

ASSIGNMENT # 1

Computer Organization and Assembly Language

Note: Attempt all Questions by making code and output

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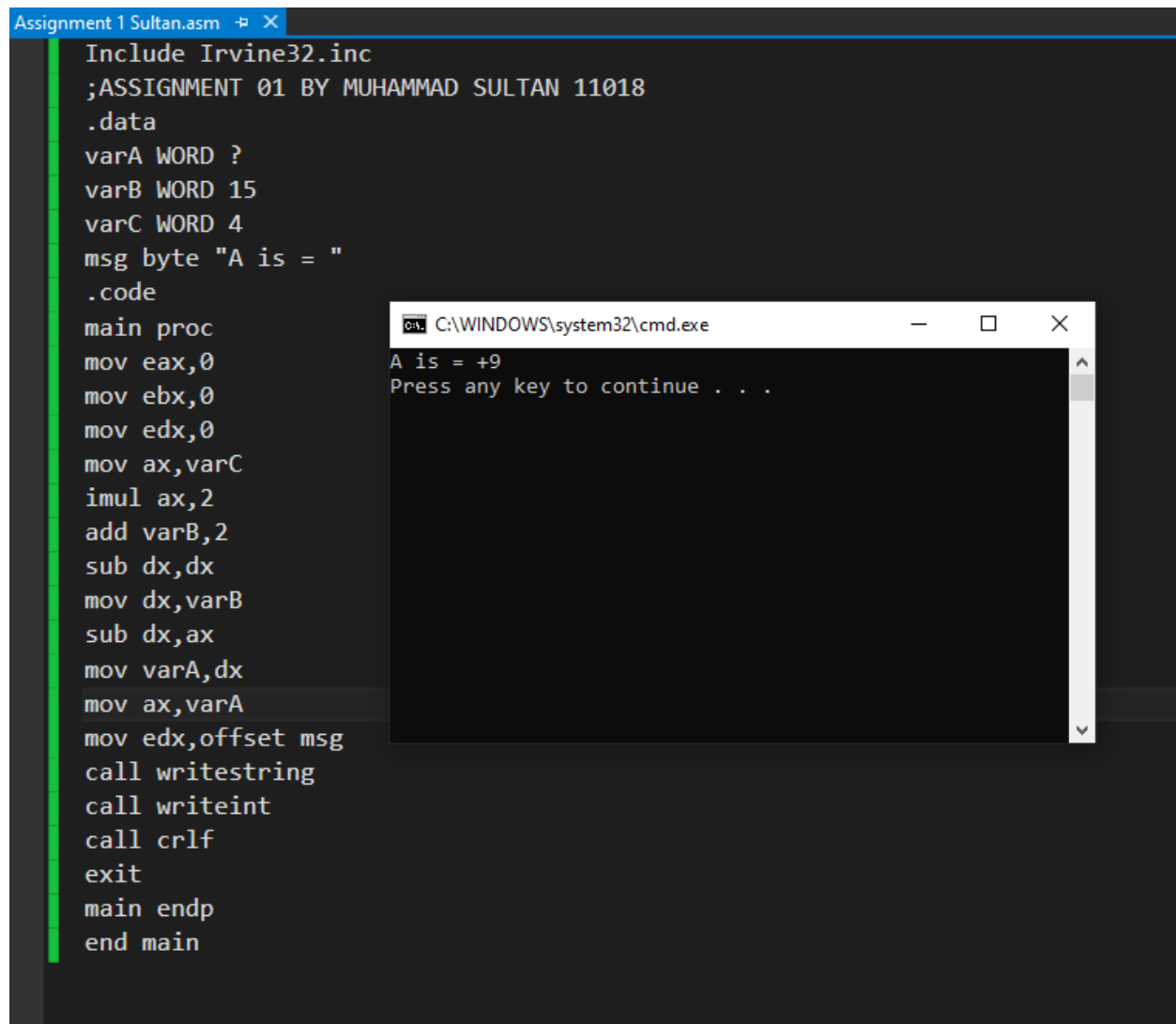
Question 01:

Using only basic arithmetic instructions, translate the given statement into assembly Language code.

Assume A, B and C are word variables

$$A = B + 2 - (C * 2)$$

Answer to Q1

The image shows a screenshot of a Windows environment. On the left, a text editor window titled 'Assignment 1 Sultan.asm' contains assembly code. The code includes Irvine32.inc, sets a title, defines variables varA, varB, and varC, and contains a main procedure that calculates a value and prints it. On the right, a command prompt window titled 'C:\WINDOWS\system32\cmd.exe' shows the output of the program: 'A is = +9' followed by a prompt to press any key to continue.

```
Assignment 1 Sultan.asm
Include Irvine32.inc
;ASSIGNMENT 01 BY MUHAMMAD SULTAN 11018
.data
varA WORD ?
varB WORD 15
varC WORD 4
msg byte "A is = "
.code
main proc
mov eax,0
mov ebx,0
mov edx,0
mov ax,varC
imul ax,2
add varB,2
sub dx,dx
mov dx,varB
sub dx,ax
mov varA,dx
mov ax,varA
mov edx,offset msg
call writestring
call writeint
call crlf
exit
main endp
end main
```

```
C:\WINDOWS\system32\cmd.exe
A is = +9
Press any key to continue . . .
```

Question 02:

Write a program that displays the smallest and largest of five variables. The five variables are num1, num2, num3, num4 and num5 and are taken from user input.

Answer to Q2

Assignment1 Sultan.asm

```
Include Irvine32.inc
;ASSIGNMENT 01 BY MUHAMMAD SULTAN 11018
.data
msg1 byte "Enter the first number: ",0
msg2 byte "Enter the second number: ",0
msg3 byte "Enter the third number: ",0
msg4 byte "Enter the fourth number: ",0
msg5 byte "Enter the fifth number: ",0

msglargest byte "The Largest number is: ",0
msgsmallest byte "The Smallest number is: ",0
num1 dword ?
num2 dword ?
num3 dword ?
num4 dword ?
num5 dword ?
smallestnum dword ?
largestnum dword ?
.code
main proc
mov edx,offset msg1
call writestring
call readint
mov num1,eax
mov edx,offset msg2
call writestring
call readint
mov num2,eax
mov edx,offset msg3
call writestring
call readint
mov num3,eax
mov edx,offset msg4
call writestring
call readint
mov num4,eax
mov edx,offset msg5
call writestring
```

C:\WINDOWS\system32\cmd.exe

```
Enter the first number: 23
Enter the second number: 31
Enter the third number: 58
Enter the fourth number: 22
Enter the fifth number: 6
The Largest number is: 58
The Smallest number is: 6
Press any key to continue . . .
```

Assignment 1 Sultan.asm

```
call writestring
call readint
mov num4,eax
mov edx,offset msg5
call writestring
call readint
mov num5,eax
mov eax,0
mov eax,num1
mov ebx,num2
mov ecx,num3
mov edx,num4
mov ebp,num5
.if eax>ebx
mov largestnum,eax
.endif
.if ebx>ecx
mov largestnum,ebx
.endif
.if ecx>edx
mov largestnum,ecx
.endif
.if edx>ebp
mov largestnum,edx
.endif
.if ebp>eax
mov largestnum,ebp
.endif

.if eax<ebx
mov smallestnum,eax
.endif
.if ebx<ecx
mov smallestnum,ebx
.endif
.if ecx<edx
mov smallestnum,ecx
.endif
```

C:\WINDOWS\system32\cmd.exe

```
Enter the first number: 23
Enter the second number: 31
Enter the third number: 58
Enter the fourth number: 22
Enter the fifth number: 6
The Largest number is: 58
The Smallest number is: 6
Press any key to continue . . .
```

```
Assignment 1 Sultan.asm  X
.endif
.if ebp>eax
mov largestnum,ebp
.endif

.if eax<eax
mov smallestnum,eax
.endif
.if ebx<eax
mov smallestnum,ebx
.endif
.if ecx<eax
mov smallestnum,ecx
.endif
.if edx<eax
mov smallestnum,edx
.endif
.if ebp<eax
mov smallestnum,ebp
.endif

mov eax ,largestnum
mov edx,offset msglargest
call writestring
call writedec
call crlf
mov eax ,smallestnum
mov edx,offset msgsmallest
call writestring
call writedec
call crlf
exit
main endp
end main
```

```
C:\WINDOWS\system32\cmd.exe
Enter the first number: 23
Enter the second number: 31
Enter the third number: 58
Enter the fourth number: 22
Enter the fifth number: 6
The Largest number is: 58
The Smallest number is: 6
Press any key to continue . . .
```

Question 03:

Perform the following INSTRUCTIONS on given values of registers and write FLAG values after execution.

| AX/AL | BX/BL | INSTRUCTION | FLAG VALUE |
|-------|-------|-------------|-------------------------|
| 02h | FFh | MUL BL | SF= 1 OF=1 ZF= 0 |
| FFFFh | 02h | DIV BL | SF=0 OF=0 ZF=1 |
| 3AD1h | AD2Bh | ADD AX,BX | SF= 1 OF= 0 ZF= 0 |

```
Assignment 01 Sultan.asm*  -  X
Include Irvine32.inc
;Assignmnet 01 by MUHAMMAD SULTAN 11018
.data
.code
main proc
mov EAX,0
mov EBX,0
mov AL,02h
mov BL,0ffh
mul BL
call dumpregs
exit
main endp
end main
```

C:\WINDOWS\system32\cmd.exe

EAX=000001FE EBX=000000FF ECX=00D81005 EDX=00D81005
ESI=00D81005 EDI=00D81005 EBP=010FF824 ESP=010FF818
EIP=00D834C5 EFL=00000A83 CF=1 SF=1 ZF=0 OF=1 AF=0 PF=0

Press any key to continue . . .

```
Assignment 01 Sultan.asm  -  X
Include Irvine32.inc
;Assignmnet 01 by MUHAMMAD SULTAN 11018
.data
.code
main proc
mov EAX,0
mov EBX,0
call dumpregs
mov AX,0ffffh
mov BX,02h
div BL
call dumpregs
exit
main endp
end main
```

C:\WINDOWS\system32\cmd.exe

EAX=00000000 EBX=00000000 ECX=009D1005 EDX=009D1005
ESI=009D1005 EDI=009D1005 EBP=0087F95C ESP=0087F950
EIP=009D34BF EFL=00000246 CF=0 SF=0 ZF=1 OF=0 AF=0 PF=1

Press any key to continue . . .

The image shows a screenshot of a Windows environment. On the left, a text editor window titled 'Assignment 01 Sultan.asm' contains the following assembly code:

```
Include Irvine32.inc
;Assignmnet 01 by MUHAMMAD SULTAN 11018
.data
.code
main proc
mov EAX,0
mov EBX,0
mov AX,03ad1h
mov BX,0ad2bh
add AX,BX
call dumpregs
call crlf
exit
main endp
end main
```

On the right, a command prompt window titled 'C:\WINDOWS\system32\cmd.exe' displays the output of the program. It shows the state of various CPU registers and flags, followed by a carriage return and a prompt to press any key to continue.

```
EAX=0000E7FC  EBX=0000AD2B  ECX=00581005  EDX=00581005
ESI=00581005  EDI=00581005  EBP=00B3F944  ESP=00B3F938
EIP=005834CA  EFL=00000286  CF=0   SF=1   ZF=0   OF=0   AF=0   PF=1

Press any key to continue . . .
```

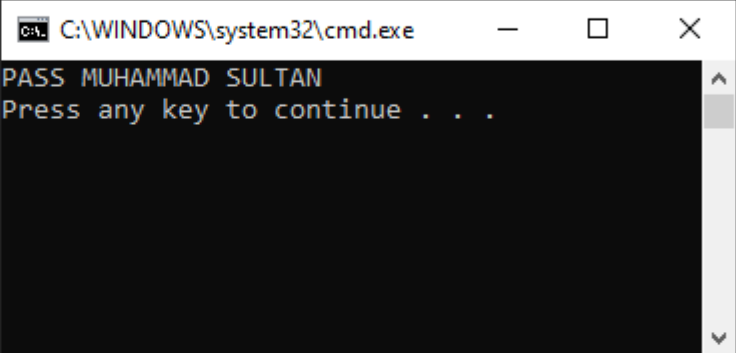
Question 04:

Convert below given statement into assembly language code:

IF ((X < Y) and (Z > T)) or (A > B) THEN stmt1;

Answer to Q4

```
Assignment 1 Sultan.asm
Include Irvine32.inc
;ASSIGNMENT 01 BY MUHAMMAD SULTAN 11018
.data
stmt1 byte "PASS MUHAMMAD SULTAN" , 0dh,0ah,0
varX dword 4
varY dword 9
varZ dword 16
varT dword 10
varA dword 25
varB dword 11
.code
main proc
mov eax,varX
mov ebx,varY
mov ecx,varZ
mov edx,varT
mov ebp,varA
mov esi,varB
.if eax<ebx && ecx> edx || ebp > esi
mov edx,offset stmt1
call writestring
.endif
exit
main endp
end main
```



Question 05:

Make a program that prints a pyramid with 'numbers' and stearic "*" in the below given manner:

C:\WINDOWS\system32\cmd.exe

```
12
****
343434
*****
5656565656
*****
787878787878
*****
Press any key to continue . . .
```

Answer to Q5

Assignment 01 Sultan.asm* X

```
Include Irvine32.inc
;Assignmnet 01 By MUHAMMAD SULTAN 11018
.data
space byte " ",0
star byte "**",0
var1 dword 0,0
var2 dword 0,0
var3 dword 0,0
var4 dword 0,0
.code
main proc
mov ecx,1
.while ecx <= 7
mov var3,10
.while var3 >ecx
mov edx,offset space
call writestring
dec var3
.endw
mov var1,1
.while var1 <= ecx
mov eax,ecx
call writedec
inc eax
inc var1
call writedec
.endw
call crlf
mov var2,1
mov ebx,ecx
add ebx,1
mov var4,9
```

Assignment 01 Sultan.asm* -# X

```
inc eax
inc var1
call writedec
.endw
call crlf
mov var2,1
mov ebx,ecx
add ebx,1
mov var4,9
.while var4 > ecx
mov edx,offset space
call writestring
dec var4
.endw
.while var2 <= ebx
mov edx,offset star
call writestring
inc var2
.endw
call crlf
inc ecx
.endw
exit
main endp
end main
```

```
C:\WINDOWS\system32\cmd.exe

12
****
2323
*****
343434
*****
45454545
*****
5656565656
*****
676767676767
*****
78787878787878
*****
Press any key to continue . . .
```