National University of Computer and Emerging Sciences

FAST School of Computing **Spring-2024** **Islamabad Campus**

EE-2003: Computer Organization & Assembly Language

Student Name _____ Roll No. _____ Course Section _____ Student Signature _____

Date: 4th April, 2024

Course Instructor(s)

Mehreen Javaid, Ahmad Raza, Shahbaz Hassan

Sessional-II Exam

Total Time: 1 Hour

Total Marks: 50

Do not write anything on the question paper except the information required above.

Instructions:

1. Read the question carefully, understand the question, and then attempt your answers in the provided answer booklet.
2. Verify that you have **3** printed pages of the question paper including this page. There are **Four (4)** questions.
3. Calculator sharing is strictly prohibited.
4. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking

Question 1 [10 Marks]

Carefully dry run the given program. Show complete traces of runtime stack for **both** fill and clear phases by writing the actual offset and values as provided. Stack segment starts at 1000h. Write the final values of register at the end of program and also where asked in between the code in the form of comments. Suppose data segment starts at **000Fh** offset. ***(No Need to Write Code Just Fill the Stack on Provided Answer Sheet)***.

1.	.model small
2.	.data
3.	ary db 25, 35, 52, 49, 53
4.	.code
5.	mov ax, @data
6.	mov ds, ax
7.	jmp start
8.	**MySub PROC uses dx cx**
9.	push bp
10.	mov bp,sp
11.	sub sp, 4
12.	mov word ptr [bp-4], 59
13.	mov word PTR [bp-2], 57
14.	mov dX, [bp-2] ;dX=
15.	mov dx, [bp+4] ;dx=
16.	mov bx, [bp+10] ;bx=
17.	mov dx, [bx] ;dx=
18.	mov sp, bp
19.	pop bp

20.	ret 2
21.	MySub ENDP
22.	start:
23.	**main proc**
24.	mov si, offset ary
25.	mov word ptr [si], 45h
26.	add si, 2
27.	mov dx, [si-2] ;dx=
28.	mov dx, [si] ;dx=
29.	mov di, offset ary
30.	Add di,3
31.	push di
32.	mov cx, 49
33.	push cx
34.	call MySub
35.	inc cx
36.	push cx
37.	push dx
38.	call AddTwo
39.	mov dx, ax ;dx=
40.	main endp
41.	mov ah, 4ch
42.	int 21h
43.	End main
44.	**AddTwo Proc**
45.	push bp
46.	mov bp, sp
47.	mov ax, [bp+6] ;AX=
48.	mov si, [bp+8]
49.	add ax,[si] ;AX=
50.	pop bp
51.	ret
52.	AddTwo endp

Question 2 [5 + 5 + 5 = 15 Marks]

[a]. Write an assembly code **to multiply [Ax * 42]** using Shift and rotate instructions. The value of **Accumulator register (Ax = 04).**

```
mov ax,04
mov bx,ax
mov cx,ax
shl ax,5
shl bx,3
shl cx,1
add ax,bx
add ax,cx
```

[b]. Write down the **values of each register** at each step. (0.5 mark for each correct value)

Mov ax, -96	;ax= FFA0	1111111110100000
Mov cx, 2	;cx= 0002	0000000000000010
Shl al, 2	;ax= FF80	1111111110000000
Shr ah, 3	;ax= 1F80	0001111110000000
Mov dx, ax	;dx= 1F80	0001111110000000
Sal dx, cl	;dx= 7E00	0111111000000000
Sar Ax, 1	;ax= 0FC0	0000111111000000
rcr dl, 1	;dl= 00	00000000
Shl dx, 1	;dh= FC	11111100
Rol Ax, 1	;ax= 1F80	0001111110000000

[c]. Perform the **1-bit logical left shift operation** on following **Qword Number**. You are required to write an **assembly language code**.

```
.data
  Var1 dq 45F37C4A556DE13h
.code

mov si,offset var1     ;1 marks
shl word ptr [si],1    ;1 marks
rcl word ptr [si+2],1  ;1 marks
rcl word ptr [si+4],1  ;1 marks
rcl word ptr [si+6],1  ;1 marks
```

Question 1 solution