College of Vocational Studies

Semester V

Microprocessors

Practical

Documentary

Submitted to: **Submitted by:**

Dr.Geetika Vashisht   **Aryan Garg**

                                               2K21/CS/18

                                               21013570015

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Aryan Garg
21013570015

ACKNOWLEDGEMENT

On the successful completion of the practical file of **MICROPROCESSORS**, I would like to express my sincere gratitude to everyone who helped me in the completion of this Practical File. I am sincerely thankful to our guide **Dr.Geetika Vashishta**, for her interest, guidance, and suggestions throughout the session. I feel honored and privileged to work under her. She shared her vast pool of knowledge with us and helped us steer through all the difficulties with ease. This file would not have been possible without her guidance

<u>CERTIFICATE</u>

This is to certify that the Practical file of **MICROPROCESSORS** submitted by: **ARYAN GARG** has been carried out under supervision. The file has been submitted as per the requirements in the fifth semester of BSc(H) Computer Science.

Supervisor:-

Dr.Geetika Vashisht

Q1) Write a program for 32-bit binary division and multiplication.

```
;32-BIT BINARY DIVISION
model small
.386
.data
DATA1 dd 00000000H
DATA2 dd 00000000H
REM dd ?
QUO dd ?
msg db 10,13,"Enter the first no.::$"
msg1 db 10,13,"Enter the second no.::$"
msg2 db 10,13,"The Remainder is ::$"
msg3 db 10,13,"The Quoitent is ::$"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg
INT 21H
MOV EBX,0
MOV CX,8
AGAIN: MOV AH,01;1ST NO. ENTERED
INT 21H
CMP AL,'A'
JGE L5
JMP L6
L5:SUB AL,37H
L6: SUB AL,30H
SHL EBX,4
ADD BL,AL
LOOP AGAIN
MOV DATA1,EBX
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV EBX,0
MOV CX,8
AGAIN1:MOV AH,01; 2nd NO. ENTERED
INT 21H
CMP Al,'A'
JGE L7
SUB AL,30H
JMP L8
L7: SUB AL,37H
L8:SHL EBX,4
ADD BL,AL
```

```
        LOOP AGAIN1
        MOV DATA2,EBX
        MOV EBX,0
        MOV EDX,0
        MOV EAX,0
        MOV EAX,DATA1
        MOV EBX,DATA2
        DIV EBX
        MOV REM,EDX; REM=REMAINDER
        MOV QUO,EAX; QUO=QUOITENT
        MOV AH,09
        MOV DX,OFFSET msg2
        INT 21H
        MOV EBX,REM
        MOV CX,8
        AGAIN2:ROL EBX,4
        MOV DL,BL
        AND DL,0FH; to o/p the result in rem
        CMP DL,9
        JBE L1
        ADD DL,37H
        INT 21H
        JMP L2
        L1:ADD DL,30H
        MOV AH,02
        INT 21H
        L2:LOOP AGAIN2
        MOV AH,09
        MOV DX,OFFSET msg3
        INT 21H
        MOV EBX,QUO
        MOV CX,8
        AGAIN3: ROL EBX,4
        MOV DL,BL
        AND DL,0FH; to o/p the result in quo
        CMP DL,9
        JBE L3
        ADD DL,37H
        MOV AH,02
        INT 21H
        JMP L4
        L3:ADD DL,30H
        MOV AH,02
        INT 21H
        L4:LOOP AGAIN3
        .EXIT
        END
```

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21013570015

Output:

Output   ▾ ⏸ ✕

Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST

[26 Nov 2023 13:35:16.639] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q1Div.asm
[26 Nov 2023 13:35:17.047] Executing command: TASM /ml /z /zi Q1Div.asm
[26 Nov 2023 13:35:18.161] --- Output from TASM --
[26 Nov 2023 13:35:18.168] Turbo Assembler Version 4.1 Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 13:35:18.175] Assembling file: Q1Div.asm
[26 Nov 2023 13:35:18.175] Error messages: None
[26 Nov 2023 13:35:18.185] Warning messages: None
[26 Nov 2023 13:35:18.192] Passes: 1
[26 Nov 2023 13:35:18.197] Remaining memory: 463k
[26 Nov 2023 13:35:18.200] --
[26 Nov 2023 13:35:18.208] The code assemble process completed successfully.
[26 Nov 2023 13:35:18.208] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q1Div.obj
[26 Nov 2023 13:35:18.248] Executing command: TLINK /x /v /3 /k Q1Div
[26 Nov 2023 13:35:19.720] --- Output from TLINK ---
[26 Nov 2023 13:35:19.727] Turbo Link Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 13:35:19.735] --
[26 Nov 2023 13:35:19.746] The code build process completed successfully.
[26 Nov 2023 13:35:19.760] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q1Div.exe

---

| Q1Div.asm ✕ | Q1Mul.asm | Q2Add.asm | Q2Sub.asm | Q3Linear.asm | Q3Binary.asm | Q4ArrAdd.asm |

```
49
50  MOV EAX,DATA1
51  MOV EBX,DA
52  DIV EBX
53  MOV REM,ED
54  MOV QUO,EA
55  MOV AH,09
56  MOV DX,OFF
57  INT 21H
58  MOV EBX,RE
59  MOV CX,8
60  AGAIN2:ROL
61  MOV DL,BL
62  AND DL,OFH
63  CMP DL,9
64  JBE L1
65  ADD DL,37H
66  INT 21H
67  JMP L2
68  L1:
```

GUI Turbo Assembler x64   —   □   ✕

```
Enter the first no.::84967163
Enter the second no.::12345678
The Remainder is ::0528141B
The Quoitent is ::00000007


Press any key to exit...
```

Output

[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13
[26 Nov 2023 13:39:03.472] Assembling file: Q1Div.asm
[26 Nov 2023 13:39:03.488] Error messages: None

```
;32 BIT BINARY MULTIPLICATION
.model small
.386
.data
DATA1 dd 00000000H
DATA2 dd 00000000H
PROD1 dd ?
PROD2 dd ?
msg db 10,13,"Enter the first no.::$"
msg1 db 10,13,"Enter the second no.::$"
msg2 db 10,13,"The product(in hexadecimal)is::$"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg
INT 21H
MOV EBX,0
MOV CX,8
AGAIN: MOV AH,01; 1ST NO. ENTERED
INT 21H
CMP AL,'A'
JGE L5
SUB AL,30H
JMP L6
L5: SUB AL,37H
L6: SHL EBX,4
ADD BL,AL
LOOP AGAIN
MOV DATA1,EBX
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV EBX,0
MOV CX,8
AGAIN1: MOV AH,01; 2ND NO. ENTERED
INT 21H
CMP AL,'A'
JGE L7
SUB AL,30H
JMP L8
L7: SUB AL,37H
L8: SHL EBX,4
ADD BL,AL
LOOP AGAIN1
MOV DATA2,EBX
MOV EBX,0
MOV EDX,0
```

```
        MOV EAX,0
        MOV EAX,DATA1
        MOV EBX,DATA2
        MUL EBX
        MOV PROD1,EDX
        MOV PROD2,EAX
        MOV AH,09
        MOV DX,OFFSET msg2
        INT 21H
        MOV EBX,PROD1
        MOV CX,8
        AGAIN2:ROL EBX,4
        MOV DL,BL
        AND DL,0FH; to o/p the result
        CMP DL,9
        JBE L1
        ADD DL,37H
        MOV AH,02
        INT 21H
        JMP L2
        L1:ADD DL,30H
        MOV AH,02
        INT 21H
        L2: LOOP AGAIN2
        MOV EBX,PROD2
        MOV CX,8
        AGAIN3: ROL EBX,4
        MOV DL,BL
        AND DL,0FH; to o/p the result
        CMP DL,9
        JBE L3
        ADD DL,37H
        MOV AH,02
        INT 21H
        JMP L4
        L3:ADD DL,30H
        MOV AH,02
        INT 21H
        L4: LOOP AGAIN3
        .EXIT
        END
```

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21013570015

Output:

| Q1Mul.asm | X | Q2Add.asm | Q2Sub.asm | Q3Linear.asm | Q3Binary.asm | Q4ArrA |

GUI Turbo Assembler x64

```
Enter the first no.::84216593
Enter the second no.::15782364
The product(in hexadecimal)is::0B14BF40D9D6C66C


Press any key to exit...
```

13:42:59.248] --- Output from TASM
13:42:59.259] Turbo Assembler Version 4.1 Copyright (c) 1988, 1996 Borland Inter

Q2) Write a program for 32-bit binary Addition and Subtraction.

```asm
;32-BIT BCD ADDITION
.model small
.386
.data
no1 dd 00000000H
no2 dd 00000000H
no3 dd 00000000H
msg1 db 10,13,"Enter the first no.:: $"
msg2 db 10,13,"Enter the second no.:: $"
msg3 db 10,13,"The Resultant sum is:: $"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV EBX,0
MOV CX,8
AGAIN: MOV AH,01;1ST NO ENTERED
INT 21H
CMP AL,'A'
JGE L2
SUB AL,30H
SHL EBX,4
ADD BL,AL
LOOP AGAIN
MOV no1,EBX
MOV AH,09
MOV DX,OFFSET msg2
INT 21H
MOV EBX,0
MOV CX,8
AGAIN1:MOV AH,01 ;2ND NO ENTERED
INT 21H
CMP AL,'A'
JGE L2
SUB AL,30H
SHL EBX,4
ADD BL,AL
LOOP AGAIN1
MOV no2,EBX
mov ax, word ptr no1
mov dx, word ptr no2
add al,dl
daa
```

```asm
            mov bl,al
            mov al,ah
            adc al,dh
            daa
            mov bh,al
            mov word ptr no3,bx
            mov ax, word ptr no1+2
            mov dx, word ptr no2+2
            adc al,dl
            daa
            mov bl,al
            mov al,ah
            adc al,dh
            daa
            mov bh,al
            mov word ptr no3+2,bx
            mov ebx,no3
            mov ah,09h
            mov dx,offset msg3
            int 21h
            jnc l6
            mov ah,02h
            mov dl,"1"
            int 21h
            l6: MOV CX,8
            AGAIN2: ROL EBX,4
            MOV DL,BL
            AND DL,0FH
            ADD DL,30H
            MOV AH,02
            INT 21H
            LOOP AGAIN2
            L2:.EXIT
            END
```

Output:

Q2Add.asm ✕   Q2Sub.asm   Q3Linear.asm   Q3Binary.asm   Q4ArrAdd.asm   Q4

■ GUI Turbo Assembler x64   —   □   ✕

Enter the first no.:: 24681139
Enter the second no.:: 73916482
The Resultant sum is:: 98597621

Press any key to exit...

Turbo Assembler Version 4.1 Copyright (c) 1988, 1996 Borland International

```
;32-BIT BCD SUBTRACTION
.model small
.386
.data
no1 dd 00000000H
no2 dd 00000000H
no3 dd 00000000H
msg1 db 10,13,"Enter the first no.:: $"
msg2 db 10,13,"Enter the second no.:: $"
msg3 db 10,13,"The Resultant output is:: $"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV EBX,0
MOV CX,8
AGAIN: MOV AH,01; 1ST NO ENTERED
INT 21H
CMP AL,'A'
JGE L2
SUB AL,30H
SHL EBX,4
SUB BL,AL
LOOP AGAIN
MOV no1,EBX
MOV AH,09
MOV DX,OFFSET msg2
INT 21H
MOV EBX,0
MOV CX,8
AGAIN1:MOV AH,01; 2ND NO ENTERED
INT 21H
CMP AL,'A'
JGE L2
SUB AL,30H
SHL EBX,4
SUB BL,AL
LOOP AGAIN1
MOV no2,EBX
mov ax, word ptr no1
mov dx, word ptr no2
add al,dl
daa
mov bl,al
mov al,ah
adc al,dh
```

```asm
        daa
        mov bh,al
        mov word ptr no3,bx
        mov ax, word ptr no1+2
        mov dx, word ptr no2+2
        adc al,dl
        daa
        mov bl,al
        mov al,ah
        adc al,dh
        daa
        mov bh,al
        mov word ptr no3+2,bx
        mov ebx,no3
        mov ah,09h
        mov dx,offset msg3
        int 21h
        jnc l6
        mov ah,02h
        mov dl,"1"
        int 21h
l6:     MOV CX,8
AGAIN2: ROL EBX,4
        MOV DL,BL
        AND DL,0FH
        SUB DL,30H
        MOV AH,02
        INT 21H
        LOOP AGAIN2
L2:.EXIT
        END
```
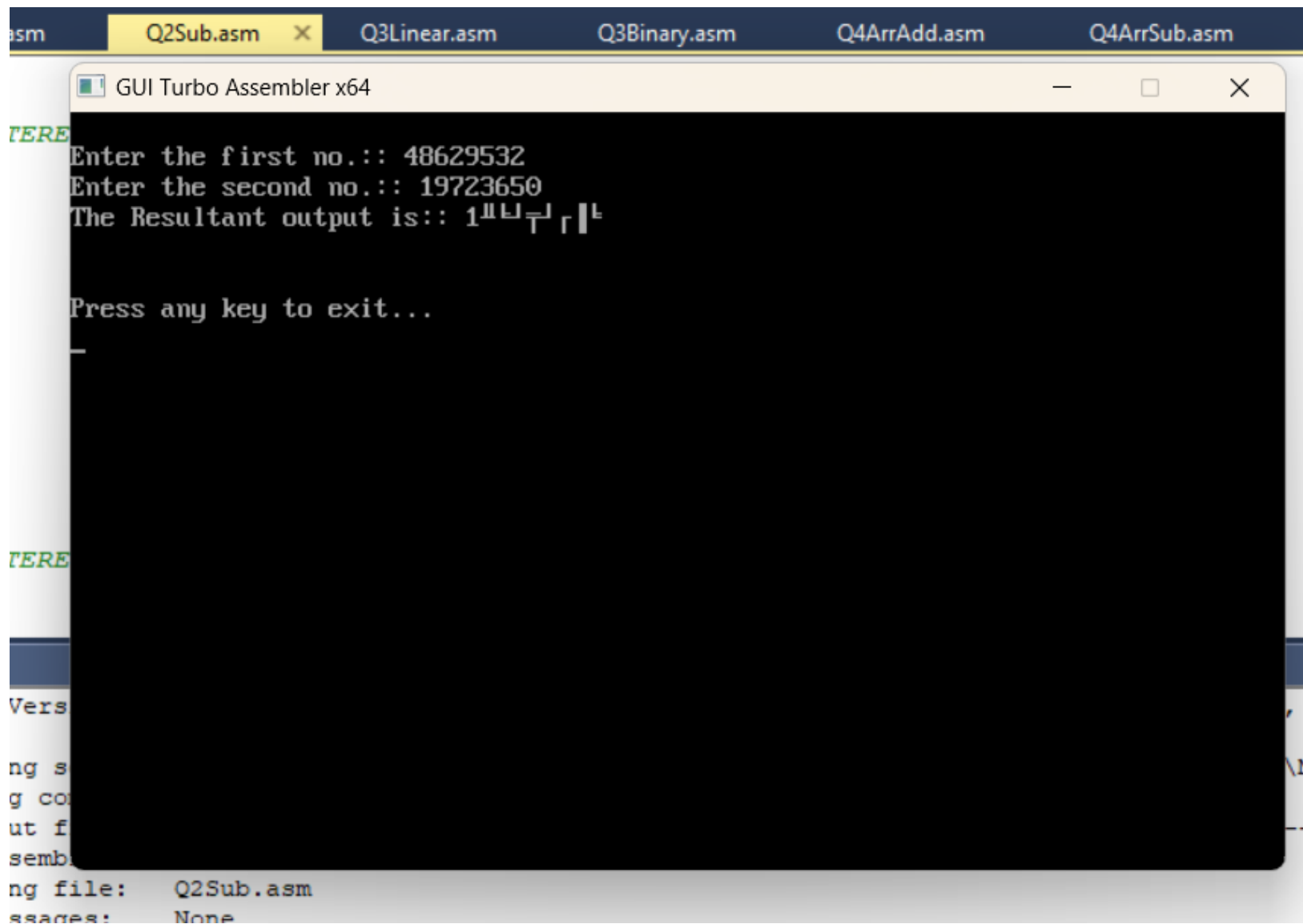
Output:

Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST

```
[26 Nov 2023 14:04:54.532] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q2Sub.asm
[26 Nov 2023 14:04:54.577] Executing command: TASM /ml /z /zi Q2Sub.asm
[26 Nov 2023 14:04:55.347] --- Output from TASM ------------------------------------------------------------
[26 Nov 2023 14:04:55.353] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:04:55.357] Assembling file:    Q2Sub.asm
[26 Nov 2023 14:04:55.361] Error messages:     None
[26 Nov 2023 14:04:55.364] Warning messages:   None
[26 Nov 2023 14:04:55.367] Passes:             1
[26 Nov 2023 14:04:55.369] Remaining memory:   463k
[26 Nov 2023 14:04:55.372] ------------------------------------------------------------------------------
[26 Nov 2023 14:04:55.376] The code assemble process completed successfully.
[26 Nov 2023 14:04:55.380] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q2Sub.obj
[26 Nov 2023 14:04:55.396] Executing command: TLINK /x /v /3 /k Q2Sub
[26 Nov 2023 14:04:56.528] --- Output from TLINK -----------------------------------------------------------
[26 Nov 2023 14:04:56.533] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:04:56.536] ------------------------------------------------------------------------------
[26 Nov 2023 14:04:56.539] The code build process completed successfully.
[26 Nov 2023 14:04:56.543] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q2Sub.exe
```

asm | Q2Sub.asm | × | Q3Linear.asm | Q3Binary.asm | Q4ArrAdd.asm | Q4ArrSub.asm

GUI Turbo Assembler x64 — □ ×

TERE

```
Enter the first no.:: 48629532
Enter the second no.:: 19723650
The Resultant output is:: 1


Press any key to exit...
```

TERE

Vers

ng s
g co
ut f
semb
ng file: Q2Sub.asm
ssages: None

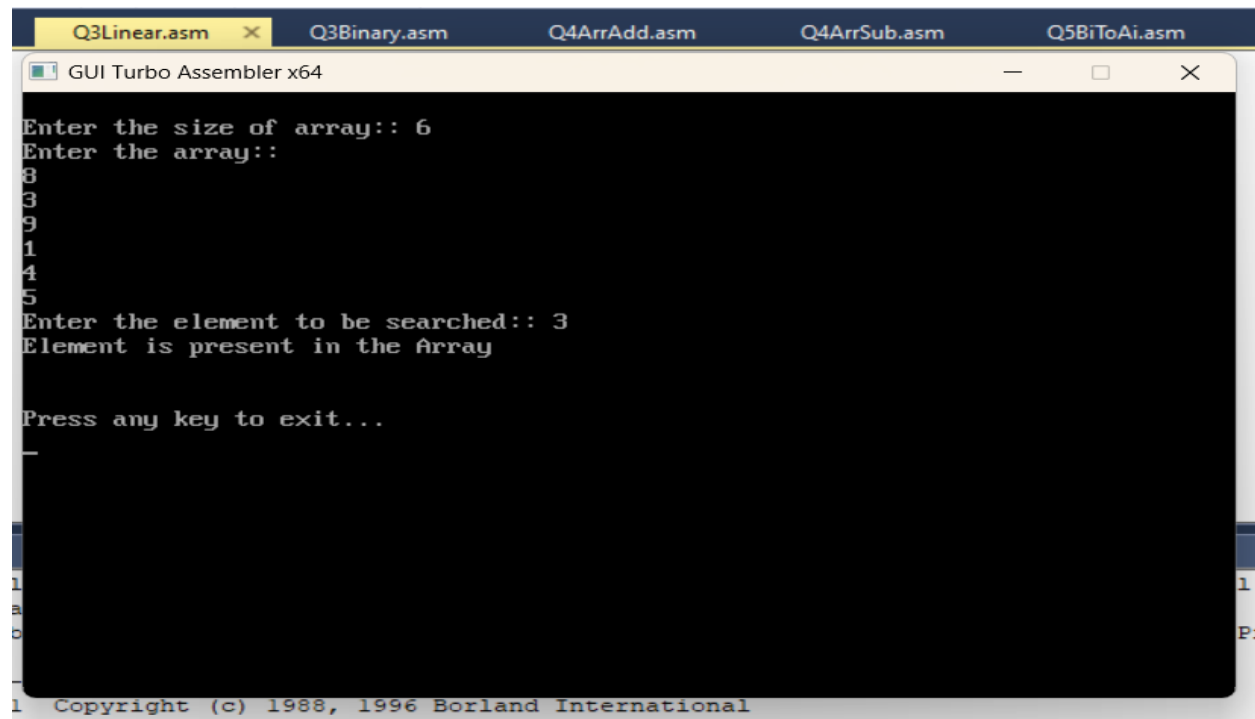# Q3) Write a program for Linear Search and Binary Search.

```
;LINEAR SEARCH
.model small
.386
.data
ARRAY DW 20 DUP(?)
DATA1 dw 0000H
success db 10,13,"Element is present in the Array$"
fail db 10,13,"Element is not present in the Array$"
msg1 db 10,13,"Enter the size of array:: $"
msg2 db 10,13,"Enter the array:: $"
msg3 db 10,13,"Enter the element to be searched:: $"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV AH,01
INT 21H
SUB AL,30H
MOV AH,0
MOV CX,AX
MOV DATA1,AX
MOV AH,09
MOV DX,OFFSET msg2
INT 21H
MOV AH,0
MOV SI,0
MOV BX,OFFSET ARRAY
L1: MOV DL,0AH; jump onto next line
MOV AH,02H
INT 21H
MOV DX,SI; input element of the array
MOV AH,01H
INT 21H
SUB AL,30H
;MOV SI,DX
MOV[BX+SI],AX
INC SI
LOOP L1
MOV CX,DATA1
MOV AH,09
```

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```asm
        MOV DX,OFFSET msg3
        INT 21H
        MOV AH,01; enter element to be searched
        INT 21H
        SUB AL,30H
        MOV SI,0
        MOV BX,OFFSET ARRAY
    L2: CMP[BX+SI],AL; linear search loop
        JZ L3; jump if element is found
        INC SI
        LOOP L2
        MOV AH,09H
        MOV DX,OFFSET fail; if the element is not found
        INT 21H
        MOV AH,4CH; to forcefully terminate the program
        INT 21H
    L3: MOV AH,09H
        MOV DX,OFFSET success ; if the element is found
        INT 21H
        MOV AH,4CH
        INT 21H
        .EXIT
        END
```

Output:

```
Output                                                                                                    ▾ ⫿ X

### Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST ###


[26 Nov 2023 14:10:01.030] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Linear.asm
[26 Nov 2023 14:10:01.064] Executing command: TASM /ml /z /zi Q3Linear.asm
[26 Nov 2023 14:10:01.799] --- Output from TASM ----------------------------------------------------------------
[26 Nov 2023 14:10:01.802] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:10:01.806] Assembling file:   Q3Linear.asm
[26 Nov 2023 14:10:01.809] Error messages:    None
[26 Nov 2023 14:10:01.813] Warning messages:  None
[26 Nov 2023 14:10:01.816] Passes:            1
[26 Nov 2023 14:10:01.819] Remaining memory:  464k
[26 Nov 2023 14:10:01.823] -------------------------------------------------------------------------------------
[26 Nov 2023 14:10:01.828] The code assemble process completed successfully.
[26 Nov 2023 14:10:01.830] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Linear.obj
[26 Nov 2023 14:10:01.847] Executing command: TLINK /x /v /3 /k Q3Linear
[26 Nov 2023 14:10:02.969] --- Output from TLINK ---------------------------------------------------------------
[26 Nov 2023 14:10:02.969] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:10:02.980] -------------------------------------------------------------------------------------
[26 Nov 2023 14:10:02.992] The code build process completed successfully.
[26 Nov 2023 14:10:02.992] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Linear.exe
```
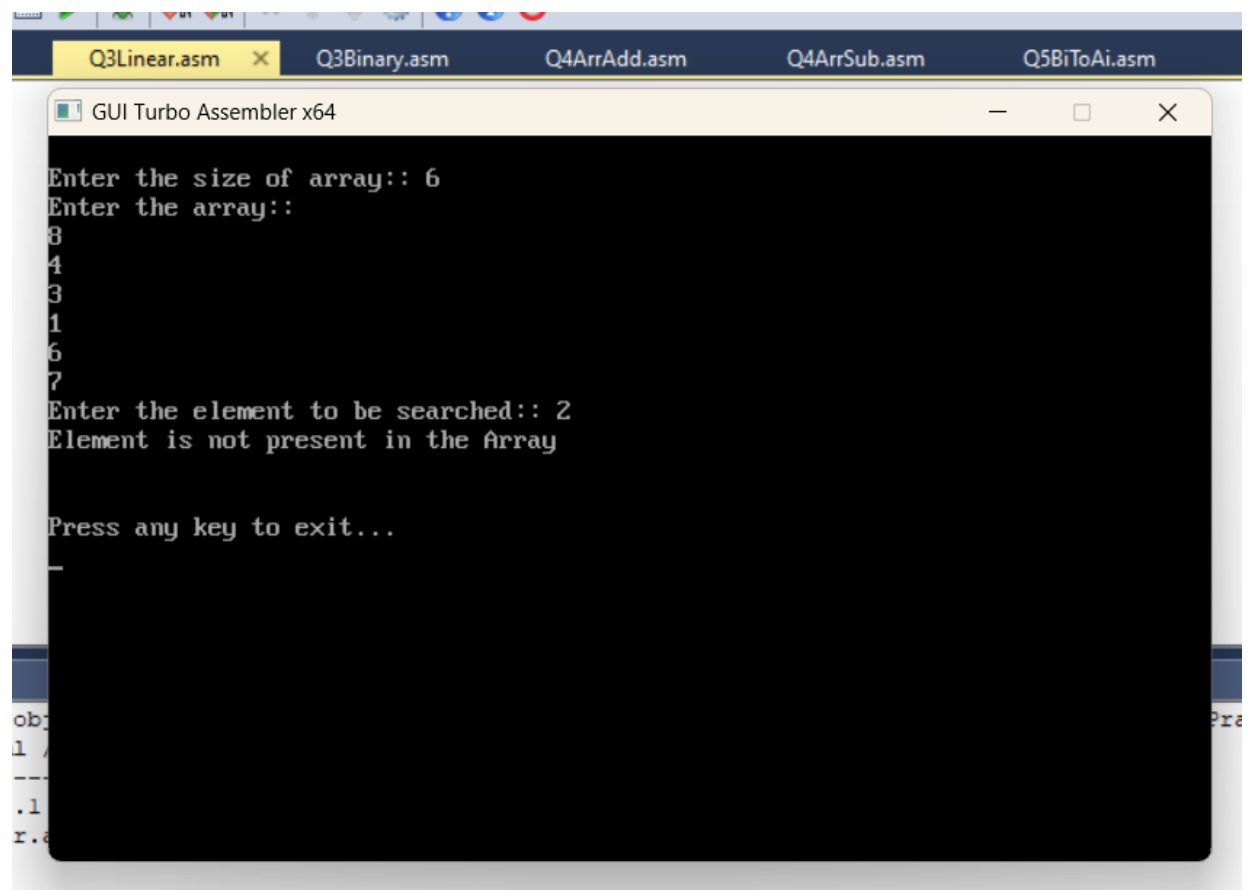
Q3Linear.asm   ✕   Q3Binary.asm   Q4ArrAdd.asm   Q4ArrSub.asm   Q5BiToAi.asm

GUI Turbo Assembler x64   —   □   ✕

```
Enter the size of array:: 6
Enter the array::
8
3
9
1
4
5
Enter the element to be searched:: 3
Element is present in the Array


Press any key to exit...
_
```

Copyright (c) 1988, 1996 Borland International

Q3Linear.asm   ✕   Q3Binary.asm   Q4ArrAdd.asm   Q4ArrSub.asm   Q5BiToAi.asm

GUI Turbo Assembler x64   —   □   ✕

```
Enter the size of array:: 6
Enter the array::
8
4
3
1
6
7
Enter the element to be searched:: 2
Element is not present in the Array


Press any key to exit...
_
```
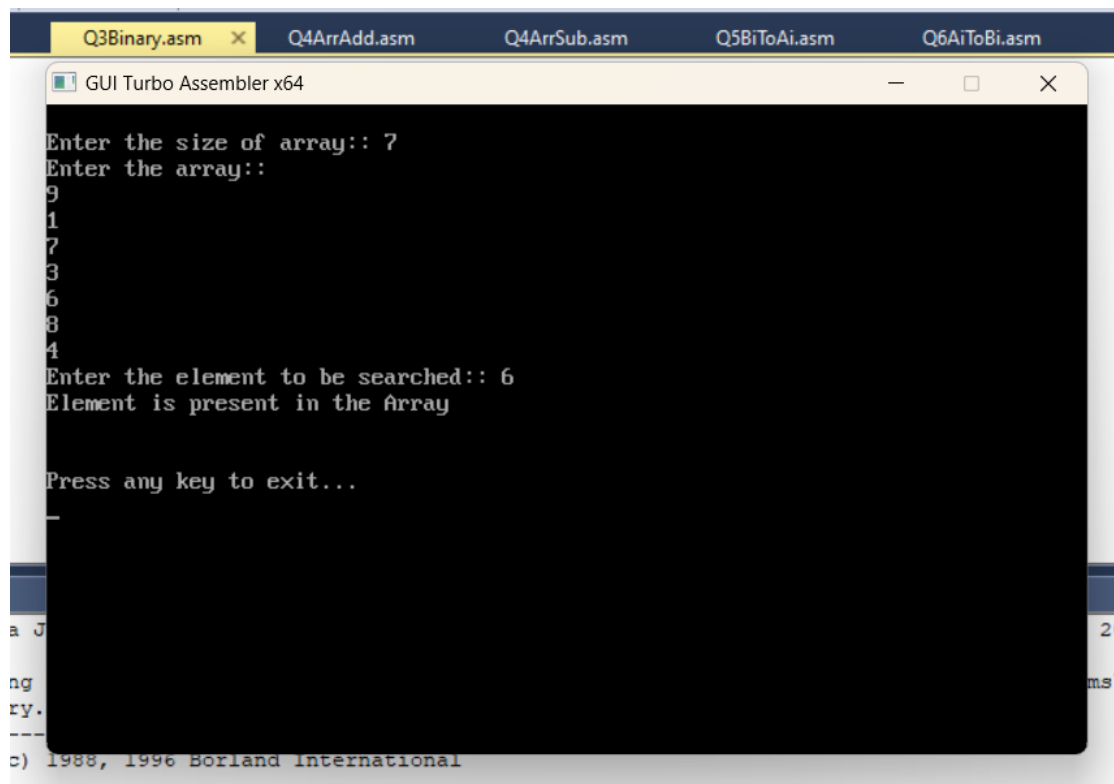
```asm
;BINARY SEARCH
.model small
.386
.data
ARRAY DW 20 DUP(?)
DATA1 dw 0000H
DATA2 dw 0000H
success db 10,13,"Element is present in the Array$"
fail db 10,13,"Element is not present in the Array$"
msg1 db 10,13,"Enter the size of array:: $"
msg2 db 10,13,"Enter the array:: $"
msg3 db 10,13,"Enter the element to be searched:: $"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV AH,01
INT 21H
SUB AL,30H
MOV AH,0
MOV CX,AX
MOV DATA1,AX
MOV AH,09
MOV DX,OFFSET msg2
INT 21H
MOV AH,0
MOV SI,0
MOV BX,OFFSET ARRAY
L1: MOV DL,0AH; jump onto next line
MOV AH,02H
INT 21H
MOV DX,SI; input element of the array
MOV AH,01H
INT 21H
SUB AL,30H
MOV SI,DX
MOV[BX+SI],AX
INC SI
LOOP L1
MOV AH,09
MOV DX,OFFSET msg3
INT 21H
MOV AH,01; enter element to be searched
INT 21H
SUB AL,30H
MOV DATA2,AX
```

Aryan Garg
21013570015

```asm
            MOV CX,DATA1
            MOV SI,0
            MOV DI,DATA1
            MOV BP,0
            MOV BX,OFFSET ARRAY
            MOV AX,DATA1
       L2: MOV SI,DI
            ADD SI,BP
            MOV AX,SI
            MOV DL,2
            DIV DL
            MOV AH,0
            MOV DX,0
            MOV SI,AX
            MOV DX,DATA2
            CMP[BX+SI],DL
            JZ L3
            CALL L4
            LOOP L2
            MOV AH,09H
            MOV DX,OFFSET fail ; if the element is not found
            INT 21h
            MOV AH,4CH ; to forcefully terminate the program
            INT 21H
       L3: MOV AH,09H
            MOV DX,OFFSET success; if the element is found
            INT 21H
            MOV AH,4CH
            INT 21H
       L4 PROC NEAR
            CMP[BX+SI],DL
            JL L6
            MOV DI,SI
            RET
       L6: MOV BP,SI
            RET
       L4 ENDP
            .EXIT
            END
```

Output:


```
Output
### Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST ###

[26 Nov 2023 14:15:41.790] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Binary.asm
[26 Nov 2023 14:15:42.190] Executing command: TASM /ml /z /zi Q3Binary.asm
[26 Nov 2023 14:15:43.015] --- Output from TASM ---------------------------------------------------------------
[26 Nov 2023 14:15:43.021] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:15:43.024] Assembling file:   Q3Binary.asm
[26 Nov 2023 14:15:43.026] Error messages:    None
[26 Nov 2023 14:15:43.029] Warning messages:  None
[26 Nov 2023 14:15:43.031] Passes:            1
[26 Nov 2023 14:15:43.034] Remaining memory:  463k
[26 Nov 2023 14:15:43.037] ---------------------------------------------------------------------------------
[26 Nov 2023 14:15:43.041] The code assemble process completed successfully.
[26 Nov 2023 14:15:43.045] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Binary.obj
[26 Nov 2023 14:15:43.070] Executing command: TLINK /x /v /3 /k Q3Binary
[26 Nov 2023 14:15:44.209] --- Output from TLINK --------------------------------------------------------------
[26 Nov 2023 14:15:44.213] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:15:44.216] ---------------------------------------------------------------------------------
[26 Nov 2023 14:15:44.221] The code build process completed successfully.
[26 Nov 2023 14:15:44.225] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q3Binary.exe
```
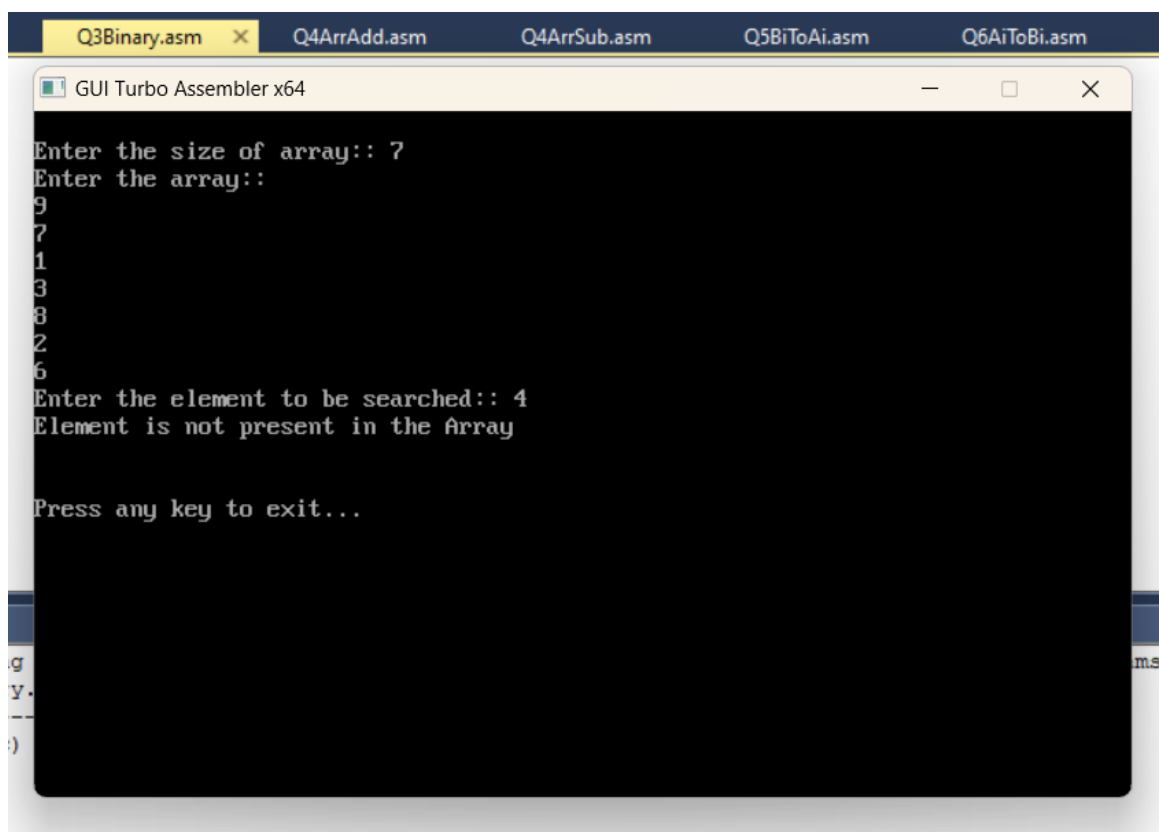
Q3Binary.asm   ✕   Q4ArrAdd.asm   Q4ArrSub.asm   Q5BiToAi.asm   Q6AiToBi.asm

■ GUI Turbo Assembler x64   —   □   ✕

```
Enter the size of array:: 7
Enter the array::
9
1
7
3
6
8
4
Enter the element to be searched:: 6
Element is present in the Array


Press any key to exit...
_
```

a J   20

ng   ms\
ry.
---
c) 1988, 1996 Borland International

Q3Binary.asm   ✕   Q4ArrAdd.asm   Q4ArrSub.asm   Q5BiToAi.asm   Q6AiToBi.asm

■ GUI Turbo Assembler x64   —   □   ✕

```
Enter the size of array:: 7
Enter the array::
9
7
1
3
8
2
6
Enter the element to be searched:: 4
Element is not present in the Array


Press any key to exit...
```

ng   ms\
y.
--
)

Q4) Write a program to add and subtract two arrays.

```asm
;adding two arrays
.model small
.386
.data
A1 DB 20 DUP(?)
A2 DB 20 DUP(?)
DATA1 dw 0000H
DATA2 DW 0000H
msg1 db 10,13,"Enter the size of the arrays:: $"
msg2 db 10,13,"Enter the first array:: $"
msg3 db 10,13,"The entered array is:: $"
msg4 db 10,13,"Enter the second array:: $"
msg5 db 10,13,"The sum of both array is::$"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV CX,2
L4:MOV AH,01
INT 21H
CMP AL,'A'
JGE L9
SUB AL,30H
JMP L8
L9:SUB AL,37H
L8:SHL BX,4
ADD BL,AL
LOOP L4
MOV AL,BL
MOV CL,AL
MOV AH,0
MOV DATA1,AX
MOV CX,DATA1
MOV AH,09
MOV DX,OFFSET msg2
INT 21H
MOV AH,0
MOV CX,DATA1
LEA SI,A1
L1:MOV DL,0AH; JUMP ONTO NEXT LINE
MOV AH,02H
INT 21H
```

```asm
        MOV AH,01H
        INT 21H
        SUB AL,30H
        MOV[SI],AL
        INC SI
        LOOP L1
        MOV AH,09H
        MOV DX,OFFSET msg3
        INT 21H
        MOV CX,DATA1
        LEA SI,A1
L2:     mov ah,02h
        mov dl,0ah
        int 21h
        MOV DL,[SI]
        ADD DL,30h
        MOV AH,02
        INT 21H
        INC SI
        LOOP L2
        MOV CX,DATA1
        MOV AH,09
        MOV DX,OFFSET msg4
        INT 21H
        MOV AH,0
        LEA DI,A2
L3:     MOV DL,0AH; jump onto next line
        MOV AH,02H
        INT 21H
        MOV AH,01H
        INT 21H
        SUB AL,30H
        MOV [DI],AL
        INC DI
        LOOP L3
        MOV AH,09H
        MOV DX,OFFSET msg3
        INT 21H
        MOV CX,DATA1
        LEA DI,A2
L14:    mov ah,02h
        mov dl,0ah
        int 21h
        mov dl,0dh
        int 21h
        MOV DX,[DI]
        ADD DL,30h
```

```asm
        MOV AH,02
        INT 21H
        INC DI
        LOOP L14
        LEA SI,A1
        LEA DI,A2
        MOV CX,DATA1
ADDA:MOV AL,[SI]
        ADD AL,[DI]
        MOV [SI],AL
        INC DI
        INC SI
        LOOP ADDA
        MOV AH,09H
        MOV DX,OFFSET msg5
        INT 21H
        MOV CX,DATA1
        LEA SI,A1
L5:     mov ah,02h
        mov dl,0ah
        int 21h
        MOV DATA2, CX
        MOV CX,2
        MOV BL,[SI]
ADDA1:ROL BL,4
        MOV DL,BL
        AND DL,0FH
        CMP DI,9
        JA L6
        ADD DL,30h
        JMP L7
L6:ADD DL,37H
L7: MOV AH,02
        INT 21H
        LOOP ADDA1
        MOV CX,DATA2
        INC SI
        LOOP L5
        .EXIT
        END
```
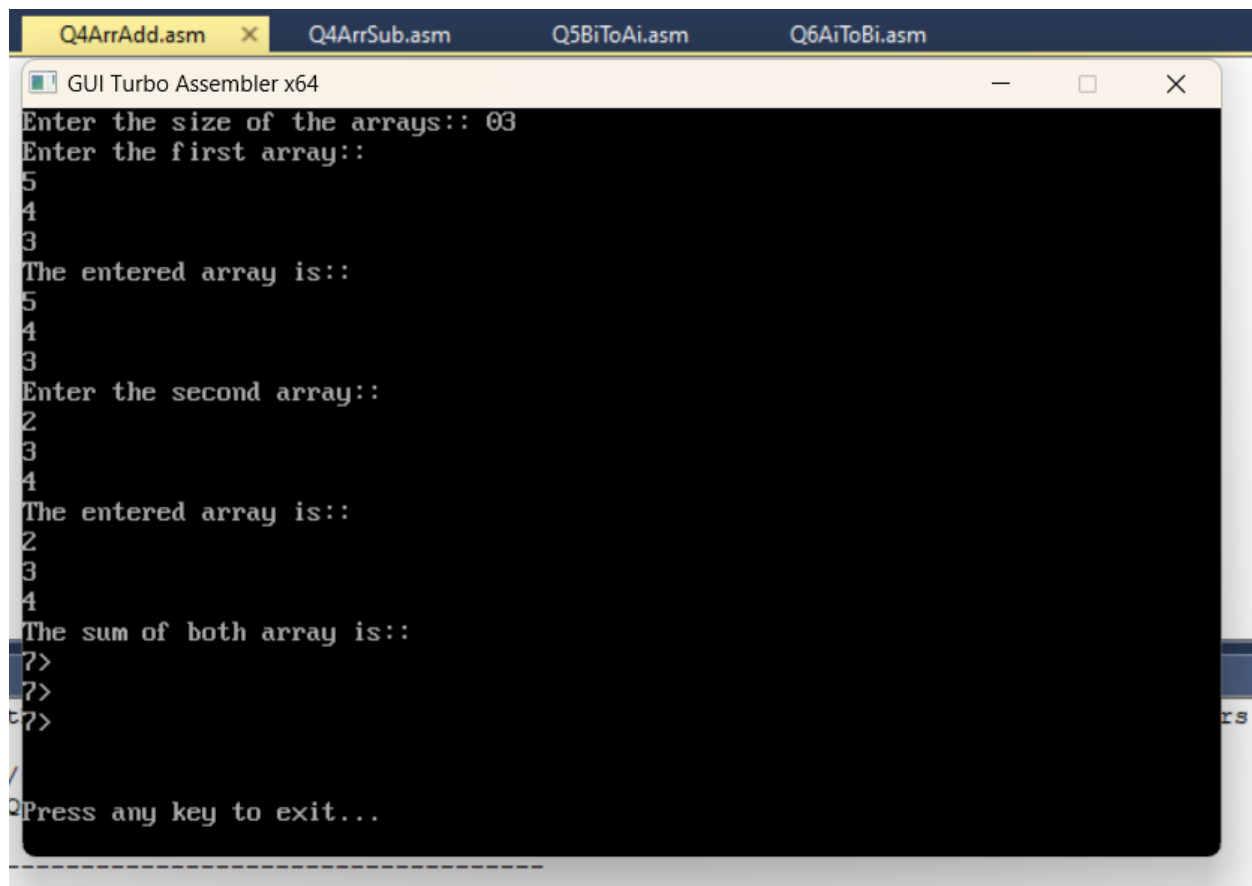
Aryan Garg
21013570015

Output:


```
Output                                                                                                                                    ▼ ₽
### Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST ###

[26 Nov 2023 14:21:13.208] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q4ArrAdd.asm
[26 Nov 2023 14:21:14.226] Saving file D:\Bsc Sem V\Microprocesser\Practical Programs\Q4ArrAdd.asm
[26 Nov 2023 14:21:14.242] Executing command: TASM /ml /z /zi Q4ArrAdd.asm
[26 Nov 2023 14:21:15.012] --- Output from TASM --------------------------------------------------------------------
[26 Nov 2023 14:21:15.016] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:21:15.022] Assembling file:    Q4ArrAdd.asm
[26 Nov 2023 14:21:15.025] Error messages:     None
[26 Nov 2023 14:21:15.028] Warning messages:   None
[26 Nov 2023 14:21:15.030] Passes:             1
[26 Nov 2023 14:21:15.033] Remaining memory:   462k
[26 Nov 2023 14:21:15.035] --------------------------------------------------------------------------------------
[26 Nov 2023 14:21:15.039] The code assemble process completed successfully.
[26 Nov 2023 14:21:15.043] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q4ArrAdd.obj
[26 Nov 2023 14:21:15.061] Executing command: TLINK /x /v /3 /k Q4ArrAdd
[26 Nov 2023 14:21:16.182] --- Output from TLINK -------------------------------------------------------------------
[26 Nov 2023 14:21:16.186] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:21:16.189] --------------------------------------------------------------------------------------
[26 Nov 2023 14:21:16.192] The code build process completed successfully.
[26 Nov 2023 14:21:16.195] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q4ArrAdd.exe
```



```
Q4ArrAdd.asm  ✕    Q4ArrSub.asm      Q5BiToAi.asm      Q6AiToBi.asm

GUI Turbo Assembler x64                                          —    □    ✕
Enter the size of the arrays:: 03
Enter the first array::
5
4
3
The entered array is::
5
4
3
Enter the second array::
2
3
4
The entered array is::
2
3
4
The sum of both array is::
7>
7>
7>

Press any key to exit...
```
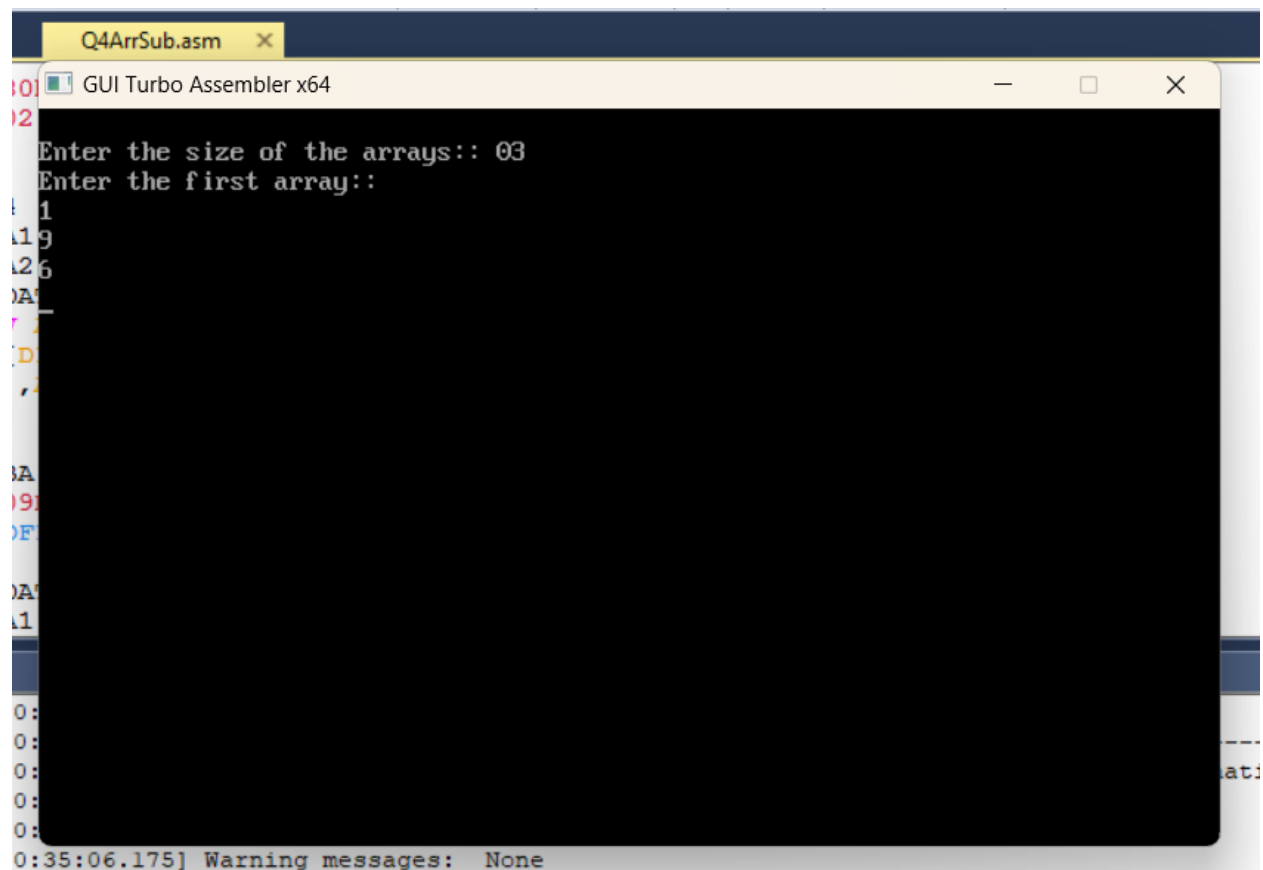
```
;subtracing two arrays
.model small
.386
.data
A1 DB 20 DUP(?)
A2 DB 20 DUP(?)
DATA1 dw 0000H
DATA2 DW 0000H
msg1 db 10,13,"Enter the size of the arrays:: $"
msg2 db 10,13,"Enter the first array:: $"
msg3 db 10,13,"The entered array is:: $"
msg4 db 10,13,"Enter the second array:: $"
msg5 db 10,13,"The difference of both array is::$"
.code
.startup
MOV AH,09
MOV DX,OFFSET msg1
INT 21H
MOV CX,2
L4:MOV AH,01
INT 21H
CMP AL,'A'
JGE L9
SUB AL,30H
JMP L8
L9:SUB AL,37H
L8:SHL BX,4
SUB BL,AL
LOOP L4
MOV AL,BL
MOV CL,AL
MOV AH,0
MOV DATA1,AX
MOV CX,DATA1
MOV AH,09
MOV DX,OFFSET msg2
INT 21H;
MOV AH,0
MOV CX,DATA1
LEA SI,A1
L1:MOV DL,0AH; JUMP ONTO NEXT LINE
MOV AH,02H
INT 21H
MOV AH,01H
INT 21H
SUB AL,30H
MOV[SI],AL
```

```asm
        INC SI
        LOOP L1
        MOV AH,09H
        MOV DX,OFFSET msg3
        INT 21H
        MOV CX,DATA1
        LEA SI,A1
L2:     mov ah,02h
        mov dl,0ah
        int 21h
        MOV DL,[SI]
        SUB DL,30h
        MOV AH,02
        INT 21H
        INC SI
        LOOP L2
        MOV CX,DATA1
        MOV AH,09
        MOV DX,OFFSET msg4
        INT 21H
        MOV AH,0
        LEA DI,A2
L3:     MOV DL,0AH; jump onto next line
        MOV AH,02H
        INT 21H
        MOV AH,01H
        INT 21H
        SUB AL,30H
        MOV [DI],AL
        INC DI
        LOOP L3
        MOV AH,09H
        MOV DX,OFFSET msg3
        INT 21H
        MOV CX,DATA1
        LEA DI,A2
L14:    mov ah,02h
        mov dl,0ah
        int 21h
        mov dl,0dh
        int 21h
        MOV DX,[DI]
        SUB DL,30h
        MOV AH,02
        INT 21H
        INC DI
        LOOP L14
```

```
        LEA SI,A1
        LEA DI,A2
        MOV CX,DATA1
        SUBA:MOV AL,[SI]
        SUB AL,[DI]
        MOV [SI],AL
        INC DI
        INC SI
        LOOP SUBA
        MOV AH,09H
        MOV DX,OFFSET msg5
        INT 21H
        MOV CX,DATA1
        LEA SI,A1
        L5:mov ah,02h
        mov dl,0ah
        int 21h
        MOV DATA2,CX
        MOV CX,2
        MOV BL,[SI]
        SUBA1:ROL BL,4
        MOV DL,BL
        AND DL,0FH
        CMP DI,9
        JA L6
        SUB DL,30h
        JMP L7
        L6:SUB DL,37H
        L7:MOV AH,02
        INT 21H
        LOOP SUBA1
        MOV CX,DATA2
        INC SI
        LOOP L5
        .EXIT
        END
```

Aryan Garg
21013570015

Output:

Q4ArrSub.asm

GUI Turbo Assembler x64

```
Enter the size of the arrays:: 03
Enter the first array::
```

0:35:06.175] Warning messages: None

Aryan Garg
21013570015
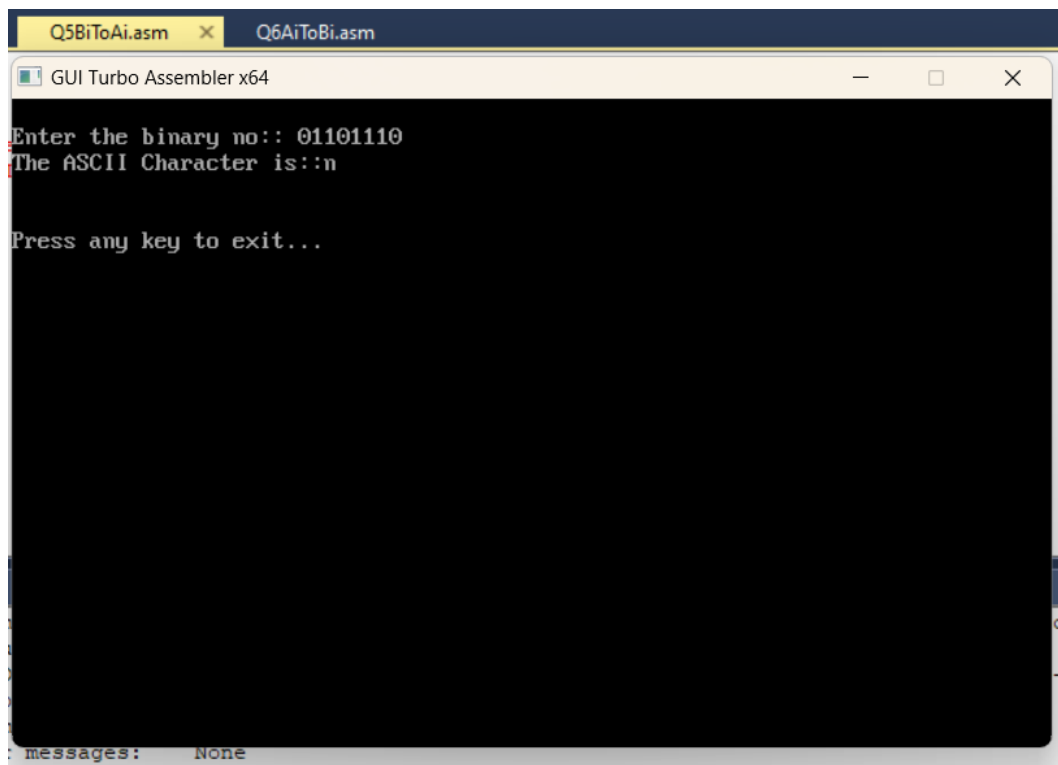
Q5) Write a program for binary to Ascii conversion.

```
;BINARY TO ASCII
.model small
.data
INPUT DB 10,13,"Enter the binary no:: $"
OUTPUT DB 10,13,"The ASCII Character is::$"
ARR DB ?
.code
.startup
MOV AH,09H
MOV DX,OFFSET INPUT
INT 21H
MOV BL,00H
MOV CL,08H
INPUT1: MOV AH,01H
INT 21H
SUB AL,30H
SHL BL,1
ADD BL,AL
LOOP INPUT1
MOV AH,09H
LEA DX,OUTPUT
INT 21H
MOV AH,02H
MOV DL,BL
INT 21H
.EXIT
END
```

Output:

```
Output                                                                                                    ▾ ⤏ X
### Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST ###

[26 Nov 2023 14:35:10.898] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q5BiToAi.asm
[26 Nov 2023 14:35:11.312] Executing command: TASM /ml /z /zi Q5BiToAi.asm
[26 Nov 2023 14:35:12.064] --- Output from TASM -------------------------------------------------------------
[26 Nov 2023 14:35:12.070] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:35:12.070] Assembling file:   Q5BiToAi.asm
[26 Nov 2023 14:35:12.076] Error messages:    None
[26 Nov 2023 14:35:12.076] Warning messages:  None
[26 Nov 2023 14:35:12.076] Passes:            1
[26 Nov 2023 14:35:12.076] Remaining memory:  465k
[26 Nov 2023 14:35:12.076] -------------------------------------------------------------------------------
[26 Nov 2023 14:35:12.087] The code assemble process completed successfully.
[26 Nov 2023 14:35:12.087] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q5BiToAi.obj
[26 Nov 2023 14:35:12.125] Executing command: TLINK /x /v /3 /k Q5BiToAi
[26 Nov 2023 14:35:13.264] --- Output from TLINK ------------------------------------------------------------
[26 Nov 2023 14:35:13.275] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:35:13.278] -------------------------------------------------------------------------------
[26 Nov 2023 14:35:13.278] The code build process completed successfully.
[26 Nov 2023 14:35:13.285] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q5BiToAi.exe
```
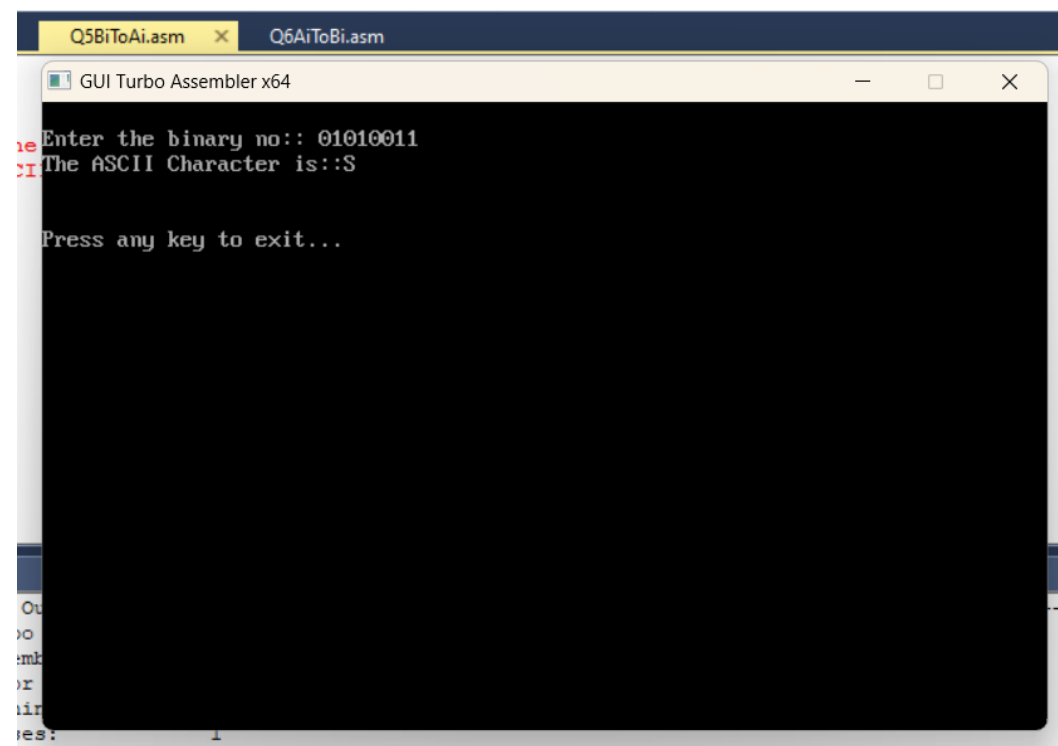
Q5BiToAi.asm ✕ Q6AiToBi.asm

GUI Turbo Assembler x64 — ☐ ✕

```
Enter the binary no:: 01101110
The ASCII Character is::n


Press any key to exit...
```

messages: None

Q5BiToAi.asm ✕ Q6AiToBi.asm

GUI Turbo Assembler x64 — ☐ ✕

```
Enter the binary no:: 01010011
The ASCII Character is::S


Press any key to exit...
```
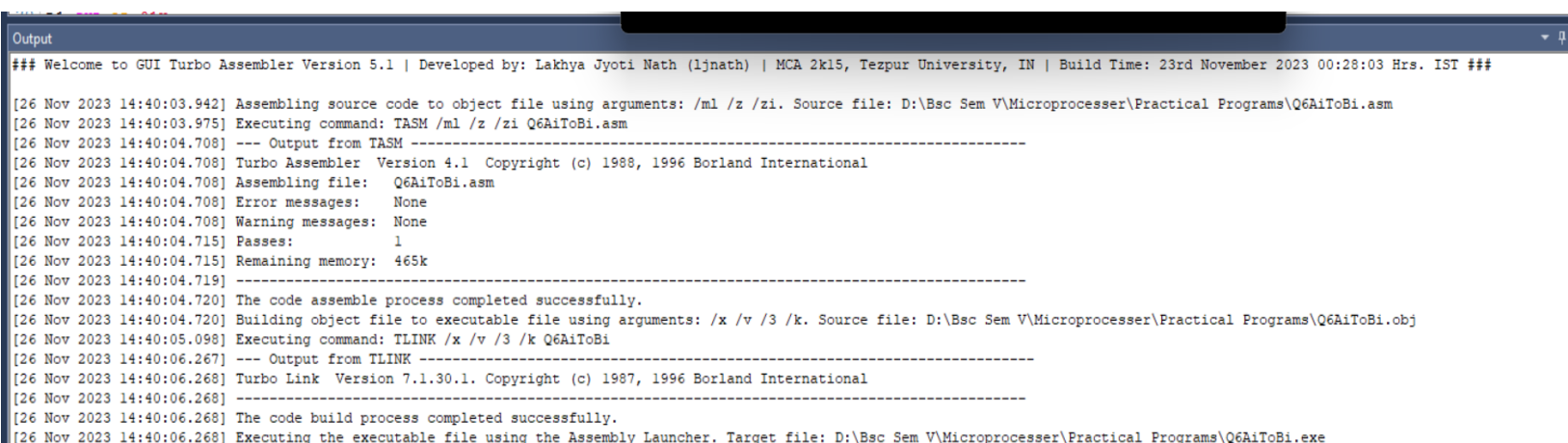
Q6) Write a program for Ascii to binary conversion.

```asm
;ASCII TO BINARY
.model small
.data
msg db 10,13,"Enter an ASCII Character:: $"
result db 10,13,"Result is:: $"
.code
.startup
MOV DX,OFFSET msg
MOV AH,09H
INT 21H
MOV AH,01H
INT 21H
MOV BL,AL
MOV DX,OFFSET result
MOV AH,09H
INT 21H
MOV CL,08H
MOV AH,00H
MOV AL,BL
L1:SHL AL,01H
MOV BL,AL
MOV AL,00H
ADC AL,30H
MOV DL,AL
MOV AH,02H
INT 21H
MOV AL,BL
LOOP L1
.EXIT
END
```

Output:


```
Output
### Welcome to GUI Turbo Assembler Version 5.1 | Developed by: Lakhya Jyoti Nath (ljnath) | MCA 2k15, Tezpur University, IN | Build Time: 23rd November 2023 00:28:03 Hrs. IST ###

[26 Nov 2023 14:40:03.942] Assembling source code to object file using arguments: /ml /z /zi. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q6AiToBi.asm
[26 Nov 2023 14:40:03.975] Executing command: TASM /ml /z /zi Q6AiToBi.asm
[26 Nov 2023 14:40:04.708] --- Output from TASM -------------------------------------------------------------
[26 Nov 2023 14:40:04.708] Turbo Assembler  Version 4.1  Copyright (c) 1988, 1996 Borland International
[26 Nov 2023 14:40:04.708] Assembling file:   Q6AiToBi.asm
[26 Nov 2023 14:40:04.708] Error messages:    None
[26 Nov 2023 14:40:04.708] Warning messages:  None
[26 Nov 2023 14:40:04.715] Passes:            1
[26 Nov 2023 14:40:04.715] Remaining memory:  465k
[26 Nov 2023 14:40:04.719] ------------------------------------------------------------------------------
[26 Nov 2023 14:40:04.720] The code assemble process completed successfully.
[26 Nov 2023 14:40:04.720] Building object file to executable file using arguments: /x /v /3 /k. Source file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q6AiToBi.obj
[26 Nov 2023 14:40:05.098] Executing command: TLINK /x /v /3 /k Q6AiToBi
[26 Nov 2023 14:40:06.267] --- Output from TLINK ------------------------------------------------------------
[26 Nov 2023 14:40:06.268] Turbo Link  Version 7.1.30.1. Copyright (c) 1987, 1996 Borland International
[26 Nov 2023 14:40:06.268] ------------------------------------------------------------------------------
[26 Nov 2023 14:40:06.268] The code build process completed successfully.
[26 Nov 2023 14:40:06.268] Executing the executable file using the Assembly Launcher. Target file: D:\Bsc Sem V\Microprocesser\Practical Programs\Q6AiToBi.exe
```

Q6AiToBi.asm ✕

GUI Turbo Assembler x64   — □ ✕

r:Enter an ASCII Character:: g
 Result is:: 01100111

 Press any key to exit...
 _

od
TA
M
rsi
Q6AiToBi.asm
None

Q6AiToBi.asm ✕

GUI Turbo Assembler x64   — □ ✕

er Enter an ASCII Character:: k
 Result is:: 01101011

 Press any key to exit...
 _

oo
T
5M
er
Q
None
None