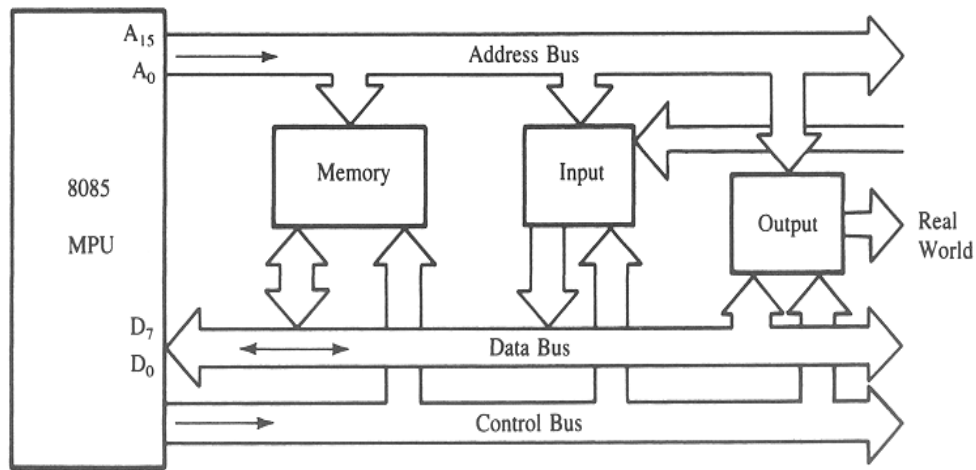


## Q.2

- A. Draw the block diagram of a microprocessor based computer system showing the address, data and control bus structure.

**Ans:** In the microprocessor based computer system, three buses exist for transfer of address, data and control information between the microprocessor and its memory and I/O system.



- B. In Intel 8086 microprocessors, why is the segment register content appended by 0 to generate the physical address? Using the stack, complete the code to exchange two word-size data items located at DAT1 and DAT2 in the memory.

**Ans:**

Segment registers are 16 bits, but the 8086 uses 20-bit addresses. The extra zero is needed to create the physical 20-bit address. Without that one may not create segments in all parts of the memory.

```
LEA AX, DAT1
LEA BX, DAT2
PUSH WORD PTR [AX]
PUSH WORD PTR [BX]
POP WORD PTR [AX]
POP WORD PTR [BX]
```

- C. Explain with examples the Immediate, Addressing, Register Addressing and Direct Addressing modes.

**Ans:** Direct Mode:

- Instruction includes memory access.
- CPU accesses that location in memory.

Example:

LDAC 5

Reads the data from memory location 5, and stores the data in the CPU's accumulator.

Register Direct and Register Indirect Modes

- Does not specify a memory address. Instead specifies a register.

Example:

LDAC R

Where R is a register containing the value 5. The instruction copies the value 5 from register and into the CPU's accumulator.

Immediate Mode

- The operand specified in this mode is the actual data itself.

Example:

LDAC #5

Moves the value 5 into the accumulator.

**Q.3 A.** Mention any three data conversion instructions. Give an example for each.

**Ans: Page no. 64-68 of Textbook 1**

**B.** Explain the working of process control instruction.

**Ans: Page no. 141-144 of Textbook 1**

**C.** Give the applications of PUSH and POP instructions and I/O port instructions.

**Ans: Page no. 53-62 of Textbook 1**

**Q.4**

**A.** Explain the working of any two software interrupt instructions.

**Ans: Page no. 195-197 of textbook 1**

**B.** Write advantages of Iteration instruction. Explain one of the iteration instruction in detail.

**Ans: Page no. 174-178 of textbook 1**

C. Explain the following for CALL and RETURN instructions:-

- i. NEAR(Intrasegment)
- ii. FAR(Intersegment)

**Ans: Page no. 180-186 of textbook 1**

### Q.5

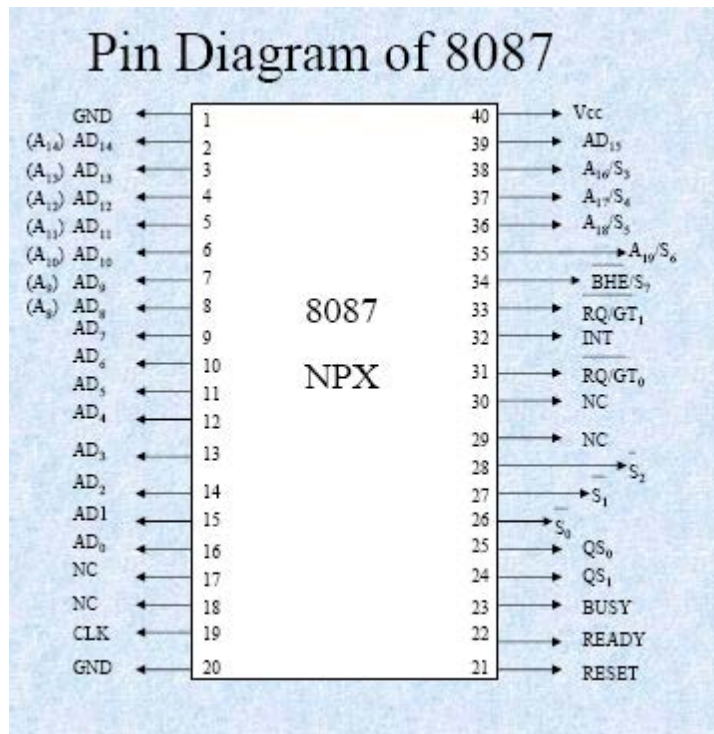
A. Draw the pin diagram of 8087 and give its overview.

**Ans:**

The need is to calculate many times faster than 8086-based processor:

- real numbers,
- packed BCD numbers,
- long integers.

Using a general-purpose microprocessor such as the 8088/86 to perform mathematical functions such as log, sine, and others is very time consuming, not only for the CPU but also for programmers writing such programs.



The 8088 and 8087 receive the same signals, CLK, READY, and RESET, from the 8284. This ensures that they are synchronized.

2. S<sub>0</sub>, S<sub>1</sub>, and S<sub>2</sub> are going from the 8088 or 8087 to the 8288, which allows either of these two processors to provide the status signal to the 8288.

3. The Queue Status, QS<sub>1</sub> and QS<sub>2</sub>, from the 8088 go to the 8087, allowing it to know the status of the queue of the 8088 at any given time.

4. The TEST signal to the 8088 comes from BUSY of the 8087. By deactivating (going low) the BUSY signal, the 8087 informs the 8088 that it finished execution of the instruction which it has been WAITing for.
5. RQ/GT1 (request/grant) of the 8088 is connected to RQ/GTO of the 8087, allowing them to arbitrate mastery over the buses. There are two sets of RQ/GT: RQ/GT1 and RQ/GTO . RQ/GT1 of the 8087 is not used and is connected to Vcc permanently. This extra RQ/GT is provided in case there is a third microprocessor connected to the local bus.
6. Both the 8088 and 8087 share buses ADO -AD7 and A8 -A19, allowing either one to access memory. Since the 8087 is designed for both the 8088 and 8086, signal BHE is provided for the 8086 processor. It is connected to Vcc if the 8087 is used with the 8088. If the microprocessor used was an 8086, BHE from the 8086 is connected to BHE of the 8087.
7. INT of the 8087 is an output signal indicating error conditions, also called exceptions, such as divide by zero. Error conditions are given in the status word. Assuming the bit for that error is not masked and an interrupt is enabled, whenever any of these errors occurs, the 8087 automatically activates the INT pin by putting high on it. In the IBM PC and compatibles, this signal is connected to the NMI circuitry as discussed in Chapter 14. Since there is only one INT for all error conditions (exceptions) of the 8087, it is up to the programmer to write a program to check the status word to see which has caused the error.
8. The 8088, often called the host processor, must be connected in maximum mode to be able to accommodate a coprocessor such as the 8087.

**B.** Explain the various transcendental instructions of 8087.

**Ans:** In this group there are instructions to compute the value of Y and X which forms the sides of a right angled triangle, given the value of the angle  $\theta$ .

1. FPTAN: Computes the partial tangent, given  $\theta$  value.
2. FPATAN: Computes the partial arc-tangent, given Y and X values.
3. FYL2X: Computes  $Y \times \log_2 X$ , given Y and X value.
4. FYL2XP1: Computes  $Y \times \log_2 (X + 1)$ , given Y and X values.
5. F2XM1: Computes  $2^X - 1$ , given X value.

**C.** Explain data types in 8087.

**Ans:** Page no. 207 of textbook 1

**Q.6 A.** Write an 8086 assembly language program to compute LCM of two 16 bit unsigned integers.

**Ans: Page no. 275 of Textbook 1**

**B.** Explain the following:

(i) Debugging a program

**Ans:** It is a program which allows user to test and debug programs. All computers including microprocessor kits provide debugging facility. To detect errors a program can be tested in single steps. Each step of the program is executed and tested. The debugger allows the user to examine the contents of registers and memory locations after each step of execution. This also provides facility to insert breakpoint in the programs.

(ii) Assembling a program

**Ans:** An assembler or macro-assembler generally forms a part of the operating system. Which translates a assembly language program into machine language program.

(iii) Linking a program

**Ans:** A large program is divided in smaller programs known as modules. A linker is a program which links smaller programs together to form a large program. While developing a program subroutines, which are stored in library file, are frequently used in the program. The linker also links these subroutines with the main program.

(iv) Step-wise execution of a program

**Ans: Page no. 269-270 of Textbook 1**

**Q.7.**

**A.** Write an assembly language program for matrix multiplication.

**Ans: Program 3.15 on Page no. 118 of Textbook 2**

**B.** Explain the features of BIOS and DOS services.

**Ans:**

DOS functions call:

In order to use DOS function calls, always place the function number into register AH and load all other pertinent information into registers, as described in the entry data table (Refer Text1-page no 809). Once this is accomplished, follow with an INT 21H to execute the DOS function.

```
Example: MOV AH, 6
          MOV DL, 'A'
          INT 21H.
```

Example shows how to display an ASCII A on the CRT screen at the current cursor position with a DOS function call.

BIO stands for Basic Input Output System. It is a set of programs to provide most basic low-level services such as services keyboard, disks, serial port, printer, display, and bootstrap. BIOS programs are stored in a ROM. When power is switched on ROM-BIOS takes the control of a computer. First of all, ROM-BIOS programs for power-on-self test are executed. These tests check that whether the computer is in proper working order after this test, the process of loading the operating system into main memory is called booting. ROM-BIOS contains a program called bootstrap loader, this directs CPU to read from the disk a specific program called boot and to load it into main memory.

BIOS function calls are found stored in the system and video BIOS ROMs. These BIOS ROM function directly control the I/O devices, with or without DOS loaded into a system.

INT10H: This is a BIOS interrupt is often called the video services interrupt because it directly controls the video display in a system. The INT10H instruction uses a register AH to select video services provided by this interrupt. The video BIOS ROM is located on the video board and varies from one video card to another.

INT11H: This function used to determine the type of equipment installed in the system.

INT12H: The memory size is returned by the INT 12 H instructions.

INT13H: This call controls the diskettes and also fixed or hard disk drives attached to the system.

INT14H: This call controls the serial COM ports attached to the computer.

C. Write an 8086 assembly language program which checks whether the printer is online.

**Ans. Page no. 337-338 of Textbook 1**

### Q.8

A. Using DOS function call, write a C program to obtain the attributes of a file. Message should be displayed on the screen. If the file is not found, suitable error message has to be displayed.

**Ans: Page no. 368-369 of Textbook 1**

B. Mention any four 8087 co-processor instruction. Give an illustration to compute square root.

**Ans: Page no. 356-363 of Textbook 1**

### Q.9

A. Explain privilege and protection features of 80286.

**Ans: 9.6-9.7 on Page no. 463-470 of Textbook 2**

B. Compare 80286 and 80486 processors.

**Ans:** The second generation of x86 16-bit processors, Intel 80286, was released in 1982. The major new feature of the 80286 microprocessor was protected mode. When switched to this mode, the CPU could address up to 16 MB of operating memory. In the protected mode it was possible to protect memory and other system resources from user programs - this feature was necessary for real program multitasking. There were many operating systems that utilized the 80286 protected mode: OS/2 1.x, Venix, SCO Xenix 286, and others. While this mode was useful for multitasking operating systems, it was of limited use for systems that required execution of existing x86 programs.

The protected mode couldn't run multiple virtual 8086 programs, and had other limitations as well:

80286 was a 16-bit microprocessor. Although in protected mode the CPU could address up to 16 MB of memory, this was implemented using memory segments. Maximum size of memory segment was still 64 KB.

There was no fast and reliable way to switch back to real mode from protected mode. Currently the 80286 protected mode is not used by x86

operating systems. All modern 32-bit x86-based operating systems use 80386 protected mode that was introduced by next generation of Intel x86 processors. The Intel 80286 microprocessor included new protected mode and all real-mode instructions that were introduced by 80186/80188 processors. Execution time of many real-mode instructions was reduced.

### 80486

The successor to the 80386 processor, Intel 80486 (i486) included many changes to its microarchitecture that resulted in significant performance improvements: 8 KB unified level 1 cache for code and data was added to the CPU. In later versions of the 80486 the size of level 1 cache was increased to 16 KB.

Execution time of instructions was significantly reduced. Many load, store and arithmetic instructions executed in just one cycle (assuming that the data was already in the cache). Intel 486 featured much faster bus transfers - 1 CPU cycle as opposed to two or more CPU cycles for the 80386 bus. Floating-point unit was integrated into 80486DX CPUs. This eliminated delay in communications between the CPU and FPU. Furthermore, all floating-point instructions were optimized - they required fewer number of CPU cycles to execute.

Clock-doubling and clock-tripling technology was introduced in faster versions of Intel 80486 CPU. These i486 processors could run in existing motherboards with 20 - 33 MHz bus frequency, while running internally at two or three times of bus frequency. 80486SX2 and 80486DX2 were clock-doubled version, and 80486DX4 was a clock-tripled version. AMD also produced 80486DX5 or X5 - clock-quadrupled version of the 80486. Power management features and System Management Mode (SMM) became a standard feature of the processor.

A few different variations of the 80486 microprocessors were produced. Two most common versions are 80486DX with integrated FPU and 80486SX without integrated FPU. There were also low power versions and embedded 80486 microprocessors. Intel 80486 microprocessor was produced at speeds up to 100 MHz. AMD produced even faster 120 and 133 MHz versions of the 80486, and manufactured in small quantities 150 MHz and possibly 166 MHz versions.

C. Explain the salient features of Pentium.

**Ans: Page no. 557 of Textbook 2**



**Text Books**

- 1. Advanced Microprocessors & IBM-PC Assembly Language Programming, K. Udaya Kumar and B.S. Umashankar, TMH, 1996**
- 2. Advanced Microprocessors and Peripherals, A.K. Ray and K.M. Burchandi, TMH, 2000**