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ASSIGNMENT-3

1. **Study and write the basic features of 8085 microprocessor in detail.**

   Ans: The Features of 8085 Microprocessor include:

   1. It is an 8-bit microprocessor i.e. it can accept, process, or provide 8-bit data simultaneously.

   2. It operates on a single +5V power supply connected at Vcc; power supply ground is connected to Vss.

   3. It operates on clock cycle with 50% duty cycle.

   4. It has on chip clock generator. This internal clock generator requires tuned circuit like LC, RC or crystal. The internal clock generator divides oscillator frequency by 2 and generates clock signal, which can be used for synchronizing external devices.

   5. It can operate with a 3 MHz clock frequency. The 8085A-2 version can operate at the maximum frequency of 5 MHz.

   6. It has 16 address lines, hence it can access (2^{16}) 64 Kbytes of memory.

   7. It provides 8 bit I/O addresses to access (2^8) 256 I/O ports.

   8. In 8085, the lower 8-bit address bus ($A_0 - A_7$) and data bus ($D_0 - D_7$) are Multiplexed to reduce number of external pins. But due to this, external hardware (latch) is required to separate address lines and data lines.

   9. It supports 74 instructions with the following addressing modes:

   - Immediate
   - Register
   - Direct
   - Indirect
   - Implied
     10. The Arithmetic Logic Unit (ALU) of 8085 performs:

   - 8-bit binary addition with or without carry
   - 16-bit binary addition
   - 2 digit BCD addition.
   - 8-bit binary subtraction with or without borrow
   - 8-bit logical AND, OR, EX-OR, complement (NOT), and bit shift operations.
     11. It has 8-bit accumulator, flag register, instruction register, six 8-bit general purpose registers (B, C, D, E, H and L) and two 16-bit registers. (SP and PC). Getting the operand from the general purpose registers is more faster than from memory. Hence skilled programmers always prefer general purpose registers to store program variables than memory.

   12. It provides five hardware interrupts : TRAP, RST 7.5, RST 6.5, RST 5.5 and INTR.

   13. It has serial I/O control which allows serial communication.

14. It provides control signals (IO/M, RD, WR) to control the bus cycles, and hence external bus controller is not required.

15. The external hardware (another microprocessor or equivalent master) can detect which machine cycle microprocessor is executing using status signals (IO/M, S_0, S_1). This Features of 8085 Microprocessor is very useful when more than one processors are using common system resources (memory and I/O devices).

16. It has a mechanism by which it is possible to increase its interrupt handling capacity.

17. The 8085 has an ability to share system bus with Direct Memory Access controller. This Features of 8085 Microprocessor allows to transfer large amount of data from I/O device to memory or from memory to I/O device with high speeds.

18. Features of 8085 Microprocessor can be used to implement three chip microcomputer with supporting I/O devices like IC 8155 and IC 8355.

2. Study and draw the pin architecture of 8085 microprocessor in detail.

Ans: The details of the pin architecture of 8085 microprocessor are as follows:

1. Address Bus and Data Bus: The address bus is a group of sixteen lines i.e A0-A15. The address bus is unidirectional, i.e., bits flow in one direction from the microprocessor unit to the peripheral devices and uses the high order address bus.

2. Control and Status Signals:
- ALE – It is an Address Latch Enable signal. It goes high during first T state of a machine cycle and enables the lower 8-bits of the address, if its value is 1 otherwise data bus is activated.
- IO/M' – It is a status signal which determines whether the address is for input-output or memory. When it is high(1) the address on the address bus is for input-output devices. When it is low(0) the address on the address bus is for the memory.
- SO, S1 – These are status signals. They distinguish the various types of operations such as halt, reading, instruction fetching or writing.
- RD' – It is a signal to control READ operation. When it is low the selected memory or input-output device is read.

- WR' – It is a signal to control WRITE operation. When it goes low the data on the data bus is written into the selected memory or I/O location.

- READY – It senses whether a peripheral is ready to transfer data or not. If READY is high(1) the peripheral is ready. If it is low(0) the microprocessor waits till it goes high. It is useful for interfacing low speed devices.

3. Power Supply and Clock Frequency:

- Vcc – +5v power supply

- Vss – Ground Reference

- XI, X2 – A crystal is connected at these two pins. The frequency is internally divided by two, therefore, to operate a system at 3MHZ the crystal should have frequency of 6MHZ.

- CLK (OUT) – This signal can be used as the system clock for other devices.

4. Interrupts and Peripheral Initiated Signals:

The 8085 has five interrupt signals that can be used to interrupt a program execution.
(i) INTR
(ii) RST 7.5
(iii) RST 6.5
(iv) RST 5.5
(v) TRAP

The microprocessor acknowledges Interrupt Request by INTA' signal. In addition to Interrupts, there are three externally initiated signals namely RESET, HOLD and READY. To respond to HOLD request, it has one signal called HLDA.

- INTR – It is an interrupt request signal.

- INTA' – It is an interrupt acknowledgement sent by the microprocessor after INTR is received.

    5. Reset Signals:

- RESET IN' – When the signal on this pin is low(0), the program-counter is set to zero, the buses are tristated and the microprocessor unit is reset.

- RESET OUT – This signal indicates that the MPU is being reset. The signal can be used to reset other devices.

    6. DMA Signals:

- HOLD – It indicates that another device is requesting the use of the address and data bus. Having received HOLD request the microprocessor relinquishes the use of the buses as soon as the current machine cycle is completed. Internal processing may continue. After the removal of the HOLD signal the processor regains the bus.

- HLDA – It is a signal which indicates that the hold request has been received after the removal of a HOLD request, the HLDA goes low.

7. Serial I/O Ports:

Serial transmission in 8085 is implemented by the two signals,
- SID and SOD – SID is a data line for serial input where as SOD is a data line for serial output.

8085 Pin Diagram :-

	Pin		Pin		
Crystal Input	X₁ → 1		40 ← Vcc		
	X₂ → 2		39 ↔ HOLD		
	Reset out → 3		38 → HLDA		**Timing and Control Signals**
Serial I/O	SOD → 4		37 → CLK (out)		
	SID → 5		36 ← $\overline{Reset\,in}$		
	Trap → 6		35 ← Ready		
	RST 7.5 → 7		34 → $IO/\overline{M}$		
Interrupts	RST 6.5 → 8		33 → S₁		
	RST 5.5 → 9		32 ← Vpp		
	INTR → 10		31 → $\overline{RD}$		
	INTA → 11		30 → $\overline{WR}$		
Address Data Bus	AD₀ ↔ 12		29 → S₀		
	AD₁ ↔ 13		28 → A₁₅		
	AD₂ ↔ 14		27 → A₁₄		
	AD₃ ↔ 15		26 → A₁₃		**Address Bus**
	AD₄ ↔ 16		25 → A₁₂		
	AD₅ ↔ 17		24 → A₁₁		
	AD₆ ↔ 18		23 → A₁₀		
	AD₇ ↔ 19		22 → A₉		
	Vss → 20		21 → A₈		