Microprocessors and Microcontrollers Lab

Digital Assignment 2

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22BKT0058

Aim:

i.) **To create an Assembly Language Program to find factorial of a number and find nCr and nPr.**

ii.) **To create an Assembly Language Program to find the sum of two 32-bit number and product of two 16-bit number.**

Procedure:

i.) Start up the Keil µVision Software.
ii.) Create new µVision project at required directory.
iii.) Set the device as 8051 microcontroller (AT89C51).
iv.) Create new item at Source Group 1 in Target 1.
v.) Set the file type as ASM file.
vi.) Continue writing the code for the ALP.
vii.) Translate and build the file.
viii.) Start debug session, and run code line by line to get output
ix.) Check output at the memory location set, in memory 1.

Code:

a.) To find factorial of a number:-

```
1    MOV R2, #05H
2    MOV A, #01H
3    LOOP: MOV B, R2
4    MUL AB
5    DJNZ R2, LOOP
6    MOV 30H, A
7    MOV A, B
8    MOV 31H, A
9    END
10
```

b.) To calculate permutation (nPr):-

```
1    MOV  30H, #7H
2    MOV 31H, #3H
3
4    MOV R0, 31H
5    MOV R2, 30H
6    MOV A,#01H
7
8    LOOP:MOV B, R2
9    MUL AB
10   DEC R2
11   DJNZ R0, LOOP
12
13   MOV 32H, A
14   END
```

c.) To calculate combination (nCr):-

```
1   MOV   30H, #07H
2   MOV 31H, #03H
3
4   MOV A, 30H
5   MOV B, 31H
6   SUBB A, B
7   MOV 32H, A
8
9   MOV R0, 31H
10  MOV R2, 30H
11  MOV A,#01H
12
13  LOOP:MOV B, R2
14  MUL AB
15  DEC R2
16  DJNZ R0, LOOP
17
18  MOV 33H, A
19  MOV A, #01H
20  MOV R1, 31H
21
22  LOOP1:MOV B, R1
23  MUL AB
24  DJNZ R1, LOOP1
25
26  MOV B, A
27  MOV A, 33H
28  DIV AB
29
30  MOV 33H, A
31
32  END
```

d.) To add two 32bit numbers

```
1    MOV 30H, #04H
2    MOV 31H, #03H
3    MOV 32H, #02H
4    MOV 33H, #01H
5    MOV 40H, #0ffH
6    MOV 41H, #0feH
7    MOV 42H, #0deH
8    MOV 43H, #0ceH
9    MOV R2, #04H
10   MOV R0, #30H
11   MOV R1, #40H
12   CLR C
13   START:
14   MOV A, @R0
15   ADDC A, @R1
16   MOV @R0, A
17   INC R0
18   INC R1
19   DJNZ R2, START
20   MOV 00H, C
21   END
22
```

e.) To multiply two 16 bit numbers

```
1    MOV 30H, #0ffH
2    MOV 31H, #0ffH
3    MOV 40H, #0ffH
4    MOV 41H, #0ffH
5    MOV A, 30H
6    MOV B, 40H
7    MUL AB
8    MOV 50H, A
9    MOV 51H, B
10   MOV A, 31H
11   MOV B, 41H
12   MUL AB
13   MOV 52H, A
14   MOV 53H, B
15   MOV A, 31H
16   MOV B, 40H
17   MUL AB
18   ADD A, 51H
19   MOV 51H, A
20   MOV A, B
21   ADDC A, 52H
22   MOV 52H, A
23   MOV A, 53H
24   ADDC A, #00H
25   MOV 53H, A
26   MOV A, 30H
27   MOV B, 41H
28   MUL AB
29   ADD A, 51H
30   MOV 51H, A
31   MOV A, B
32   ADDC A, 52H
33   MOV 52H, A
34   MOV A, 53H
35   ADDC A, #00H
36   MOV 53H, A
37
38   END
```

Output:

a.) To find Factorial of a number

b.) To calculate nPr

Registers / Disassembly:
```
C:0x000F   00   NOP
C:0x0010   00   NOP
C:0x0011   00   NOP
C:0x0012   00   NOP
```

Prog1.a51
```
1    MOV R2, #05H
2    MOV A, #01H
3    LOOP: MOV B, R2
4    MUL AB
5    DJNZ R2, LOOP
6    MOV 30H, A
7    MOV A, B
8    MOV 31H, A
9    END
10
```

Command:
```
Running with Code Size Limit: 2K
Load "D:\\New Folder\\Micro DAs\\DA2\\NewProj\\Objects\\Prog1"
*** error 65: access violation at C:0x000F : no 'execute/read' permission
```


c.) To calculate nCr

Registers / Disassembly:
```
C:0x0014   00   NOP
C:0x0015   00   NOP
C:0x0016   00   NOP
C:0x0017   00   NOP
```

Prog1.a51
```
1    MOV  30H, #7H
2    MOV 31H, #3H
3
4    MOV R0, 31H
5    MOV R2, 30H
6    MOV A,#01H
7
8    LOOP:MOV B, R2
9    MUL AB
10   DEC R2
11   DJNZ R0, LOOP
12
13   MOV 32H, A
14   END
```
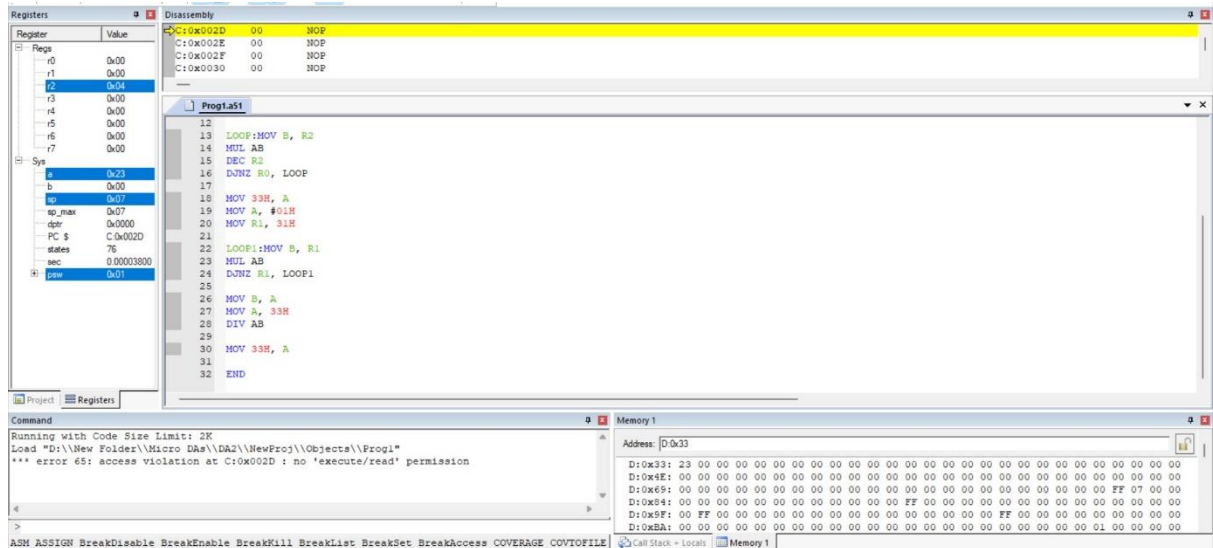
Command:
```
Running with Code Size Limit: 2K
Load "D:\\New Folder\\Micro DAs\\DA2\\NewProj\\Objects\\Prog1"
*** error 65: access violation at C:0x0014 : no 'execute/read' permission
```

d.) To add two 32bit numbers

Registers panel:
```
Register   Value
Regs
 r0        0x00
 r1        0x00
 r2        0x04
 r3        0x00
 r4        0x00
 r5        0x00
 r6        0x00
 r7        0x00
Sys
 a         0x23
 b         0x00
 sp        0x07
 sp_max    0x07
 dptr      0x0000
 PC $      C:0x002D
 states    76
 sec       0.00003800
 psw       0x01
```

Disassembly:
```
C:0x002D    00    NOP
C:0x002E    00    NOP
C:0x002F    00    NOP
C:0x0030    00    NOP
```

Prog1.a51:
```
12
13  LOOP:MOV B, R2
14  MUL AB
15  DEC R2
16  DJNZ R0, LOOP
17
18  MOV 33H, A
19  MOV A, #01H
20  MOV R1, 31H
21
22  LOOP1:MOV B, R1
23  MUL AB
24  DJNZ R1, LOOP1
25
26  MOV B, A
27  MOV A, 33H
28  DIV AB
29
30  MOV 33H, A
31
32  END
```

Command:
```
Running with Code Size Limit: 2K
Load "D:\\New Folder\\Micro DAs\\DA2\\NewProj\\Objects\\Prog1"
*** error 65: access violation at C:0x002D : no 'execute/read' permission
```

Memory 1 Address: D:0x33
```
D:0x33: 23 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0x4E: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0x69: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 07 00 00
D:0x84: 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00
D:0x9F: 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00
D:0xBA: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 00
```


e.) To multiply two 16bit numbers

Registers panel:
```
Register   Value
Regs
 r0        0x34
 r1        0x44
 r2        0x00
 r3        0x00
 r4        0x00
 r5        0x00
 r6        0x00
 r7        0x00
Sys
 a         0xcf
 b         0x00
 sp        0x07
 sp_max    0x07
 dptr      0x0000
 PC $      C:0x0028
 states    50
 sec       0.00002500
 psw       0x00
```

Disassembly:
```
C:0x0028    00    NOP
C:0x0029    00    NOP
C:0x002A    00    NOP
C:0x002B    00    NOP
```

Prog1.a51:
```
1   MOV 30H, #04H
2   MOV 31H, #03H
3   MOV 32H, #02H
4   MOV 33H, #01H
5   MOV 40H, #0ffH
6   MOV 41H, #0feH
7   MOV 42H, #0deH
8   MOV 43H, #0ceH
9   MOV R2, #04H
10  MOV R0, #30H
11  MOV R1, #40H
12  CLR C
13  START:
14  MOV A, @R0
15  ADDC A, @R1
16  MOV @R0, A
17  INC R0
18  INC R1
19  DJNZ R2, START
20  MOV 00H, C
21  END
22
```

Command:
```
Running with Code Size Limit: 2K
Load "D:\\New Folder\\Micro DAs\\DA2\\NewProj\\Objects\\Prog1"
*** error 65: access violation at C:0x0028 : no 'execute/read' permission
```
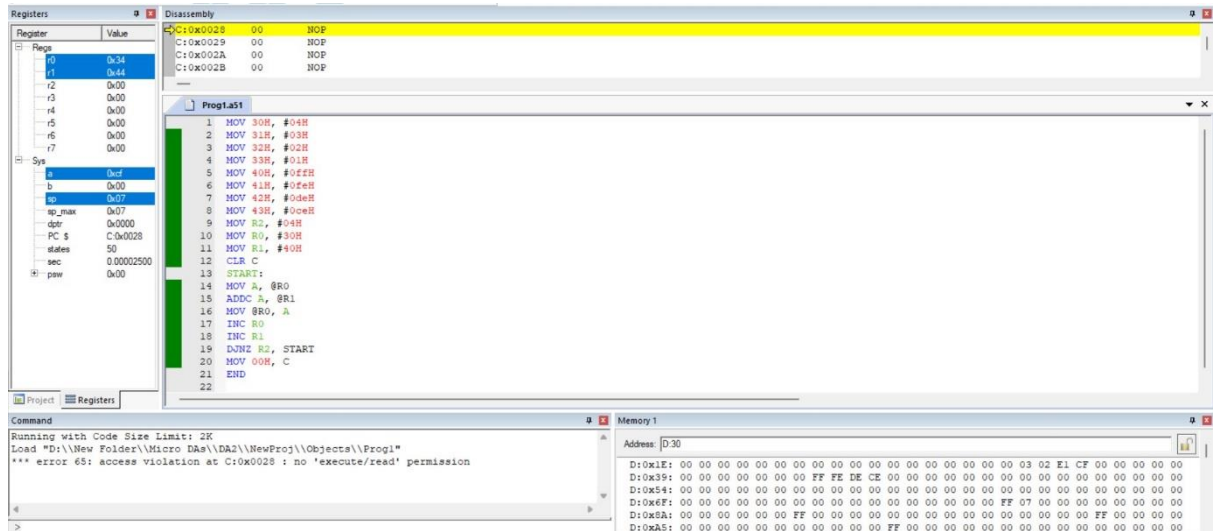
Memory 1 Address: D:30
```
D:0x1E: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 03 02 E1 CF 00 00 00 00
D:0x39: 00 00 00 00 00 00 00 FF FE DE CE 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0x54: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0x6F: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 07 00 00 00 00 00 00 00
D:0x8A: 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00
D:0xA5: 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

Registers

Register	Value
Regs	
r0	0x00
r1	0x00
r2	0x00
r3	0x00
r4	0x00
r5	0x00
r6	0x00
r7	0x00
Sys	
a	0xff
b	0xfe
sp	0x07
sp_max	0x07
dptr	0x0000
PC $	C:0x004E
states	58
sec	0.00002900
psw	0x00

Project   Registers

Disassembly

```
C:0x004E   00      NOP
C:0x004F   00      NOP
C:0x0050   00      NOP
C:0x0051   00      NOP
```

Prog1.a51 | STARTUP.A51

```
14    MOV 53H, B
15    MOV A, 31H
16    MOV B, 40H
17    MUL AB
18    ADD A, 51H
19    MOV 51H, A
20    MOV A, B
21    ADDC A, 52H
22    MOV 52H, A
23    MOV A, 53H
24    ADDC A, #00H
25    MOV 53H, A
26    MOV A, 30H
27    MOV B, 41H
28    MUL AB
29    ADD A, 51H
30    MOV 51H, A
31    MOV A, B
32    ADDC A, 52H
33    MOV 52H, A
34    MOV A, 53H
35    ADDC A, #00H
36    MOV 53H, A
37
38    END
```

Command

```
Running with Code Size Limit: 2K
Load "D:\\New Folder\\Micro DAs\\DA2\\NewProj\\Objects\\Prog1"
*** error 65: access violation at C:0x004E : no 'execute/read' permission
>
```

ASM ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE COVTOFILE

Memory 1

Address: D:0x50

```
D:0x50: 01 00 FE FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0x6B: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 07 00 00 00 00
D:0x86: 00 00 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF
D:0xA1: 00 00 00 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0xBC: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D:0xD7: 00 00 00 00 00 00 00 00 00 00 FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FE 00
```

Call Stack + Locals | Memory 1

Simulation   t1: 0.00002900 sec   L:38 C:4   CAP NUM SCRL OVR R/W