CSE2006
Microprocessor & Interfacing

Module – 6
Co-Processor

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Module 6: Co-Processor

- Introduction
- 8087 Numeric Data Processor
- Block Diagram
- Pin Description
- Interfacing 8087 with 8086
- Addressing Modes & Data Formats
- Instruction Sets
- **Assembly Language Programs**

8087 ALP

Write an assembly-language program to find out $z = \sqrt{x^2 + y^2}$. Assume x is stored in memory location 0200H and y is stored in memory location 0202H and the result z will be stored at 0300H.

Mnemonics	*Comments*
MOV BX,0200H	Store memory location (0200H) of first data x in Register BX
FLD (BX)	Load first data x into top of stack
FMUL	Multiply x with x and get x^2
FSTP ST(1)	Load x^2 in ST(1)
MOV BX,0202H	Store memory location (0202H) of second data in Register BX
FLD (BX)	Load second data y into top of stack
FMUL	Multiply y with y and get y^2
FADD ST(1)	Add x^2 with y^2 and result is stored in the top of stack
FSQRT	Find $z = \sqrt{x^2 + y^2}$
MOV BX,0300H	Store memory location 0300H in Register BX
FST (BX)	Store the result from top of stack to memory location 0300H
INT 3	Break

8087 ALP

Write a procedure in assembly-language to compute volume of a sphere $V = \frac{4}{3}\pi.r^3$ where r is the radius of sphere.

```
DATA SEGMENT
        RADIUS      DD      2.57
        CONSTANT    EQU     1.333
        VOLUME      DD 01   DUP(?)
DATA ENDS
ASSUME CS: CODE, DS:DATA
Volume PROC NEAR
Code SEGMENT
Start   MOV AX,DATA         Initialize data segment
        MOV DS,AX
        FILD RADIUS         Load radius of sphere into top of stack
        FSTP ST(2)          Store top of stack into register ST(2)
        FMUL ST(2)          Multiply r with r and get r^2, ST(0) = ST(0) × ST(2) = ST(2)^2
        FMUL ST(2)          Multiply r with r^2 and get r^3, ST(0) = ST(0)^2 × ST(2)
        FSTP ST(1)          Load r^3 in ST(1)
        FLD CONSTANT        Load 4/3 = 1.333 into top of stack
        FMUL ST(0), ST(1)   Multiply 1.333 with r^3
```

8087 ALP

Write a procedure in assembly-language to compute volume of a sphere $V = \frac{4}{3}\pi.r^3$ where r is the radius of sphere.

```
        FSTP ST(3)          Store the result of 1.333 r^3 in ST(3)
        FLDPI               Load the value of π into top of stack
        FMUL ST(0), ST(3)   Multiply π with 1.333 r^3
        FST VOLUME          Store volume of sphere
        RETP
Volume  ENDP
Code    ENDS
END     Start
```

8087 ALP

Write an assembly-language program to find out $\frac{xy}{x^2 + y^2}$. Assume x and y are integers.

Mnemonics	*Comments*
FILD x	Load first data x into top of stack
FMUL	Multiply x with x and get x^2
FSTP ST(1)	Load x^2 in ST(1)
FILD y	Load second data into top of stack
FMUL	Multiply y with y and get y^2
FADD ST(1)	Add x^2 with y^2 and result is stored in the top of stack
FSTP ST(2)	Store the result of $x^2 + y^2$ in ST(2)
FILD x	Load first data x into top of stack
FISTP ST(1)	Load x in ST(1)
FILD y	Load second data y into top of stack
FMUL ST, ST(1)	Multiply x with y and get $x\,y$
FDIV ST,ST (2)	Find $z = \frac{xy}{x^2 + y^2}$ and store the result into top of stack
INT 3	Break