University of Central Punjab

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Faculty of Information Technology & Computer Science

Mid-term Theory Exam, F22 NAME_____ REG#_____
Computer Organization and Assembly Language
BS(CS), PADP(CS)

Instructions

- All questions are mandatory.
- A scientific calculator is allowed.
- Correction, cutting, or overwriting is not allowed. If you do so, that part of the question will not be counted.
- There is no mistake in the question paper. If you find any, make a sensible guess and solve the question.
- Understanding the problem is part of the problem.
- Solve the first two questions on the question paper and the third question on the answer booklet.

Question#1 (6 + 10 points)

a) The values of various registers before executing each of the following instructions are as follows:

DS:0x1AB0 SI:0x0014 DI:0x0002 AX:0xACBD BX:0x012C CX:0xFEDC DX:0x3120

SS:0x08C0 BP:0x0100

Execute the following instructions and update the registers and memory accordingly. Also, calculate the physical addresses in the hexadecimal number system.

Instructions	**Physical Address**	**Register's contents**
MOV [BX], CX	0x1AC2C	
MOV [BP+SI], DX	0X08D14	
MOV AX, [BX+DI]	0x1AC2E	AX:___0xEA3F_____

Memory

			0x0	0x1	0x2	0x3	0x4	0x5	0x6	0x7	0x8	0x9	0xA	0xB	0xC	0xD	0xE	0xF
0x1AB0	:	0x0100																
0x1AB0	:	0x0110																
0x1AB0	:	0x0120													DC	FE	3F	EA
0x08C0	:	0x0100																
0x08C0	:	0x0110					20	31										
0x08C0	:	0x0120															DA	BF

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b) Which of the following instructions is invalid? In the case of invalid, give reasons; otherwise, write "valid."

Instructions	Reasons
MOV AX, BH	Invalid: Both operands should be the same size.
MOV BL,256	Invalid: 256 is a 9-bit number.
MOV ES, CS	Invalid: Both operands cannot be segment registers.
MOV ES, 0xFFCD	Invalid: Immediate addressing is not allowed for sreg.
MOV [DX], BX	Invalid: DX cannot be used in register indirect addressing
MOV [BL], AX	Invalid: BL cannot be used in register indirect addressing
MOV [SI + DI], AX	Invalid: Both registers can't be index registers.
MOV CS, AX	Invalid: Can't modify CS register using mov instruction.
PUSH IP	Invalid: Cannot push IP register
POP CS	Invalid: Cannot pop to CS register

Question#2: (5+ 5 points)

a) For the given program, write the value of destination operand after execution of each instruction.

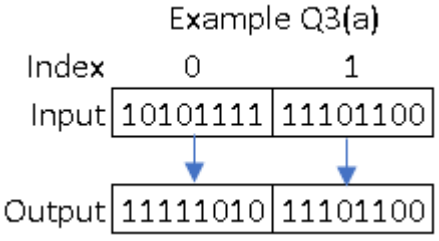
Instructions	AX (Hexadecimal)
XOR AX, AX	0x0000
XOR AX, 0x6450	0x6450
SHL AX,2	0x9140
ROR AX,1	0x48A0
AND AX,0xFEFA	0x48A0

b) Write the status of various flags after the execution of the ADD instruction.

MOV AX, 128	OF	ZF	SF	PF	AF	CF
ADD AX, AX	0	0	0	1	0	0

Question#3: (20 + 4 points)

a) Create a procedure that receives a byte array and its size via the stack. The procedure swaps the nibbles of array elements having an even number of ones. Also, call this procedure from the main procedure.
b) Write a code to write 0xDEAD at physical address 0x3FAE3.



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```
;Q3_a
.model small

.data

array db 0x1,0x2,0x3,0x4,0x5

.code
main proc
mov ax,@data
mov ds,ax

mov bx,offset array
mov si,0


mov cx,5
mov bx,offset array
push bx
push cx

call swap_nibbles

pop ax
pop ax

.exit
main endp




swap_nibbles proc


push bp
push cx
push bx
push si

mov bp,sp
```

```
;Q3_b
.model small
.data

.code

Mov ax,0x3FAE
Mov es,ax
Mov word ptr es:[0x3],0xDEAD

.exit
```

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```
mov bx,[bp+12]
mov cx,[bp+10]
mov si,0


l1:

  mov al,[bx+si]
  add al,0
  jp l2
  inc si
  loop l1

l2:
  ror al,4
  mov [bx+si],al
  inc si
  loop l1

pop si
pop bx
pop cx
pop bp

ret

swap_nibbles endp
```