



Computer Organization and Assembly Language

Lab 4

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Class	CS3
Section	A1
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Fast School of Computing

FAST-NU, Lahore, Pakistan

Activity 1:

Assembly Language Code

```
[org 0x0100]
mov ax, 0x5397
    mov bx,ax
    mov cx,ax
    and bx,0101010101010101b
    and cx,1010101010101010b
    shl bx,1
    shr cx,1
    or bx,cx
    mov ax,bx
mov ax,0x4c00
int 0x21
```

Debugging Screenshots

DOSBox 0.74, Cpu speed: 3000 cycles, Frames...

AX	SI	CS	IP	Stack	Flags
A36B	0000	19F5	0117	+0 0000	7280
BX A36B	DI 0000	DS 19F5		+2 20CD	
CX 0141	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 1 0 0 0 0

CMD >		1	0	1	2	3	4	5	6	7
0115	89D8	MOV	AX,BX	DS:0000	CD	20	FF	9F	00	EA F0 FE
0117	B8004C	MOV	AX,4C00	DS:0008	AD	DE	1B	05	C5	06 00 00
011A	CD21	INT	21	DS:0010	18	01	10	01	18	01 92 01
011C	46	INC	SI	DS:0018	01	01	01	00	02	FF FF FF
011D	E6C7	OUT	[C7],AL	DS:0020	FF	FF	FF	FF	FF	FF FF FF
011F	46	INC	SI	DS:0028	FF	FF	FF	FF	EB	19 C0 11
0120	F60000	TEST	[BX+SI],00	DS:0030	A2	01	14	00	18	00 F5 19
0123	8B46F6	MOV	AX,[BP-0A]	DS:0038	FF	FF	FF	FF	00	00 00 00
0126	D1E0	SHL	AX,1	DS:0040	05	00	00	00	00	00 00 00
				DS:0048	00	00	00	00	00	00 00 00

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DS:0000	CD	20	FF	9F	00	EA	F0	FE	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	02	FF	FF	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

Activity 2

Assembly Language Code

```
[org 0x0100]
    mov ax,0x5397
    mov bx,ax
    mov cx,ax
    and bx,0011001100110011b
    and cx,1100110011001100b
    shl bx,2
    shr cx,2
    or bx,cx
    mov ax,bx

mov ax,0x4c00
int 0x21
```

Debugging Screenshots

DOSBox 0.74, Cpu speed: 3000 cycles, Frames... — □ ×

AX 5C6D	SI 0000	CS 19F5	IP 0119	Stack +0 0000	Flags 7200
BX 5C6D	DI 0000	DS 19F5		+2 20CD	
CX 1021	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0

CMD >

0117 89D8	MOV	AX,BX	1	0	1	2	3	4	5	6	7
0119 B8004C	MOV	AX,4C00	DS:0000	CD	20	FF	9F	00	EA	F0	FE
011C CD21	INT	21	DS:0008	AD	DE	1B	05	C5	06	00	00
011E C746F60000	MOV	[BP-0A],0000	DS:0010	18	01	10	01	18	01	92	01
0123 8B46F6	MOV	AX,[BP-0A]	DS:0018	01	01	01	00	02	FF	FF	FF
0126 D1E0	SHL	AX,1	DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
0128 D1E0	SHL	AX,1	DS:0028	FF	FF	FF	FF	EB	19	C0	11
012A C55ED8	LDS	BX,[BP-28]	DS:0030	A2	01	14	00	18	00	F5	19
012D 01C3	ADD	BX,AX	DS:0038	FF	FF	FF	FF	00	00	00	00
			DS:0040	05	00	00	00	00	00	00	00
			DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DS:0000	CD	20	FF	9F	00	EA	F0	FE	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01	01	01	00	02	FF	FF	FF	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

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1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

Activity 3:

Assembly Language Code

```
[org 0x0100]
mov ax,0x5397
mov bx,ax
mov cx,ax
and bx,0000111100001111b
and cx,1111000011110000b
shl bx,4
shr cx,4
or bx,cx
mov ax,bx
mov ax,0x4c00
int 0x21
```

Debugging Screenshots

DOSBox 0.74, Cpu speed: 3000 cycles, Frames...

AX 3579	SI 0000	CS 19F5	IP 0119	Stack +0 0000	Flags 7200
BX 3579	DI 0000	DS 19F5		+2 20CD	
CX 0509	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 0 0

CMD >	
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0117 89D8	MOV	AX,BX	
0119 B8004C	MOV	AX,4C00	
011C CD21	INT	21	
011E C746F60000	MOV	[BP-0A],0000	
0123 8B46F6	MOV	AX,[BP-0A]	
0126 D1E0	SHL	AX,1	
0128 D1E0	SHL	AX,1	
012A C55ED8	LDS	BX,[BP-28]	
012D 01C3	ADD	BX,AX	

	0	1	2	3	4	5	6	7	
DS:0000	CD	20	FF	9F	00	EA	F0	FE	
DS:0008	AD	DE	1B	05	C5	06	00	00	
DS:0010	18	01	10	01	18	01	92	01	
DS:0018	01	01	01	00	02	FF	FF	FF	
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	
DS:0028	FF	FF	FF	FF	EB	19	C0	11	
DS:0030	A2	01	14	00	18	00	F5	19	
DS:0038	FF	FF	FF	FF	00	00	00	00	
DS:0040	05	00	00	00	00	00	00	00	
DS:0048	00	00	00	00	00	00	00	00	

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
DS:0000	CD	20	FF	9F	00	EA	F0	FE	AD	DE	1B	05	C5	06	00	00	
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	02	FF	FF	FF	
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11	
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00	
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	

1 Step	2 ProcStep	3 Retrieve	4 Help ON	5 BRK Menu	6	7 up	8 dn	9 le	10 ri
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Activity 4

Assembly Language Code

```
[org 0x0100]
mov ax,0x5397
mov bx,1111111111111111b
xor bx,ax
mov cx,ax
or ax,bx
xor cx,0x1BCD
and ax,cx
mov word[f],ax
mov ax,0x4c00
int 0x21
f:dw 0
```

Debugging Screenshots

DOSBox 0.74, Cpu speed: 3000 cycles, Frames... — ☐ X

AX 485A	SI 0000	CS 19F5	IP 0115	Stack +0 0000	Flags 7204
BX AC68	DI 0000	DS 19F5		+2 20CD	
CX 485A	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 0 0 0 1 0

CMD >				1 0 1 2 3 4 5 6 7																			
0112 A31A01				MOV		[011A],AX		DS:0000 CD 20 FF 9F 00 EA F0 FE															
0115 B8004C				MOV		AX,4C00		DS:0008 AD DE 1B 05 C5 06 00 00															
0118 CD21				INT		21		DS:0010 18 01 10 01 18 01 92 01															
011A 5A				POP		DX		DS:0018 01 01 01 00 02 FF FF FF															
011B 48				DEC		AX		DS:0020 FF FF FF FF FF FF FF FF															
011C 46				INC		SI		DS:0028 FF FF FF FF EB 19 C0 11															
011D E6C7				OUT		[C7],AL		DS:0030 A2 01 14 00 18 00 F5 19															
011F 46				INC		SI		DS:0038 FF FF FF FF 00 00 00 00															
0120 F60000				TEST		[BX+SI],00		DS:0040 05 00 00 00 00 00 00 00															
								DS:0048 00 00 00 00 00 00 00 00															

2		0 1 2 3 4 5 6 7 8 9 A B C D E F																	
DS:0000		CD 20 FF 9F 00 EA F0 FE AD DE 1B 05 C5 06 00 00																= f.Ω≡ i ..†...	
DS:0010		18 01 10 01 18 01 92 01 01 01 01 00 02 FF FF FF															ff.	
DS:0020		FF FF FF FF FF FF FF FF FF FF FF FF EB 19 C0 11																δ.L.	
DS:0030		A2 01 14 00 18 00 F5 19 FF FF FF FF 00 00 00 00																6.....J.	
DS:0040		05 00 00 00 00 00 00 00 00 00 00 00 00 00 00																

1 Step 2ProcStep 3Retrieve 4Help ON 5BRK Menu 6 7 up 8 dn 9 le 10 ri

Activity 5

Assembly Language Code

```
org 0x0100
mov ax,[roll]
mov ax,bx
not bx

mov [f],ax
shl word[f],16
add [f],bx

start: mov cl,16
        mov dx,[bx]
checkbit: shr dx,1
           jnc skip

mov ax,[roll]
add [mult],ax
mov ax,[roll+2]
adc [mult+2],ax

skip: shl word[roll],1
      rcl word[roll+2],1
      dec cl
      jnz checkbit

mov ax,[mult]
add word[f],ax
mov ax,[mult+2]
adc word[f+2],ax

mov ax,0x4c00
int 0x21
f:dd 0
roll: dw 0111011100011000b
mult: dd 0
```

Debugging Screenshots

DOSBox 0.74, Cpu speed: 3000 cycles, Frames...

AX 9923	SI 0000	CS 19F5	IP 0143	Stack +0 0000	Flags 7284
BX FFFF	DI 0000	DS 19F5		+2 20CD	
CX 0000	BP 0000	ES 19F5	HS 19F5	+4 9FFF	OF DF IF SF ZF AF PF CF
DX 0000	SP FFFE	SS 19F5	FS 19F5	+6 EA00	0 0 1 1 0 0 1 0

CMD >				1	0	1	2	3	4	5	6	7
013F	11064A01	ADC	[014A],AX	DS:0000	CD	20	FF	9F	00	EA	F0	FE
0143	B8004C	MOV	AX,4C00	DS:0008	AD	DE	1B	05	C5	06	00	00
0146	CD21	INT	21	DS:0010	18	01	10	01	18	01	92	01
0148	17	POP	SS	DS:0018	01	01	01	00	02	FF	FF	FF
0149	7724	JN	016F	DS:0020	FF	FF	FF	FF	FF	FF	FF	FF
014B	99	CWD		DS:0028	FF	FF	FF	FF	EB	19	C0	11
014C	0000	ADD	[BX+SI],AL	DS:0030	A2	01	14	00	18	00	F5	19
014E	187723	SBB	[BX+23],DH	DS:0038	FF	FF	FF	FF	00	00	00	00
0151	99	CWD		DS:0040	05	00	00	00	00	00	00	00
				DS:0048	00	00	00	00	00	00	00	00

2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DS:0000	CD	20	FF	9F	00	EA	F0	FE	AD	DE	1B	05	C5	06	00	00
DS:0010	18	01	10	01	18	01	92	01	01	01	01	00	02	FF	FF	FF
DS:0020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	EB	19	C0	11
DS:0030	A2	01	14	00	18	00	F5	19	FF	FF	FF	FF	00	00	00	00
DS:0040	05	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

1 Step	2 ProcStep	3 Retrieve	4 Help ON	5 BRK Menu	6	7 up	8 dn	9 le	10 ri
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