Assignment – 6 (Program to switch from real mode to protected mode and display the values of GDTR, LDTR, IDTR, TR and MSW Registers.)

# Code

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; Problem statement: Write X86/64 ALP to switch from real mode to protected mode and display the values of GDTR, LDTR, IDTR, TR and MSW Registers also identify CPU type using CPUID instruction.
; BEGINING OF CODE
section .data
rmodemsg db 10,'Processor is in REAL MODE.',
rmsg_len:equ $-rmodemsg
pmodemsg db 10,'Processor is in PROTECTED MODE.'
pmsg_len:equ $-pmodemsg
gdtmsg db 10,'GDT Contents are: '
gmsg_len:equ $-gdtmsg
ldtmsg db 10,'LDT Contents are: '
lmsg_len:equ $-ldtmsg
idtmsg db 10,'IDT Contents are: '
imsg_len:equ $-idtmsg
trmsg db 10,'Task Register Contents are: '
tmsg_len: equ $-trmsg
mswmsg db 10,'Machine Status Word: '
mmsg_len:equ $-mswmsg
colmsg db ':'
nwline db 10
section .bss
gdt resd 1
resw 1
ldt resw 1
idt resd 1
resw 1
tr  resw 1
cr0_data resd 1
dnum_buff resb 04
%macro print 2
mov rax,01
mov rdi,01
mov rsi,%1
mov rdx,%2
syscall
%endmacro
section .text
global _start
_start:
smsw eax
mov [cr0_data],rax
bt rax,0
jc prmode
print rmodemsg,rmsg_len
jmp nxt1
prmode:         print pmodemsg,pmsg_len
nxt1:sgdt [gdt]
sldt [ldt]
sidt [idt]
str [tr]
print gdtmsg,gmsg_len
mov bx,[gdt+4]
call print_num
mov bx,[gdt+2]
call print_num
print colmsg,1
mov bx,[gdt]
call print_num
print ldtmsg,lmsg_len
mov bx,[ldt]
call print_num
print idtmsg,imsg_len
mov bx,[idt+4]
call print_num
mov bx,[idt+2]
call print_num
print colmsg,1
mov bx,[idt]
call print_num
print trmsg,tmsg_len
mov bx,[tr]
call print_num
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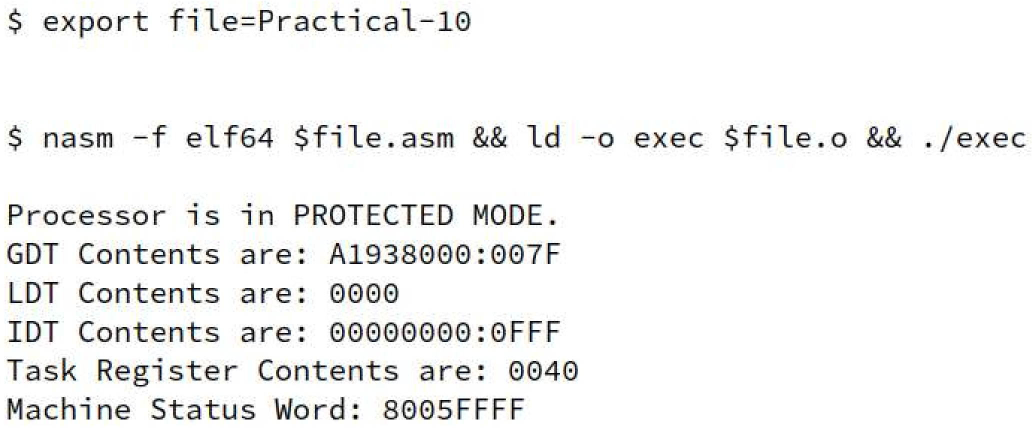
print mswmsg,mmsg_len
mov bx,[cr0_data+2]
call print_num
mov bx,[cr0_data]
call print_num
print nwline,1
exit:     mov rax,60
xor rdi,rdi
syscall
print_num:
mov rsi,dnum_buff
mov rcx,04
up1:
rol bx,4
mov dl,bl
and dl,0fh
add dl,30h
cmp dl,39h
jbe skip1
add dl,07h
skip1:
mov [rsi],dl
inc rsi
loop up1
print dnum_buff,4
ret
; END OF CODE
```

# Output



```
$ export file=Practical-10


$ nasm -f elf64 $file.asm && ld -o exec $file.o && ./exec

Processor is in PROTECTED MODE.
GDT Contents are: A1938000:007F
LDT Contents are: 0000
IDT Contents are: 00000000:0FFF
Task Register Contents are: 0040
Machine Status Word: 8005FFFF
```