Assignment - 1
(unit -1 and 2)

Q1. Define following in 8085 microp. -

(A) Program counter

(B) Stack Pointer

(C) HOLD and HLDA PIN

(D) Instruction Registers

(E) General Purpose Prog. registers

(F) Control and status pins

(G) Flags

(H) PSW

Ans. (A) Program Counter -

MP uses Program counter register to sequence execution of instructions. The function of program counter is to point to memory address from which next byte is to be fetched. When a byte is being fetched, PC is incremented by one to point to next memory location.

(B) Stack Pointer -

Stack Pointer is also a 16-bit register used as memory pointer. It points to memory location in R/W memory,

called the stack. The beginning of stack is defined by loading a 16-bit address in stack of pointer. It is register which stores address of top of stack.

(C) **HOLD and HLDA PIN** —

HOLD signal indicates that peripheral such as DMA controller is requesting use of address and data buses.

HLDA signal acknoledges the HOLD request. It is active high signal.

(D) **Instruction Register** —

It is an 8-bit register. when an instruction is fetched from memory then it is stored in The instruction register.

(E) **General purpose registers** —

8085 mP has 6 general-purpose register to store 8-bit data. These are identified as B, C, D, E, H, L. They can be formed combined as register pairs - BC, DE, HL to perform 16-bit

operations: These registers are used to store or copy data.

(F) control and status pins —

i) ALE — This is positive going pulse generated every time 8085 begins an operation (machine cycle). It indicates that bits on $AD_0 - AD_7$ are address bits.

ii) $\overline{RD}$ (Read) — This is read control signal. This is active low signal. This signal indicates that selected I/o or memory device is to be read and data are available on data bus.

iii) $\overline{WR}$ (write) — This is write control signal. This signal indicates that data on data bus are to be written into selected memory or I/o location.

iv) $IO/\overline{M}$ — when it is high, it indicates I/o operation. when it is low, it indicates memory location.

v) S_1 and S_0 — These status signals, similar to $IO/\overline{m}$ signals, can identify various operations, but

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they are rarely used in small systems.

(G) Flags —
ALU includes 5 flip-flops which are set or reset after an operation according to data conditions of result in accumulator and other registers. They are called zero (Z), carry(Cy), sign (S), parity(P), auxiliary carry (AC). The MP uses these flags to test data conditions.

(H) Power supply signals —
8085 mp operates on single +5v power supply connected to Vcc at pin no. 40. The ground reference is connected to Vss at pin no. 20.

Q2. Define multiplexed pins of 8085 MP. Explain with block diagram of demultiplexing of $AD_0 - AD_7$ pins of 8085.

Ans— Lower order address bus ($A_0 - A_7$) are multiplexed with 8-bit data bus ($D_0 - D_7$). It means that

data and address are sent on same line but at different instant of time. This configuration is done to reduce no. of pins on 8085 microprocessor IC. This multiplexed bus is denoted by $AD_0 - AD_7$. The signal lines $AD_0 - AD_7$ are bidirectional.
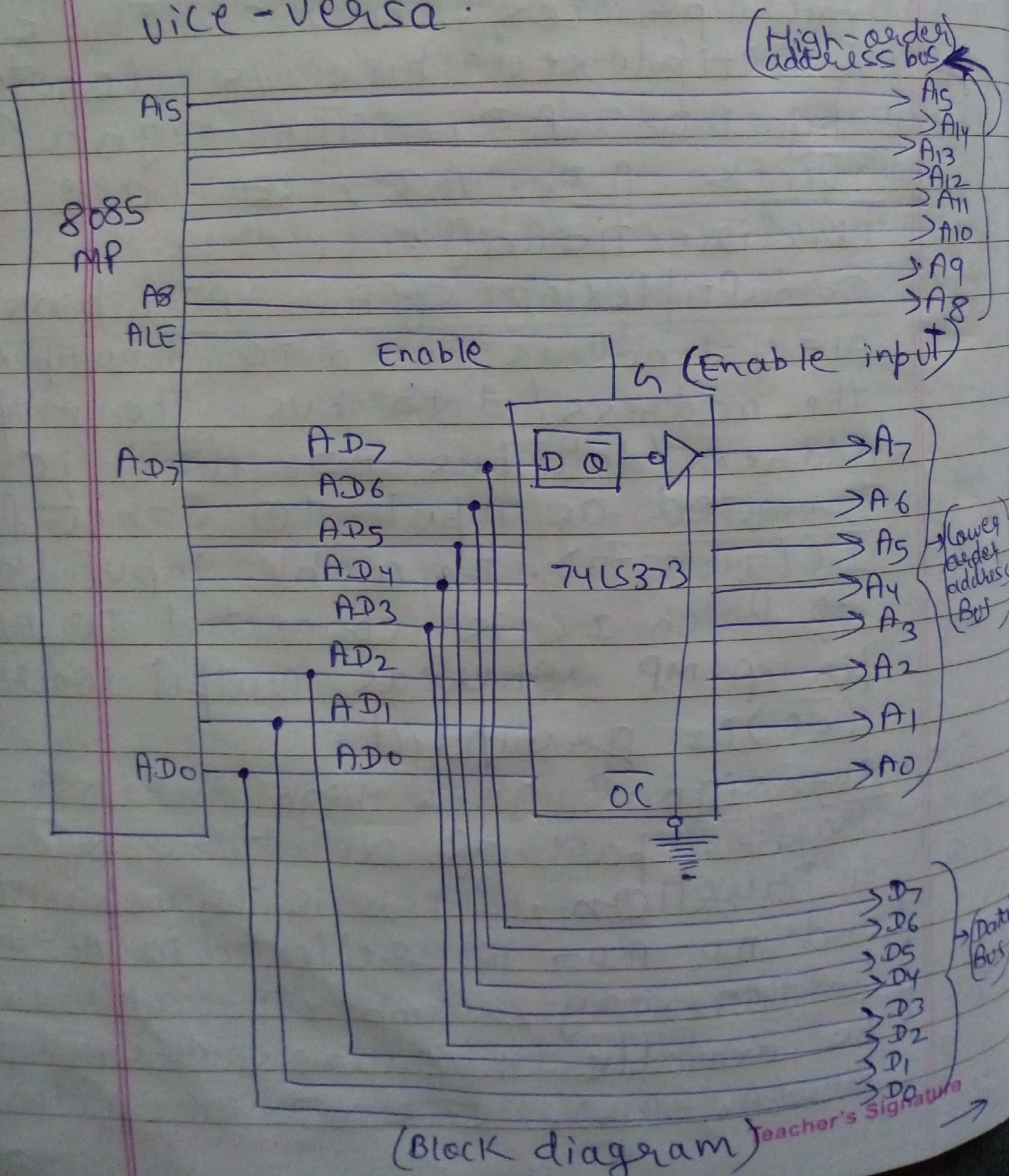
Demultiplexing of $AD_0 - AD_7$ pins -

ALE signal is used to demultiplex the address/data bus. The multiplexed address/data bus ($AD_0 - AD_7$) is connected as input to 8-bit latch IC (74LS373). The enable input (a) of latch IC is connected to ALE pin of MP whereas output control ($\overline{OC}$) is grounded.

ALE signal goes high during earlier part of execution of instruction, latch is transparent and $AD_0 - AD_7$ is reflected to $A_0 - A_7$. In this way, complete address is available in address bus once address bus ($A_0 - A_{15}$).

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is located, ALE signal goes low and latch is disable. Now data is available on multiplexed bus ($AD_0 - AD_7$), which may flow from MP to memory and vice-versa.

(Block diagram)

Q3- Define direct and indirect addressing modes with appropriate examples.

Ans- Direct addressing mode -

In this, address of data is directly given in instruction itself using its hex representation. If 16-bit address is used, second and third bytes of instruction contain 16 bit address. If 8-bit address is used, then second byte is 8-bit port address. The length of these instruction is always 3 bytes excluding IN and OUT instruction.

example -

	Instruction	Hex Code	Operation
1.	STA 3000H	32	store contents of
		00	acc. to given memory
		00	location 3000H
2.	SHLD 2000H	22	store HL register
		00	pair into 2 consecutive
		20	memory locations
3.	IN 02	DB	copy data available
		02	at port address 02H
			to accumulator

Indirect Addressing mode -

If address of data is stored in register pair and name of register pair is shown in instruction, then instruction is having indirect addressing mode. example -

	Instruction	Hex Code	operation
1.	STAX B	02	store contents of acc. at location specified by BC Register pair
2.	MOV A,M	7E	copy contents of memory location by HL RP to acc.
3.	CMP M	BE	compare contents of memory location specified by ML register pair to acc. for less than, equal to, or more than

Q4. Explain address bus, data bus and control bus of 8085 microprocessor. Also draw flag register.

Ans. Address bus — It is a group of

16 lines generally identified as A_0 to A_{15}. The address bus is unidirectional (from MPU to peripheral devices). The MPU uses address bus to perform the first function that is identifying a peripheral or memory location.

Data bus— It is group of 8 lines used for data flow. These lines are bidirectional. The MPU uses data bus to perform second function that is transferring binary information.

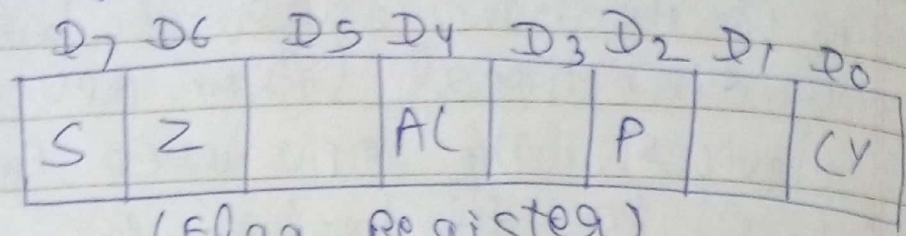The eight data lines enable MPU to manipulate 8-bit data ranging from 00 to FF ($2^8 = 256$ numbers).

Control bus — Control bus is comprised of various single lines that carry synchronization signals. The MPU uses such lines to perform third operation that is providing timing signal. MPU generates specific control signals for every operation it performs. These signals are used to identify device type also.

Flag Register –

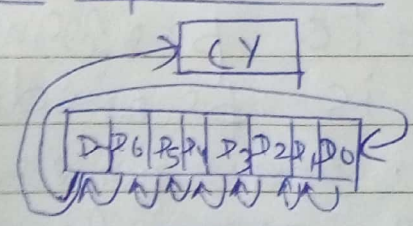| D7	D6	D5	D4	D3	D2	D1	D0
S	Z		AC		P		CY

(Flag Register)

ALU includes 5 flip-flops, which are set or reset after an operation according to data conditions of result in accumulator and other registers.

Q5. Write short note on Rotate instructions of 8085 microprocessor.

Ans- These instructions allows each bit in accumulator to shift either left or right to next position. Rotation instruction may include carry flag in shifting the position. example –
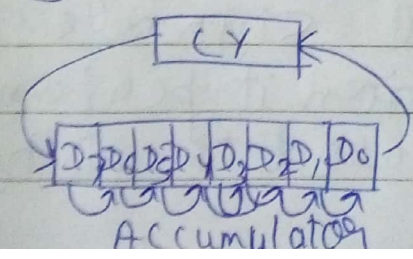
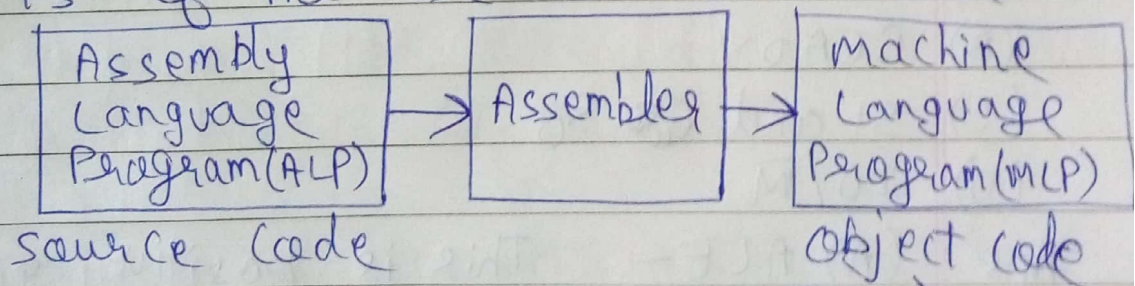| Instruction	operation	comments
1. RLC		Rotate acc. to left without carry
2. RAR		Rotate accumulator right

Accumulator

Q6. What is assembly language? Also explain its advantages and disadvantages.

Ans- A translator, called assembler, translates assembly language (source program) to machine language (object program).

Assembly language uses abbreviated names, called mnemonics, instead of sequence of Os and 1s. Since microprocessor can understand only Os and 1s, the program written in assembly language is of no use without translator.

Assembly Language Program(ALP)	→	Assembler	→	machine Language Program(MLP)
source code				object code

(use of Assembler)

The complete set of 8085 mnemonics is called 8085 assembly language and program written in the mnemonics is called an assembly language program.

Advantages —
i) Easy to learn and remember.
ii) Assembly language is executed faster than high level language.
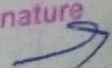
Disadvantages —
i) Programs written in assembly language is not portable.
ii) Assembler is needed for translating assembly language program into machine code.

Q7. Explain following pins in relation to 8085 microprocessor—

(A) ALE
(B) READY
(C) S1 and S0
(D) IO/$\overline{M}$

Ans— (A) ALE— This is positive going pulse generated every time the 8085 begins operation. It indicates that bits on AD₇-AD₀ are address bits. This signal is used to latch low-order address from multiplex bus and generate seperate set of 8 address lines A₇ to A₀.

(B) <u>READY</u> — This signal is used to delay MP read and write cyclyes untill a slow-responding peripheral is ready to send or accept data.

(c) <u>S1 and S2</u>

(c) <u>S1 and S0</u> — These status signals, similar to IO/M̄ signal, can identify various operations.

(D) <u>IO/M̄</u> — This is status signal used to diff. between I/O and memory operations. when it is high, it indicates an I/o operation. when it is low, it indicates a memory operation.

Q8. Explain following instruction —
(A) CMA   (B) CMP C
(c) LDAX B   (D) LXI B,3050H
(E) IN 56H

Ans—

Mnemonics	Examples	Operation
(A) CMA	CMA	Invert (compliment) each bit in accumulator

(B)	CMP R	CMP C	Compare contents of Register C with contents of A for less than, equal to, or greater than
(C)	LDAX Rp	LDAX B	Copy data byte in A from memory specified by address in register pair
(D)	LXI Rp, 16bit	LXI B, 3050H	Load 16 bit no. 3050H in Register pair
(E)	IN 8-bit	IN 56H	Accept (read) data byte from input device and place it in accumulator