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| Course Name: | Microprocessors and Peripherals (2UXC404) | Semester: | IV |
| Date of Performance: | 28/04/2021 | Batch No: | B2 |
| Faculty Name: | KCS | Roll No: | 1912052 |
| Faculty Sign & Date: | | Grade/Marks : | ___/25 |

Experiment No: 8

Title: Counting characters in string

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| Aim and Objective of the Experiment: |
| <p>Aim: Write an 8086 based ALP to</p> <ol style="list-style-type: none"> Count how many times a given character appears in a given string. Display the same on port 110. Also indicate with the message "Number of time character appears = ", "Sorry, the character is absent in a given string" <p>Objectives:</p> <ol style="list-style-type: none"> To study string instruction. To study I/O instructions. To study DOS interrupts <p>This experiment covers</p> <ol style="list-style-type: none"> String instructions and I/O instructions DOS interrupts for taking input from keyboard and displaying strings on screen. |

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| COs to be achieved: |
| CO 2. Develop 8086 based assembly language programs for various applications. |

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| Useful links |
| <p>NASM Assembler https://www.tutorialspoint.com/compile_assembly_online.php</p> <p>Simulator/Emulator: https://emu8086-microprocessor-emulator.en.softonic.com/download</p> <p>DOSBox x86 emulator https://sourceforge.net/projects/dosbox/</p> |

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| Work to be done |
| <ol style="list-style-type: none"> Upload image of handwritten algorithm/flowchart and list file of the program with comments and output screenshots . Also upload results for post lab questions. <p>data segment</p> |

```
msg1 db 10,13,'ENTER ANY STRING :- $'  
str db 10H dup('$')  
strlen db $-str  
msg2 db 10,13,'ENTER ANY CHARACTER :- $'  
msg3 db 10,13,' $'  
msg4 db 10,13,' Sorry, the character is absent in a given string$'  
msg5 db ' FOUND IN THE GIVEN STRING $'
```

```
count db 00h
```

```
data ends
```

```
code segment
```

```
    assume cs:code, ds=data
```

```
start: mov ax,data
```

```
    mov ds,ax
```

```
    mov es,ax
```

```
    mov ah,09
```

```
    lea dx,msg1
```

```
    int 21h
```

```
    mov ah,0Ah
```

```
    lea dx,str
```

```
    int 21h
```

```
    lea si,str
```

```
    mov cl,1Ah
```

```
    mov dl,00h
```

```
repeat:mov bl,[si]
```

```
    cmp bl,'a'
```

```
    jnz next
```

```
    inc dl
```

```
next:inc si
```

```
    loop repeat
```

```
    mov count,dl
```

```
    mov al,dl
```

```
    out 199,al
```

```
    cmp dl,00h
```

```
    jnz down
```

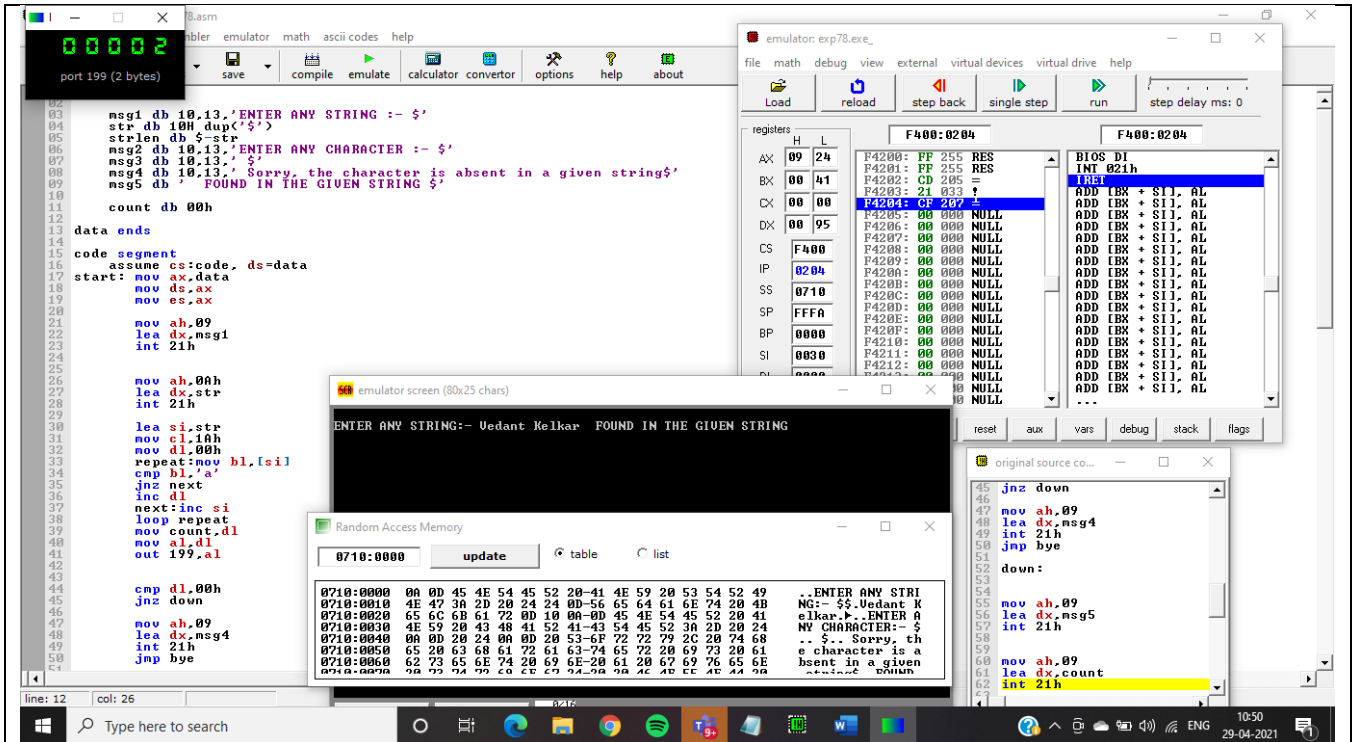
```
mov ah,09  
lea dx,msg4  
int 21h  
jmp bye
```

```
down:
```

```
mov ah,09  
lea dx,msg5  
int 21h
```

```
mov ah,09  
lea dx,count  
int 21h
```

```
bye:  
mov ah,4ch  
int 21h  
code ends  
end start
```



Post Lab Subjective/Objective type Questions:

Q1. What is the difference between `cmpsb` and `scasb`

SCAS(B/W) compares a byte in `AL` or a word in `AX` with a byte or word pointed to by `DI` in `ES`. The direction flag determines the direction of scan. Used with the `REP` prefix to find the first occurrence of a specified byte(word) in a string.

The **CMPSB(W)** instruction can be used to compare a byte(word) in one string (`DS:offset` in `SI`) with a byte (word) in another string (`ES:offset` in `DI`). The comparison is executed by subtracting the byte (word) in `DI` from the byte (word) in `SI`.

Q2. Write about dos interrupts which you have used for inputting a string or a character and also for printing a message or a single character.

For taking input we use the procedure as follows

Load `0Ah` in `ah`

Load effective address(where the i/p needs to be stored) in `dx`
`int 21h`

For printing out we use the procedure as follows

Load `09h` in `ah`

Load effective address(of the msg that needs to be printed out) in `dx`
`int 21h`



1. INT 21h is provided by DOS. When MS-DOS is loaded into the computer, INT 21H can be invoked to perform some extremely useful functions. These functions are commonly referred to as DOS INT 21H function calls. Data input and output through the keyboard and monitor are the most commonly used functions. Below are two examples that use DOS interrupts. 1. Display the message defined with variable DATA_ASC DB 'the earth is but one country', '\$' MOV AH,09 ;option 9 to display string of data MOV DX, OFFSET DATA_ASC ;DX= offset address of data INT 21H ; invoke the interrupt 2. Inputting a single character, with echo. MOV AH, 01 ;option 01 to input one character INT 21H ;invoke the interrupt DOS interrupts

Conclusion: We wrote an ALP for counting the number of character 'a' in the given string. The string is taken as an input from the user and the number of characters found are sent to the port 110.

**Signature of faculty in-charge with
Date:**