EE2003: COMPUTER ORGANIZATION

ASSIGNMENT – 1

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Question (P12):

Write a program to multiply two positive numbers by a repeated addition method. For example, to multiply 5 X 4, the program evaluates the product by adding 5 four times.

Use this to implement following expression:

(A x B) + (C x D)

Logic Used:

I have used 2 loops, one for each multiplication.

For performing (A x B), the steps used are:

- Take the negative of A and store in CNT.
  - Actually taking compliment and adding 1 to A gives us a number in which if original A is added then due to overflow, all the bits set to 0.
  - So in some sense we can use this concept as a counting mechanism to be used in loops
- Keep adding B to the accumulator and incrementing CNT until CNT is 0.

Similarly repeat for the second multiplication (C x D).

Program:

```
LDA A
CMA
INC
STA CNT
CLA

LOOP1,
ADD B
ISZ CNT
BUN LOOP1
STA RESULT

LDA C
CMA
INC
STA CNT
LDA RESULT

LOOP2,
ADD D
ISZ CNT
BUN LOOP2
STA RESULT
HLT
```

Inputs:

A, HEX 0002

B, HEX 0007

C, HEX 0004

D, HEX 0003

CNT, HEX 0000

RESULT, HEX 0000

Result:

001A {(2 x 7) + (4 x 3) = Dec 26 = Hex 001A}

Output:

RAM:

Label	Address	Instruction	Hex
	000	LDA A	2013
	001	CMA	7200
	002	INC	7020
	003	STA CNT	3017
	004	CLA	7800
LOOP1	005	ADD B	1014
	006	ISZ CNT	6017
	007	BUN LOOP1	4005
	008	STA RESULT	3018
	009	LDA C	2015
	00A	CMA	7200
	00B	INC	7020
	00C	STA CNT	3017
	00D	LDA RESULT	2018
LOOP2	00E	ADD D	1016
	00F	ISZ CNT	6017
	010	BUN LOOP2	400E
	011	STA RESULT	3018
	012	HLT	7001

Label	Address	Instruction	Hex
A	013	HEX 0002	0002
B	014	HEX 0007	0007
C	015	HEX 0004	0004
D	016	HEX 0003	0003
CNT	017		0000
RESULT	018		001A