**Microprocessor and Interfacing – CSE2006**

**Module 6 – Coprocessor**

1. **Instruction Sets**

**Instruction Set**

The mnemonics of the 8087 instruction begins with F so that there will not be any confusion between the instructions of microprocessor and the coprocessor. F stands for floating point. When an error condition occurs, the 8087 categorizes it as an ‘exception’ and sets the corresponding bit in the status register. The 8087-instruction set can be categorized into four functional groups as follows:

1. DATA TRANSFER INSTRUCTIONS.
2. ARITHMETIC INSTRUCTIONS.
3. COMPARE INSTRUCTIONS.
4. TRANSCENDENTAL INSTRUCTIONS.

**I. Data Transfers Instructions**

1. REAL TRANSFER
   1. FLD Load real
   2. FST Store real
   3. FSTP Store real and pop
   4. FXCH Exchange registers
2. INTEGER TRANSFER
   1. FILD Load integer
   2. FIST Store integer
   3. FISTP Store integer and pop
3. PACKED DECIMAL TRANSFER(BCD)
   1. FBLD Load BCD
   2. FBSTP Store BCD and pop

**Example**

**FLD Source** - Decrements the stack pointer by one. Copies a real number from a memory location or stack to the new ST.

FLD ST(2) ; Copy ST(2) to ST.

FLD LONG\_REAL[BX] ; copy number from memory and paste in ST

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

FST ST(3) ; Copies ST to ST(3), increment stack pointer.

FST SHORT\_REAL[BX] ; Copy ST to a memory at a SHORT\_REAL[BX]

**FXCH Destination** – Exchange a specified stack element with the contents of ST.

FXCH ST(4) 🡪 Exchange ST and ST(4)

**FILD Source** – Convert integer number stored in the memory to temporary-real format and push on 8087 stack.

FILD DWORD PTR[BX] 🡪 Short integer from memory at [BX].

**FIST Destination-** Integer store. Convert number from ST to integer and copies the same to memory.

FIST LONG\_INT 🡪 ST to memory location namely LONG\_INT.

**FISTP Destination** – Integer is stored and is popped. It is the same as the FIST but the stack pointer is incremented after the number is copied.

**FBLD Source**- Converts BCD number stored in memory to a temporary- real format and pushes it to the on top of 8087 stack.

**II. Arithmetic Instructions.**

Arithmetic instructions have four basic functions namely Addition, Subtraction, Multiplication, and Division. Following are the instructions for arithmetic operations.

**1. Addition**

FADD Add real

FADDP Add real and pop

FIADD Add integer

**2. Subtraction**

FSUB Subtract real

FSUBP Subtract real and pop

FISUB Subtract integer

FSUBR Subtract real reversed

FSUBRP Subtract real and pop

FISUBR Subtract integer reversed

**3. Multiplication**

FMUL Multiply real

FMULP Multiply real and pop

FIMUL Multiply integer

**4. Advanced**

FABS Absolute value

FCHS Change sign

FPREM Partial remainder

FPRNDINT Round to integer

FSCALE Scale

FSQRT Square root

FXTRACT Extract exponent and mantissa.

**III. Compare Instructions.**

Comparison

FCOM Compare real

FCOMP Compare real and pop

FCOMPP Compare real and pop twice

FICOM Compare integer

FICOMP Compare integer and pop

FTST Test ST against +0.0

FXAM Examine ST

**IV. Transcendental**

FPTAN Partial tangent

FPATAN Partial arctangent

F2XM1 2x - 1

FYL2X Y log2X

FYL2XP1 Y log2(X+1)

**Constant Instructions.**

Load Constant Instruction

FLDZ Load +0.0

FLDI Load+1.0

FLDPI Load π

FLDL2T Load log210

FLDL2E Load log2e

FLDLG2 Load log102

FLDLN2 Load loge2

Weblinks

1. <http://www.psnacet.edu.in/courses/ECE/Microcontroller%20and%20Microprocessor/lecture5.pdf>
2. <http://www2.math.uni-wuppertal.de/~fpf/Uebungen/GdR-SS02/opcode_f.html>