**Experiment No**: 4

**Name of The Experiment**: Write a 8086 Assembly program to take input binary to count the number of ‘1’ bit and take decimal input to determine odd or even.

**Theory:**

**Counting number of ‘1’:**

It takes binary input from the user until a space character (20H) is entered. It converts the binary input to its equivalent decimal value and displays it. It uses interrupts (INT 21H) for input/output operations in DOS. The program reads individual characters and processes them to compute the decimal equivalent of the binary input. After the binary input ends, it displays two messages (MSG2 and MSG3) and then proceeds to count the number of set bits in the converted decimal value (BX register). Finally, it displays the count in ASCII representation by adding '0' to the count value and outputting it using interrupt 21H function 2.

**Odd or Even:**

This assembly code snippet reads individual characters from the user until the Enter key (ASCII 13D) is pressed. It converts the entered characters to their numeric values and stores them in the BX register. If the total count of entered characters is odd (determined by testing the least significant bit of BX), it displays a message (MSG2). If the count is even, it shows a different message (MSG3). This program utilizes BIOS interrupt 21H to interact with the console for input/output operations.

**Program:**

**Counting number of ‘1’:**

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG1  DB "ENTER THE NUMBER = $"
    MSG2  DB 10D,13D,"THE NUMBER IS = $"
    MSG3  DB 10D,13D,"THE NUMBER OF 1's IS = $"
    COUNT DB 0
.CODE
MAIN PROC
               MOV  AX,@DATA
               MOV  DS,AX
               LEA  DX,MSG1
```

```
           MOV  AH,9
           INT  21H
           MOV  BX,0
           MOV  AH,1
           INT  21H
ENTER_BIN:
           CMP  AL, 20H
           JE   END_BIN
           AND  AL, 0FH
           SHL  BX,1
           OR   BL,AL
           INT  21H
           INC  COUNT
           JMP  ENTER_BIN
END_BIN:

           MOV  AH,9
           LEA  DX,MSG2
           INT  21H

           MOV  CX,17
           MOV  AH,2
ROLOOP:
           RCL  BX,1
           JC   PRINT_ONE
           JNC  PRINT_ZERO
PRINT_ONE:
           MOV  DL,'1'
           INT  21H
           JMP  CONTINUE
PRINT_ZERO:
           MOV  DL,'0'
           INT  21H
           JMP  CONTINUE
CONTINUE:
           LOOP ROLOOP

           MOV  AH,9
           LEA  DX,MSG3
           INT  21H

           XOR  AX,AX
           MOV  CX,16
TOP:
           ROL  BX,1
```

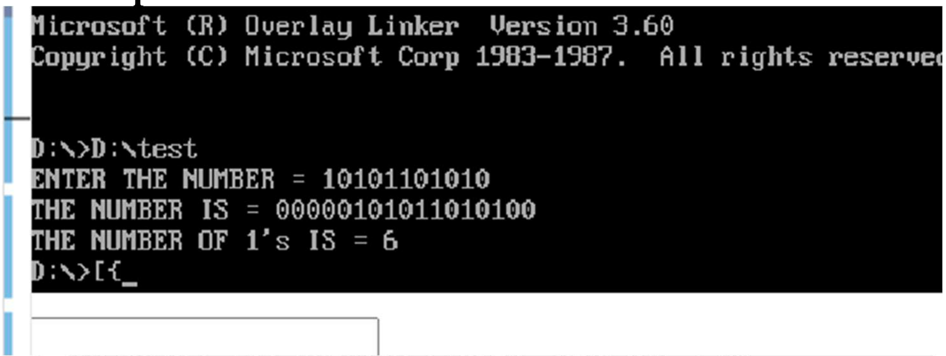
```
               JNC  NEXT
               INC  AX
    NEXT:
               LOOP TOP

               MOV  AH, 2
               MOV  DL, AL
               ADD  DL,'0'
               INT  21H
               MOV  AH, 4CH
               INT  21H
MAIN ENDP
END MAIN
```

## Odd or Even:

```
.MODEL SMALL
.STACK 100H
.DATA
    MSG1 DB "ENTER THE NUMBER = $"
    MSG2 DB 10D,13D,"THE NUMBER IS ODD.$"
    MSG3 DB 10D,13D,"THE NUMBER IS EVEN.$"
.CODE
MAIN PROC
              MOV  AX,@DATA
              MOV  DS,AX
              MOV  AH,9
              LEA  DX,MSG1
              INT  21h
              MOV  BX,0
              MOV  AH,1
    WHILE_:
              INT  21H
              CMP  AL,13D
              JE   END_WHILE
              AND  AL,15D
              SHL  BX,1
              OR   BL,AL
              JMP  WHILE_
    END_WHILE:
              TEST BX,1b
              JZ   EVE
              JMP  ODD
    ODD:
              MOV  AH,9
              LEA   DX,MSG2
              INT   21h
              JMP   QUIT
    EVE:
              MOV   AH,9
              LEA   DX,MSG3
              INT   21h
              JMP   QUIT
    QUIT:
              MOV   AH, 4CH
              INT   21H
MAIN ENDP
END MAIN
```

## Input and Output:



```
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D:\>D:\test
ENTER THE NUMBER = 10101101010
THE NUMBER IS = 00000101011010100
THE NUMBER OF 1's IS = 6
D:\>[{_
```

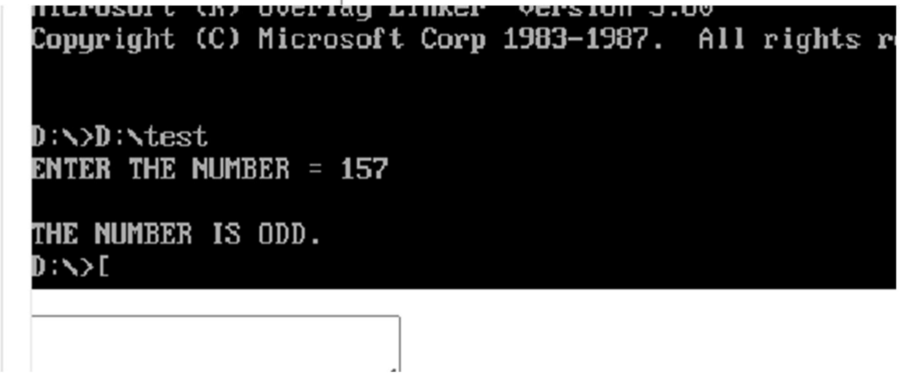

```
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D:\>D:\test
ENTER THE NUMBER = 157

THE NUMBER IS ODD.
D:\>[
```

## Comments:

Please note, This code reads binary input from the user displaying the count of set bits (number of 1s) in the entered binary value.