Name: _____ Roll Number: _____ Section: _____

National University of Computer and Emerging Sciences, Lahore Campus

Course:	**Computer Organization and Assembly Language**	**Course Code:**	**EE229**
		Semester:	**Fall 2021**
Program:	**BS (Computer Science)**	**Total Marks:**	**30**
Duration:	**60 Minutes**	**Weightage:**	**15**
Paper Date:	**21-Oct-2021**	**Page(s):**	**5**
Section:	**All**	**Section:**	**_____**
Exam:	**Midterm I**	**Roll No:**	**_____**

Instruction/Notes:

- Exam is Open book, Open notes.
- Properly comment your code.
- You **CANNOT** use an instruction **NOT** taught in class.
- If there is any ambiguity, take reasonable assumption. Questions during exam are not allowed.
- All other rules pertaining to examinations as per NUCES policy apply.
- Write your answer in the space provided. You **can take extra sheets BUT they WON'T BE ATTACHED WITH THE QUESTION PAPER OR MARKED.**

Question 1 [20 Marks]: Short Questions

i. **[5 marks]** The value of Code Segment (CS) and Stack Segment (SS) Register is 4582H while the value of different registers is as follows:

BX: 2025h, IP: 0580h, DI: 4247h, BP: 4700h, SI: FFFFh

Write the physical address of the following memory locations. Also point out which type of wraparound is there if occurred, segment or whole memory?

	Memory Location	Physical Address in hex	Wraparound Type (if occurred)
a	[cs:bx + si]		
B	[bp + di + 10]		

(Show your working in this box:)

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ii. **[2 Marks]** Point out the addressing modes in each of the following instructions.

	Instruction	Mode
a.	mov ax, [bx+si+100]	
b.	mov ax, [0500]	
c.	mov al, [bp+si]	
d.	mov as, [si+2000]	

iii. **[2 Marks]** Mark each of these instructions Valid or Invalid. In case of Invalid, give one-line reason.

		Valid/ Invalid	Reason
a.	add 34BFh, bx		
b.	mov cs, ds		
c.	mov cs, 2345		
d.	mov [num1], ax		

iv. **[3 Marks]** What is the value of OF, CF and SF at the end of the following code? Is the jump taken or not?

```
[org 0x100]
        jmp start
num1:   db  1Bh, 27h, 4Ch, 8Eh, 0h

start:
        mov al,[num1]
        mov bl,[ num1+1]
        add al, bl
        mov bl, [num1+2]
        add al, bl
        mov bl, [num1+3]
        add al, bl
        mov [num1+4], al

        mov ax, 0x4c00
        int 0x21
```

Answer:

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v. **[3 Marks]** By considering the data given in Q1(iv) (which is stored in memory label num1), you have to complete the following table and show the data placement in memory.

Hint: Remember memory storage is shown in hex numbers here.

	0	1	2	3	4
DS:0103					

vi. **[5 Marks]** For the code given below, write the decimal values stored in memory labels var1 and var2 after the execution of the program. You also have to explain what this program is doing in one line.

```
[org 0x100]
        jmp start

array:  dw -1, 7, 9, -2, 2, 0
var1:   dw 0
var2:   dw 0

start:  mov dx, [array]
        mov bx, array
        mov [var2], dx
        mov [var1], dx
        mov cx, 6

A1:     mov dx, [bx]
        cmp dx, [var1]
        jge A2

        mov [var1], dx

A2:     cmp dx, [var2]
        jle A3

        mov [var2], dx

A3:     add bx, 2
        sub cx, 1
        jnz A1

        mov ax, 0x4c00
        int 0x21
```

Answer:

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Question 2 [10 Marks]: Write an assembly language program to perform pairwise scan operation on an array such that:

Case 1: If second element of the pair is even, then multiply 1st and 2nd element through bit manipulation and store the result in place of the first element.

Case 2: If second element of the pair is odd, then add 1st and 2nd element and store the result in the location of the first element.

Case 3: If the array contains odd number of elements, then save the last element as it is.

Assume that last element of the array is -1 an indicator to stop the array iteration, as you don't know how to input array. Just assume generic array with end element -1.

Hint: You can find even and odd number by bit manipulation. See a sample run below for detail.

Sample Run:

Example 1, even sized array (excluding the last element)	**Example 2, odd sized array (excluding the last element)**
Input Array: 3, 5, 10, 9, 12, 16, -1	**Input Array:** 3, 5, 10, 9, 12, 16, 23, -1
Output Array: 8, 5, 19, 9, 192, 16, -1	**Output Array:** 8, 5, 19, 9, 192, 16, 23, -1

Answer:

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