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Roll No.: SYCOC303 Course Name: Microprocessor Architecture Lab

Div: C Batch: C4 Course Code: BCE4302

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Problem Statement:

Write X86/64 ALP to convert 4-digit Hex number into its equivalent BCD number and 5- digit BCD number into its equivalent HEX number. Make your program user friendly to accept the choice from user for:

(a) HEX to BCD

(b) BCD to HEX

(c) EXIT.

Display proper strings to prompt the user while accepting the input and displaying the result. (Wherever necessary, use64-bit registers).

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Input:

```
;Assignment 4
;Conversion of BCD to HEX and HEX to BCD
;===============================================


section .data
      nline db
10,"============================================================",10
      nline_msg equ $-nline


      ano db 10,"Assignment No.: 04",10
          db "============================================================",10
          db "Problem Statement: Conversion of BCD to HEX and HEX to BCD",10
          db "============================================================",10
      ano_len equ $-ano
```

```
      menu db 10,"====================",10
           db "1. HEX to BCD",10
           db "2. BCD to HEX",10
           db "3. EXIT",10
           db "Enter your valid choice==>"
      menu_len equ $-menu

      hmsg db 10,"Enter 4-digit HEX Number==>"
      hmsg_len equ $-hmsg

      bmsg db 10,"Enter 5-digit BCD Number==>"
      bmsg_len equ $-bmsg

      ehmsg db 10,"The equivalent HEX Number is==>"
      ehmsg_len equ $-ehmsg

      ebmsg db 10,"The equivalent BCD Number is==>"
      ebmsg_len equ $-ebmsg

      errmsg db 10,"Your have entered wrong choice!",10
      errmsg_len equ $-errmsg

      errmsg1 db 10,"Wrong values are entered!",10
      errmsg1_len equ $-errmsg1
;================================================

section .bss
      buf resb 6
      char_ans resb 6
      ans resw 1
;================================================

;============================================
```

```
;MACROS REQUIRED

%macro print 2
      MOV RAX,1
      MOV RDI,1
      MOV RSI,%1
      MOV RDX,%2
      SYSCALL
%endmacro

%macro read 2
      MOV RAX,0
      MOV RDI,0
      MOV RSI,%1
      MOV RDX,%2
      SYSCALL
%endmacro

%macro exit 0
      MOV RAX,60
      MOV RDI,1
      SYSCALL
%endmacro

;==================================
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section .text
      global _start

_start:
      print nline,nline_msg

      print ano,ano_len

MENU:
      print menu,menu_len
      read buf,2
      mov al,[buf]


      ;switching according to
choice
      ;if 1 is entered:
      c1:
            cmp al,'1'
            jne c2
            call HEX_BCD
            ;print hmsg,hmsg_len
            jmp MENU

      ;if 2 is entered:
      c2:
            cmp al,'2'
            jne c3
            call BCD_HEX
            ;print bmsg,bmsg_len
            jmp MENU

      ;if 3 is entered:
      c3:
            cmp al,'3'
            jne invalid
            exit

      ;if wrong choice is entered:
      invalid:
            print errmsg,errmsg_len
            exit
```

```
;===================================
============
;DEFINING PROCEDURES:

BCD_HEX:
      print bmsg,bmsg_len
      read buf,6

      mov rsi,buf
      xor ax,ax
      mov rbp,5
      mov rbx,10

      next:
            xor cx,cx
            mul bx
            mov cl,[rsi]
            sub cl,30h
            add ax,cx

      inc rsi
      dec rbp
      jnz next

      mov [ans],ax
      print ehmsg,ehmsg_len

      mov ax,[ans]
      call display_16
      ret
;===================================
============
HEX_BCD:
      print hmsg,hmsg_len
      call accept_16
      mov ax,bx

      mov bx,10
      xor bp,bp

      back:
            xor dx,dx
            div bx
            push dx
            inc bp

      cmp ax,0
      jne back

      print ebmsg,ebmsg_len

      back1:
            pop dx
            add dl,30H
            mov [char_ans],dl
            print char_ans,1

      dec bp
      jnz back1
      ret
;===================================
============
;===================================
============
display_16:
      mov rbx,16
      mov rcx,4
      mov rsi,char_ans+3

      cnt:
```

```
            mov rdx,0
            div rbx
            cmp dl,09h
            jbe add30
            add dl,07h

      add30:
            add dl,30h

      mov [rsi],dl
      dec rsi
      dec rcx
      jnz cnt

      print char_ans,4
      ret
;=================================
===============
;accepting hex number

accept_16:
      read buf,5
      mov rcx,4
      mov rsi,buf
      xor bx,bx

      next_byte:
            shl bx,4
            mov al,[rsi]
            cmp al,'0'
            jb error
            cmp al,'9'
            jbe sub30

            cmp al,'A'
            jb error
            cmp al,'F'
            jbe sub37

            cmp al,'a'
            jb error
            cmp al,'f'
            jbe sub57

      error:
            print
errmsg1,errmsg1_len

      sub57: sub al,20H
      sub37: sub al,07H
      sub30: sub al,30H

      add bx,ax
      inc rsi
      dec rcx
      jnz next_byte

      ret
;=================================
===============
```

Output:

```
administrator@206-4:~/Desktop/MAL programs$ nasm -f elf64 Assignment4.asm
administrator@206-4:~/Desktop/MAL programs$ ld Assignment4.o -o Assignment4
administrator@206-4:~/Desktop/MAL programs$ ./Assignment4

============================================================

Assignment No.: 04
============================================================
Problem Statement: Conversion of BCD to HEX and HEX to BCD
============================================================

====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>2

Enter 5-digit BCD Number==>00012

The equivalent HEX Number is==>000C
====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>
```

```
administrator@206-4:~/Desktop/MAL programs$ nasm -f elf64 Assignment4.asm
administrator@206-4:~/Desktop/MAL programs$ ld Assignment4.o -o Assignment4
administrator@206-4:~/Desktop/MAL programs$ ./Assignment4

============================================================

Assignment No.: 04
============================================================
Problem Statement: Conversion of BCD to HEX and HEX to BCD
============================================================

====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>5

Your have entered wrong choice!
administrator@206-4:~/Desktop/MAL programs$ nasm -f elf64 Assignment4.asm
administrator@206-4:~/Desktop/MAL programs$ ld Assignment4.o -o Assignment4
administrator@206-4:~/Desktop/MAL programs$ ./Assignment4

============================================================

Assignment No.: 04
============================================================
Problem Statement: Conversion of BCD to HEX and HEX to BCD
============================================================

====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>3
administrator@206-4:~/Desktop/MAL programs$
```

```
administrator@206-4:~/Desktop/MAL programs$ nasm -f elf64 Assignment4.asm
administrator@206-4:~/Desktop/MAL programs$ ld Assignment4.o -o Assignment4
administrator@206-4:~/Desktop/MAL programs$ ./Assignment4

============================================================

Assignment No.: 04
============================================================
Problem Statement: Conversion of BCD to HEX and HEX to BCD
============================================================

====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>1

Enter 4-digit HEX Number==>1234

The equivalent BCD Number is==>4660
====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>2

Enter 5-digit BCD Number==>00012

The equivalent HEX Number is==>000C
====================
1. HEX to BCD
2. BCD to HEX
3. EXIT
Enter your valid choice==>3
administrator@206-4:~/Desktop/MAL programs$
```

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