at Data Link Layer**

Aim

To write a program to implement flow control at the data link layer using the **Sliding Window Protocol** and simulate the flow of frames from one node to another.

Algorithm / Procedure

1. **Define** the window size for the sender and receiver.
2. **Implement** the sender logic:
   - Maintain a sending window of sequence numbers.
   - Send frames within the window limit.
   - Start a timer for each unacknowledged frame.
3. **Implement** the receiver logic:
   - Maintain a receiving window.
   - Accept frames in order and send cumulative acknowledgments (ACKs).
   - Discard out-of-order frames (or buffer, depending on the specific protocol variant).

4. **Simulate** the flow of frames, including scenarios for successful transmission, lost frames, and lost ACKs, to demonstrate the flow control mechanism.

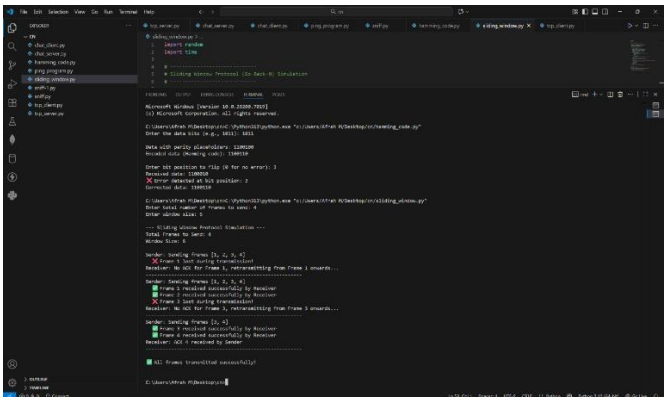
Code

```
import random
import time


# ----------------------------
# Sliding Window Protocol (Go-Back-N) Simulation
# ----------------------------


def sliding_window_simulation(total_frames, window_size):
    print("\n--- Sliding Window Protocol Simulation ---")
    print(f"Total Frames to Send: {total_frames}")
    print(f"Window Size: {window_size}\n")

    sent = 0  # Number of frames sent so far

    while sent < total_frames:
        # Determine frames in the current window
        window_end = min(sent + window_size, total_frames)
        current_window = list(range(sent + 1, window_end + 1))
        print(f"Sender: Sending frames {current_window}")

        # Simulate sending each frame in the window
        acked = True
        for frame in current_window:
            # Randomly simulate frame loss (20% chance)
            if random.random() < 0.2:
```

```
            print(f"Frame {frame} lost during transmission!")
            acked = False
            break
        else:
            print(f" Frame {frame} received successfully by Receiver")
            time.sleep(0.3)

    if acked:
        # All frames acknowledged → Slide window forward
        print(f"Receiver: ACK {window_end} received by Sender")
        sent = window_end
    else:
        # Go-Back-N retransmission
        print(f"Receiver: No ACK for Frame {frame}, retransmitting from Frame {frame} onwards...")
        time.sleep(1)
        # Sender will retransmit from the lost frame
        sent = frame - 1

    print("-" * 55)
    time.sleep(0.5)

print("\nAll frames transmitted successfully!\n")

# ----------------------------
# MAIN PROGRAM
# ----------------------------
if __name__== "__main__":
```

```
total_frames = int(input("Enter total number of frames to send: "))
window_size = int(input("Enter window size: "))

sliding_window_simulation(total_frames,  window_size)
```

Output:



Result

A program simulating the Sliding Window Protocol was successfully implemented. The simulation demonstrated effective flow control by managing the rate of frame transmission between the sender and receiver.