

**COAL**

**LAB05**

**23K2001**

**BCS-3J**

Q1:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc
.data
    var1 SDWORD 8000
.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

    add var1, 1
    mov eax, var1
    call DumpRegs

    exit
main ENDP
END main
```

The screenshot shows the Visual Studio IDE with the assembly file 'Lab05.asm' open. The code is as follows:

```
1  TITLE My Fifth Lab Tasks (Lab05.asm)
2  INCLUDE Irvine32.inc
3  .data
4      var1 SDWORD 8000
5  .code
6  main PROC
7      mov eax, 0
8      mov ebx, 0
9      mov ecx, 0
10     mov edx, 0
11
12     add var1, 1
13     mov eax, var1
14     call DumpRegs
15
16     exit
17 main ENDP
18 END main
19
```

The Microsoft Visual Studio Debug Console is open, displaying the following output:

```
EAX=00001F41  EBX=00000000  ECX=00000000  EDX=00000000
ESI=000810AA  EDI=000810AA  EBP=012FFC4C  ESP=012FFCA0
EIP=00083685  EFL=00000206  CF=0  SF=0  ZF=0  OF=0  AF=0  PF=1

C:\Users\k232001\source\repos\Lab05\Debug\Lab05.exe (process 6396) exit
To automatically close the console when debugging stops, enable Tools->
le when debugging stops.
Press any key to close this window . . .
```

Q2:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc
.data
    var1 SDWORD 8000
.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

    mov ax, 7FF0h      ; CF=0 SF=0 ZF=1 OF=0
    add al, 10h        ; CF=1 SF=0 ZF=1 OF=0
    add ah, 1          ; CF=0 SF=1 ZF=0 OF=1
    add ax, 2          ; CF=0 SF=1 ZF=0 OF=0
    call DumpRegs
    exit
main ENDP
END main
```

The screenshot shows a debugger window with the following components:

- Register Window:** Displays the state of CPU registers. EAX = 00000000, EBX = 00000000, ECX = 00000000, EDX = 00000000, ESI = 010010AA, EDI = 010010AA, EIP = 01003674, ESP = 008FF864, EBP = 008FF870, EFL = 00000246. Below this, flags are shown: OV = 0, UP = 0, EI = 1, PL = 0, ZR = 1, AC = 0, PE = 1, CY = 0.
- Assembly Window:** Displays the assembly code for 'Lab05.asm'. The code is as follows:

```
1  TITLE My Fifth Lab Tasks (Lab05.asm)
2  INCLUDE Irvine32.inc
3  .data
4      var1 SDWORD 8000
5  .code
6  main PROC
7      mov eax, 0
8      mov ebx, 0
9      mov ecx, 0
10     mov edx, 0
11
12     mov ax, 7FF0h  ≤ 1ms elapsed
13     add al, 10h
14     add ah, 1
15     add ax, 2
16     call DumpRegs
17     exit
```
- Right-Hand Side (RHS) Panel:** Contains diagnostic tools including 'Diagnostic Tools', 'Events', 'Process Monitor', 'Summary', and 'Memory Usage'.

EAX = 00007FF0 EBX = 00000000 ECX = 00000000 EDX = 00000000 ESI = 010010AA EDI = 010010AA EIP = 01003678 ESP = 008FF864 EBP = 008FF870 EFL = 00000246

OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 0

```
121 %  
Lab05.asm  
1 TITLE My Fifth Lab Tasks (Lab05.asm)  
2 INCLUDE Irvine32.inc  
3 .data  
4     var1 SDWORD 8000  
5 .code  
6 main PROC  
7     mov eax, 0  
8     mov ebx, 0  
9     mov ecx, 0  
10    mov edx, 0  
11  
12    mov ax, 7FF0h  
13    add al, 10h ≤ 1ms elapsed  
14    add ah, 1  
15    add ax, 2  
16    call DumpRegs  
17    exit
```

EAX = 00007F00 EBX = 00000000 ECX = 00000000 EDX = 00000000 ESI = 010010AA EDI = 010010AA EIP = 0100367A ESP = 008FF864 EBP = 008FF870 EFL = 00000247

OV = 0 UP = 0 EI = 1 PL = 0 ZR = 1 AC = 0 PE = 1 CY = 1

```
121 %  
Lab05.asm  
1 TITLE My Fifth Lab Tasks (Lab05.asm)  
2 INCLUDE Irvine32.inc  
3 .data  
4     var1 SDWORD 8000  
5 .code  
6 main PROC  
7     mov eax, 0  
8     mov ebx, 0  
9     mov ecx, 0  
10    mov edx, 0  
11  
12    mov ax, 7FF0h  
13    add al, 10h  
14    add ah, 1 ≤ 1ms elapsed  
15    add ax, 2  
16    call DumpRegs  
17    exit
```

EAX = 00008000 EBX = 00000000 ECX = 00000000 EDX = 00000000 ESI = 010010AA EDI = 010010AA EIP = 0100367D ESP = 008FF864 EBP = 008FF870 EFL = 00000A92

OV = 1 UP = 0 EI = 1 PL = 1 ZR = 0 AC = 1 PE = 0 CY = 0

```
121 %  
Lab05.asm  
1 TITLE My Fifth Lab Tasks (Lab05.asm)  
2 INCLUDE Irvine32.inc  
3 .data  
4     var1 SDWORD 8000  
5 .code  
6 main PROC  
7     mov eax, 0  
8     mov ebx, 0  
9     mov ecx, 0  
10    mov edx, 0  
11  
12    mov ax, 7FF0h  
13    add al, 10h  
14    add ah, 1  
15    add ax, 2 ≤ 1ms elapsed  
16    call DumpRegs  
17    exit
```

```
EAX = 00008002 EBX = 00000000 ECX = 00000000 EDX = 00000000 ESI = 010010AA EDI = 010010AA EIP = 01003681 ESP = 008FF864 EBP = 008FF870 EFL = 00000282

OV = 0 UP = 0 EI = 1 PL = 1 ZR = 0 AC = 0 PE = 0 CY = 0

121 %
Lab05.asm
1 TITLE My Fifth Lab Tasks (Lab05.asm)
2 INCLUDE Irvine32.inc
3 .data
4     var1 SDWORD 8000
5 .code
6 main PROC
7     mov eax, 0
8     mov ebx, 0
9     mov ecx, 0
10    mov edx, 0
11
12    mov ax, 7FF0h
13    add al, 10h
14    add ah, 1
15    add ax, 2
16    call DumpRegs ≤ 1ms elapsed
17    exit
```

Q3:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc
.data
    arr BYTE 61,43,11,52,25
    arrTemp BYTE 5 DUP(?)
.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

    mov al, [arr+2]
    mov [arrTemp], al

    mov al, [arr+4]
    mov [arrTemp+1], al

    mov al, [arr+1]
    mov [arrTemp+2], al

    mov al, [arr+3]
    mov [arrTemp+3], al

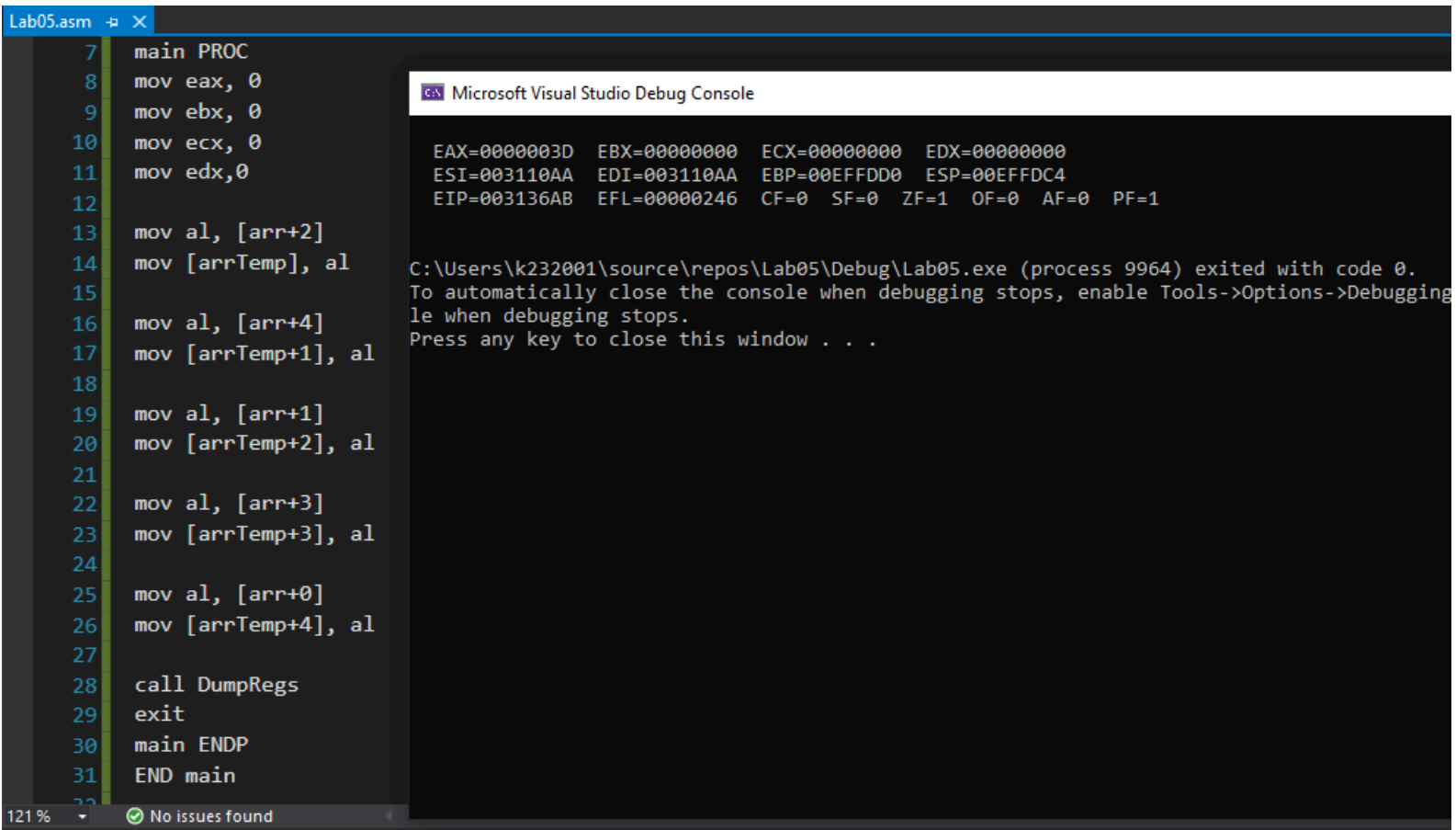
    mov al, [arr+0]
    mov [arrTemp+4], al

    call DumpRegs
```

```
exit
main ENDP
END main
```

; If the declared array was of WORD size, then while addressing each element  
; we will have to increment by 2 bytes accordingly. Eg: the third index can be accessed as  
; [wArray+4]

; If the declared array was of DWORD size, then while addressing each element  
; we will have to increment by 4 bytes accordingly. Eg: the third index can be accessed as  
; [dArray+8]



The screenshot displays the Microsoft Visual Studio interface. On the left, the 'Lab05.asm' file is open, showing assembly code for a 'main' procedure. The code includes instructions for moving values into registers (eax, ebx, ecx, edx), accessing memory at various offsets from 'arr' (e.g., [arr+2], [arr+4]), and calling 'DumpRegs' before exiting. The status bar at the bottom indicates '121 %' zoom and 'No issues found'.

On the right, the 'Microsoft Visual Studio Debug Console' is open, displaying the following information:

```
EAX=0000003D  EBX=00000000  ECX=00000000  EDX=00000000
ESI=003110AA  EDI=003110AA  EBP=00EFFDD0  ESP=00EFFDC4
EIP=003136AB  EFL=00000246  CF=0  SF=0  ZF=1  OF=0  AF=0  PF=1
```

Below the register dump, a message states: 'C:\Users\k232001\source\repos\Lab05\Debug\Lab05.exe (process 9964) exited with code 0. To automatically close the console when debugging stops, enable Tools->Options->Debugging le when debugging stops. Press any key to close this window . . .'.

## Q4:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc

.data
    arrayB BYTE 10,20,30
    arrayW WORD 150,250,350
    arrayD DWORD 600,1200,1800
    sum1 DWORD 0
    sum2 DWORD 0
    sum3 DWORD 0

.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

    movzx eax, [arrayB]
    add ax, [arrayW]
    add eax, [arrayD]
    mov sum1, eax

    movzx eax, [arrayB+1]
    add ax, [arrayW+2]
    add eax, [arrayD+4]
    mov sum2, eax

    movzx eax, [arrayB+2]
    add ax, [arrayW+4]
    add eax, [arrayD+8]
    mov sum3, eax

    mov eax, sum1
    mov ebx, sum2
    mov ecx, sum3
    call DumpRegs
    exit
main ENDP
END main
```



Microsoft Visual Studio Debug Console



```
EAX=000002F8  EBX=000005BE  ECX=00000884  EDX=00000000
ESI=009810AA  EDI=009810AA  EBP=00CFF80C  ESP=00CFF800
EIP=009836D5  EFL=00000216  CF=0   SF=0   ZF=0   OF=0   AF=1   PF=1
```

```
E:\Visual Studio Projects\COAL Lab05\Debug\COAL Lab05.exe (process 21432)
To automatically close the console when debugging stops, enable Tools->Options->
Enable console when debugging stops.
Press any key to close this window . . .|
```

Q5:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc

.data
    array1 BYTE 10,20,30,40
    array2 BYTE 4 DUP(?)
    arrSize BYTE 4

.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

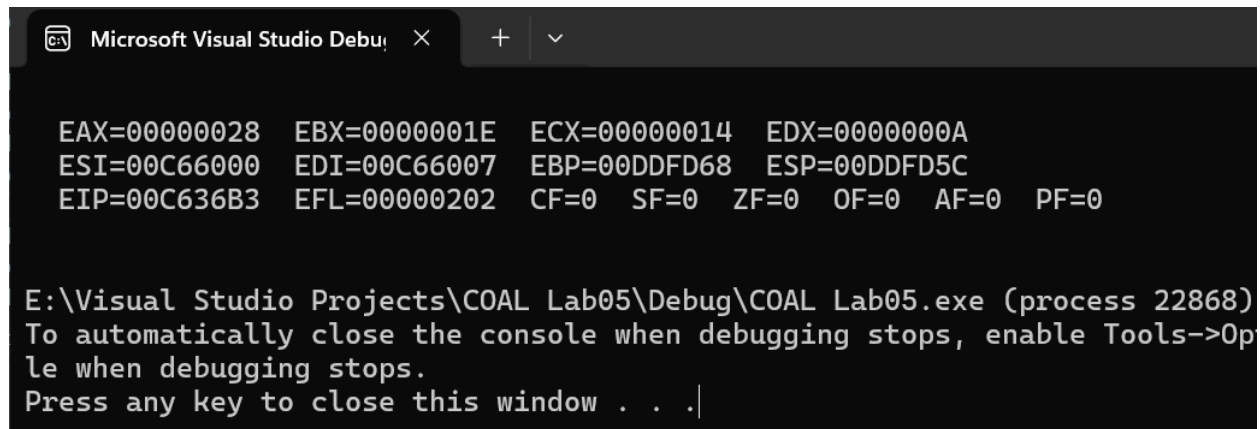
    mov esi, OFFSET array1
    add esi, 3
    mov al, [esi]
    mov edi, OFFSET array2
    mov [edi], al

    DEC esi
    mov al, [esi]
    INC edi
    mov [edi], al

    DEC esi
    mov al, [esi]
    INC edi
    mov [edi], al

    DEC esi
    mov al, [esi]
    INC edi
    mov [edi], al

    mov al, [array2]
    mov bl, [array2+1]
    mov cl, [array2+2]
    mov dl, [array2+3]
    call DumpRegs
    exit
main ENDP
END main
```



Microsoft Visual Studio Debug Console

EAX=00000028	EBX=0000001E	ECX=00000014	EDX=0000000A
ESI=00C66000	EDI=00C66007	EBP=00DDFD68	ESP=00DDFD5C
EIP=00C636B3	EFL=00000202	CF=0	SF=0 ZF=0 OF=0 AF=0 PF=0

E:\Visual Studio Projects\COAL Lab05\Debug\COAL Lab05.exe (process 22868)  
To automatically close the console when debugging stops, enable Tools->Options->Debug Console->Close when debugging stops.  
Press any key to close this window . . .|



Q6:

```
TITLE My Fifth Lab Tasks (Lab05.asm)
INCLUDE Irvine32.inc

.data
    array DWORD 2001, 2005, 2024, 2077, 2100
    res DWORD ?

.code
main PROC
    mov eax, 0
    mov ebx, 0
    mov ecx, 0
    mov edx, 0

    mov esi, OFFSET array
    mov eax, [esi]
    mov ebx, [esi+4]
    sub eax, ebx

    mov ebx, [esi+8]
    sub eax, ebx

    mov ebx, [esi+12]
    sub eax, ebx

    mov ebx, [esi+16]
    sub eax, ebx

    mov res, eax
    call DumpRegs
    exit
main ENDP
END main
```

```
array DWORD 2001, 2005, 2024, 2077, 2100
res DWORD ?
```

```
.code
```

```
main PROC
```

```
mov eax, 0
```

```
mov ebx, 0
```

```
mov ecx, 0
```

```
mov edx, 0
```

```
mov esi, OFFSET array
```

```
mov eax, [esi]
```



Microsoft Visual Studio Debug



EAX=FFFFE7C3

EBX=00000834

ECX=00000000

EDX=00000000

ESI=00036000

EDI=000310AA

EBP=008FFA28

ESP=008FFA1C

EIP=00033699

EFL=00000286

CF=0

SF=1

ZF=0

OF=0

AF=0

PF=1

Q7:

```
Lab05.asm  + X
1  TITLE My Fifth Lab Tasks (Lab05.asm)
2  INCLUDE Irvine32.inc
3  .data
4      arrayB BYTE 60, 70, 80
5      arrayW WORD 150, 250, 350
6      arrayD DWORD 600, 1200, 1800
7      first DWORD ?
8      last DWORD ?
9  .code
10 main PROC
11     mov eax, 0
12     mov ebx, 0
13     mov ecx, 0
14     mov edx, 0
15
16     mov esi, 0
17     mov al, arrayB[esi*TYPE arrayB]
18     add ax, arrayW[esi*TYPE arrayW]
19     add eax, arrayD[esi*TYPE arrayD]
20     mov first, eax
21
22     mov eax, 0
23     mov esi, 2
24     mov al, arrayB[esi*TYPE arrayB]
25     add ax, arrayW[esi*TYPE arrayW]
26     add eax, arrayD[esi*TYPE arrayD]
27     mov last, eax
28
29     mov eax, first
30     mov ebx, last
31     call DumpRegs
```

Microsoft Visual Studio Debug Console

EAX=00000032A EBX=0000008B6 ECX=000000000 EDX=000000000  
ESI=000000002 EDI=007D10AA EBP=0070FBA8 ESP=0070FB9C  
EIP=007D36C9 EFL=000000212 CF=0 SF=0 ZF=0 OF=0 AF=1 PF=0

E:\Visual Studio Projects\COAL Lab05\Debug\COAL Lab05.exe (process  
To automatically close the console when debugging stops, enable To  
le when debugging stops.  
Press any key to close this window . . .|