



K. J. Somaiya College of Engineering, Mumbai-77

(Autonomous College Affiliated to University of Mumbai)

Batch: B1 Roll No.: 1711072

Experiment / assignment / tutorial No. 5

Grade: AA / AB / BB / BC / CC / CD / DD

Signature of the Staff In-charge with date

Title: To find the value of $2^x - 1$ and to find the square-root of a number using 8087 instruction set.

Objective: To understand usage of the instruction set of 8087

Expected Outcome of Experiment:

CO 3: Analyze the techniques for faster execution of instructions and enhance performance of microprocessors

Books/ Journals/ Websites referred:

Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: By Liu & Gibson (PHI Publication).

Pre Lab/ Prior Concepts:

What are the Transcendental Instruction 8087?

Instructions used:

1. FINIT:

This instruction used to initialize 8087. Disables interrupt.

Syntax:

FINIT

2. FLD instruction:

This instruction is used to load stack with some value. It is like PUSH operation. It decrement stack pointer by 1 and copies number into stack top (ST or ST(0))



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Example

FLD 4.6

3. FMUL instruction:

This instruction performs multiplication between ST(0) & ST(1) and store result in ST(0)

Examples:

FMUL ST(0) := ST(0) * ST(1)

FMUL i ST(0) := ST(0) * i

FMUL i,0 ST(i) := ST(i) * ST(0)

FMUL 0,i ST(0) := ST(0) * ST(i)

FMUL mem4r ST(0) := ST(0) * mem4r

FMUL mem8r ST(0) := ST(0) * mem8r

4. FSQRT instruction:

Calculate square root of ST & store result in ST.

Example:

FLD 4.0

FSQRT

5. F2XM1 instruction:

It $2^X - 1$ where $0 \leq x \leq 0.5$. X must be in ST & result will be in ST.

Syntax:

F2XM1

Eg:

F2XM1

Algorithm:

DATA SEGMENT

A DD 9.0

B DD 0.25

DATA ENDS

CODE SEGMENT

ASSUME CS:CODE, DS:DATA

START:

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MOV AX, DATA

```
MOV DS, AX
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FINIT

FLD A

FSQRT

FST ST(3)

FLD B

F2XM1

FST ST(2)

MOV AH, 4CH

INT 21H

CODE ENDS

END START

Output Screen:

Command Prompt - tlink 8087.obj - td 8087.exe

File Edit View Run Breakpoints Data Options Window Help

CPU Pentium Pro

| | | | | |
|------------------|-----------------------|----|------|-----|
| cs:0018 9B | wait | ax | 173D | c=0 |
| cs:0019 D9160800 | fst dword ptr[0008] | bx | 0000 | z=0 |
| cs:001D C3 | ret | cx | 0000 | s=0 |
| cs:001E 55 | push bp | dx | 0000 | o=0 |
| cs:001F 8HEC | mov bp,sp | si | 0000 | p=0 |
| cs:0021 83EC04 | sub sp,0004 | di | 0000 | a=0 |
| cs:0024 FF7604 | push word ptr [bp+04] | bp | 0000 | i=1 |
| cs:0027 16 | push ss | sp | 0000 | d=0 |
| cs:0028 8D46FC | lea ax,[bp-04] | ds | 173D | |
| cs:002B 50 | push ax | es | 172D | |
| cs:002C 90 | | | | |
| cs:002D 0E | | | | |
| cs:002E E84F9A | | | | |

[[1]-80387 IPR=173F6 OPCODE=000 OPTR=173D4-2-[[1]]

Valid SI(0) 3

Valid SI(1) 0.18920711500272107

Empty SI(2)

Empty SI(3)

Empty SI(4)

Empty SI(5)

Empty SI(6)

Empty SI(7)

| | | |
|---------------|-------|------|
| es:0000 CD 20 | im=1 | ie=0 |
| es:0008 1D F0 | dm=1 | de=0 |
| es:0010 B9 0F | zm=1 | ze=0 |
| es:0018 01 01 | om=1 | oe=0 |
| | um=1 | ue=0 |
| | pm=1 | pe=1 |
| | iem=0 | ir=0 |
| | pc=3 | cc=0 |
| | rc=0 | st=6 |
| | ic=0 | |

F1-Help F2-Bkpt F3-Mod F4-Here F5-Zoom F6-Next F7-Trace F8-Step F9-Run F10-Menu

Conclusion: The program was executed successfully in TASM. The program gave appropriate results.



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Post Lab Descriptive Questions (Add questions from examination point view)

Explain various types of instruction sets in 8087

INSTRUCTION SET

The 8087 instruction mnemonics begins with the letter F which stands for Floating point and distinguishes from 8086. These are grouped into Four functional groups.

The 8087 detects an error condition instruction it will set the bit in its Status register. Types:

- I. DATA TRANSFER INSTRUCTIONS.
- II. ARIT
- III. COMPARE INSTRUCTIONS.
- IV. TRANSCENDENTAL INSTRUCT (Trigonometric and Exponential)

Data Transfers Instructions

REAL TRANS

FLD Load real

FST Store real

FSTP Store real and pop and pop

FXCH Exchange registers

INTEGER TRANSFER

FILD Load integer

FIST Store integer

FISTP Store integer

PACKED DECIMAL TRANSFER(BCD)

FBLD Load BCD

FBSTP Store BCD and pop

Example FLD Source- Decrements the stack pointer by one and copies a real element from a number of stack elements or memory location to new ST.

FLD LONG_REAL[BX] ;Number from memo ;copied to ST.

FLD Destination- Copies ST to a specified stack position or to a specified memory location.

FST ST(2) ;Copies ST to ST(2)

Date: 12/03/2019

Signature of faculty in-charge