



## Department of Computer Science Engineering Data Science

Academic Year: 2022-23  
Class / Branch: S.E.D.S.

Semester: IV  
Subject: Microprocessor Lab

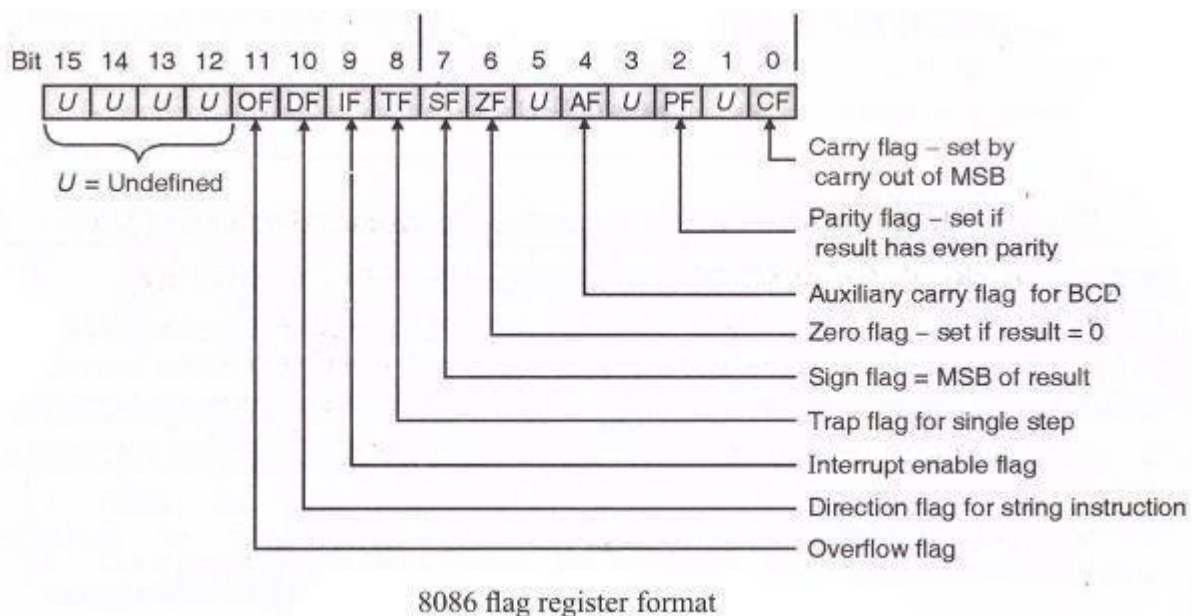
### Experiment No. 3

1. **Aim:** Write an Assembly Language Program to display the contents of a flag register.

2. **Software used:** tasm, tlink, td, dosemu

3. **Theory :-**

- Flag register is a part of EU (Execution Unit). It is a 16 bit register with each bit corresponding to a flip-flop. A flag is a flip-flop. It indicates some condition produced by the execution of an instruction. For example the zero flag (ZF) will set if the result of execution of an instruction is zero. Figure below shows the details of the 16 bit flag register of 8086 CPU.



- It consists of 9 active flags out of 16. The remaining 7 flags marked 'U' are undefined flags.
- These 9 flags are of two types:

- 6 Status flags
- 3 Control flags

#### Status flags:

1. **Carry flag (CY)-**

- It is set whenever there is a carry or borrow out of the MSB (most significant bit) of a result. D7 bit for an 8 bit operation and D15 bit for a 16 bit operation.

## **2. Parity flag (PF)-**

- It is set if the result has even parity. If parity is odd, PF is reset.
- This flag is normally used for data transmission errors.

## **3. Auxiliary carry flag (AC)-**

- It is set if a carry is generated out of the lower nibble.
- It is used only in 8 bit operations like DAA and DAS.

## **4. Zero flag (ZF)-**

- It is set if the result is zero.

## **5. Sign flag (SF)-**

- It is set if the MSB of the result is 1. For signed operations such a number is treated as negative.

## **6. Overflow flag (OF)-**

- It will be set if the result of a signed operation is too large to fit in the number of bits available to represent it.
- It can be checked using the instruction INTO (Interrupt on Overflow).

### **Control flags:**

#### **1. Trap flag (TF)-**

- It is used to set the trace mode i.e. start single stepping mode.
- Here the microprocessor is interrupted after every instruction so that the program can be debugged.

#### **2. Interrupt enable flag (IF)-**

- It is used to mask (disable) or unmask (enable) the INTR interrupt.
- If user sets IF flag, the CPU will recognize external interrupt requests. Clearing IF disables these interrupts.

#### **3. Direction flag (DF)-**

- If this flag is set, SI and DI are in auto-decrementing mode in string operations.

#### 4.Program:

```
.model small
.data
msg db 0dh,0ah,"-----OF DF IF TF SF ZF -- AF -- PF -- CF $"
newl db 0dh,0ah,"$"
flag dw ?
.code
start:
mov ax,@data
mov DS,ax

mov dx,offset msg
mov ah,09h
int 21h

mov dx,offset newl
mov ah,09h
int 21h

cli
stc
std

pushf
pop bx

mov flag,bx
mov cx,16
mov bx,8000h

loops:
mov ax,flag
and ax,bx
jz zero
mov dl,31h
mov ah,02h
int 21h
jmp space

zero: mov dl,30h
mov ah,02h
int 21h

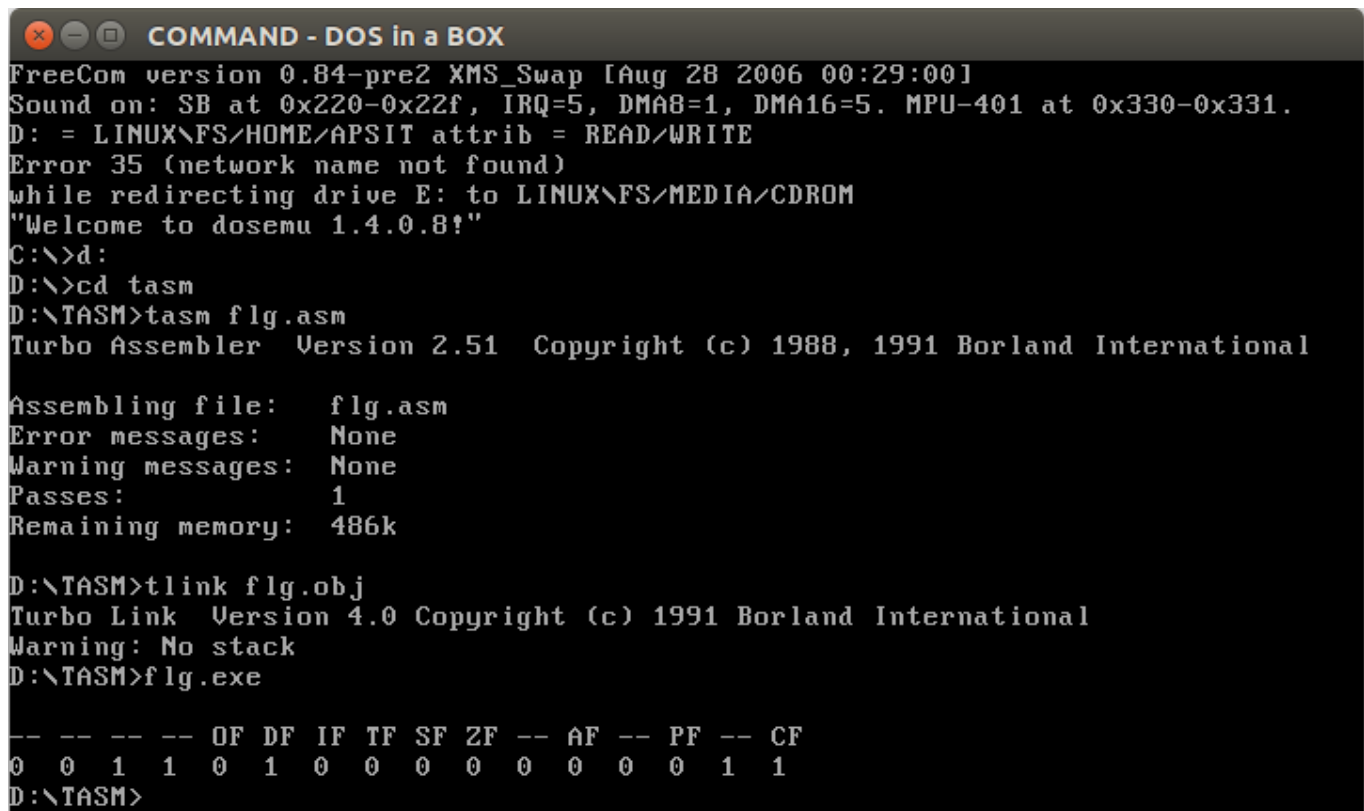
space: mov dl,' '
mov ah,02h
int 21h

mov ah,02h
int 21h
ror bx,1

loop loops
```

```
mov ah,4ch
int 21h
end start
```

### Output :



```
COMMAND - DOS in a BOX
FreeCom version 0.84-pre2 XMS_Swap [Aug 28 2006 00:29:00]
Sound on: SB at 0x220-0x22f, IRQ=5, DMA8=1, DMA16=5. MPU-401 at 0x330-0x331.
D: = LINUX\FS\HOME\APSIT attrib = READ/WRITE
Error 35 (network name not found)
while redirecting drive E: to LINUX\FS\MEDIA\CDROM
"Welcome to dosemu 1.4.0.8!"
C:\>d:
D:\>cd tasm
D:\TASM>tasm flg.asm
Turbo Assembler Version 2.51 Copyright (c) 1988, 1991 Borland International

Assembling file:    flg.asm
Error messages:     None
Warning messages:   None
Passes:             1
Remaining memory:   486k

D:\TASM>tlink flg.obj
Turbo Link Version 4.0 Copyright (c) 1991 Borland International
Warning: No stack
D:\TASM>flg.exe

-- -- -- -- OF DF IF TF SF ZF -- AF -- PF -- CF
0  0  1  1  0  1  0  0  0  0  0  0  0  0  1  1
D:\TASM>
```

### 5. Conclusion:-