Introduction to 8086

- First 16-bit processor released by INTEL in 1978

- Designed using HMOS (High-density Metal-oxide Semi-conductor) technology

- Now manufactured using HMOS III technology and contains approximately 29000 transistors

- Placed in a 40-pin DIP (Dual Inline Package) and requires 5V power supply

- Doesn't have an internal clock circuit

- Requires an external asymmetric clock source with 33% of duty cycle. For example, if a motor runs for one out of 100 seconds, or 1/100 of the time, then, its **duty cycle** is 1/100, or 1%

- 8284 clock generator is used to generate the required clock

- The maximum internal clock is 5MHz

- The other versions of 8086 with different clock rates are 8086-1, 8086-2, 8086-4 with maximum internal clock frequency of 10MHz, 8MHz and 4 MHz respectively

- 8086 uses a 20-bit address to access memory and hence it can directly address upto 1 Mb of memory space 2^{20}

- This memory space is organised as two memory banks of 512 Kb

- The memory banks are called even (lower) bank and odd (upper) bank

- The address line A0 is used to select the even bank and the control signal BHE' is used to select the odd bank

- For accessing IO-mapped devices, the 8086 uses a separate 16-bit address and so the 8086 can generate 64K IO addresses.

- The M/IO' is used to differentiate the memory and IO addresses.

- For memory address, the signal M/IO' is asserted high and for IO address the signal M/IO' asserted low by the processor

- 8086 operate in two modes, minimum and maximum mode
- The mode is decided by a signal at MN/MX' pin
- When high, it works for Minimum mode and the system is called a uniprocessor system
- When low, it works in maximum mode and the system is called a multiprocessor system
- Usually this pin is tied to low or high so that the 8086 system can work in any one of the two modes
- 8086 can work with 8087 coprocessor in maximum mode.
- In this mode an external bus controller 8288 is required to generate bus control signals.
- 8086 has two families of processors; 8086 and 8088
- 8088 uses 8-bit data bus but 8086 uses 16-bit data bus externally
- 8086 access memory in words; but 8088 access memory in bytes
- IBM designed the first PC using an INTEL 8088 microprocessor as the CPU
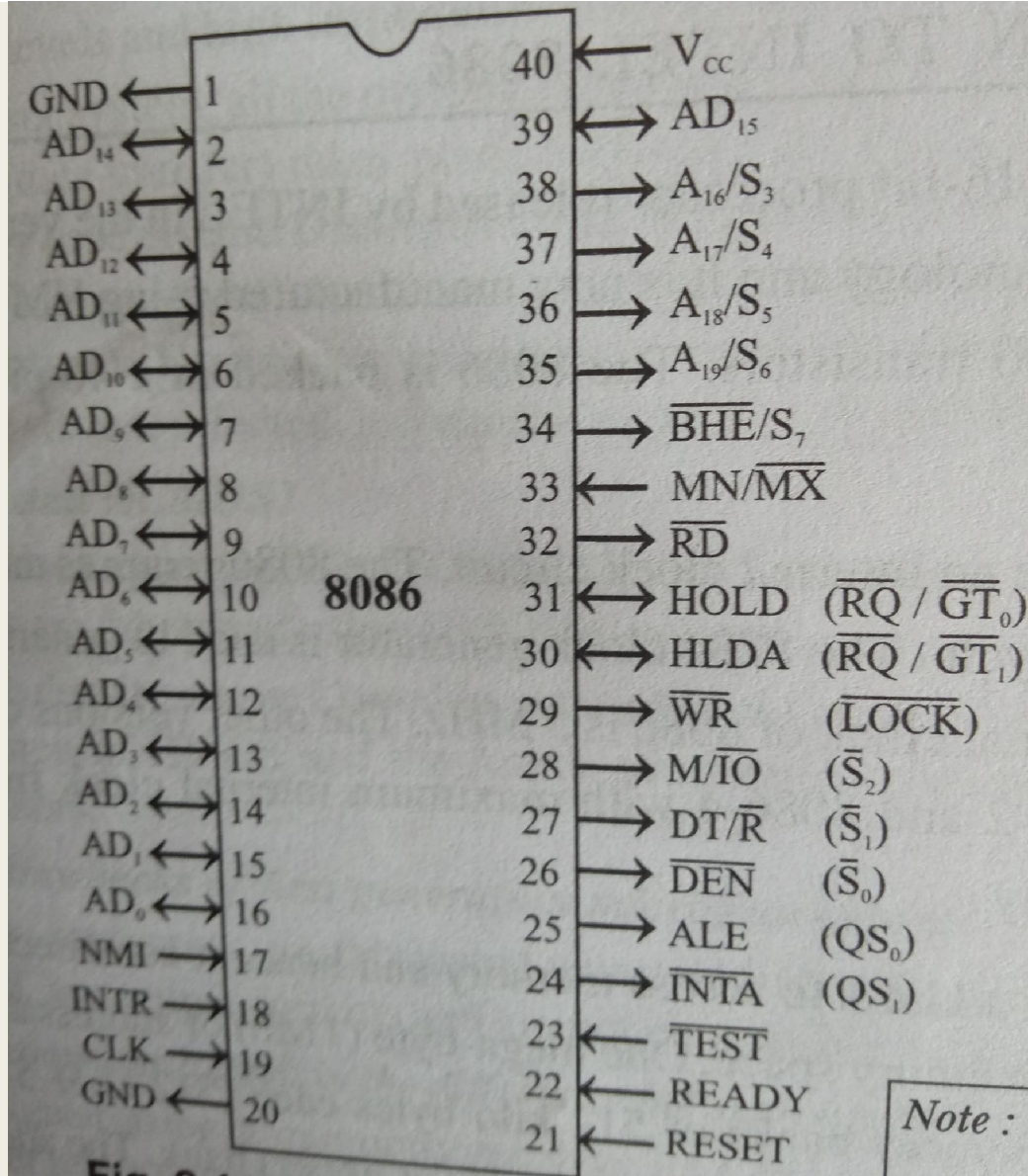
PINS and SIGNALS of INTEL 8086

Fig. 2.1a : 8086 pin assignments.