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JAGANNATH GUPTA INSTITUTE OF ENGINEERING & TECHNOLOGY JAIPUR

I-Mid Term Examination Session 2017-2018

B.Tech II Year IV Semester

Branch: CS | **Subject: MP&I**

Time: 10:00 to 11:30AM | **Subject Code: 4CS1A**

Date: 06/03/2018 | **Max. Marks: 20**

Note: Attempt any four questions out of five questions.

1. Explain the hardware model of 8085 microprocessor. 5

The hardware model in fig shows two major segments. One segment includes arithmetic logic unit [ALU] and an 8 bit register called an accumulator, instruction decoder, and flags. The flag registers are Zero, Carry, Sign, Parity and Auxilliary Carry flags. The second segment shows 8 bit and 16 bit registers. Both segments are connected with various internal connections called an internal bus. The arithmetic and logic operations are performed in the arithmetic logic unit [ALU]. Results are stored in the accumulator, and flip-flops, called flags, are set or reset to reflect the results. There are 3 buses- a 16 bit unidirectional address bus(A_0 TO A_{15}), an 8 bit bidirectional data bus(D_O TO D_7), and a control bus.

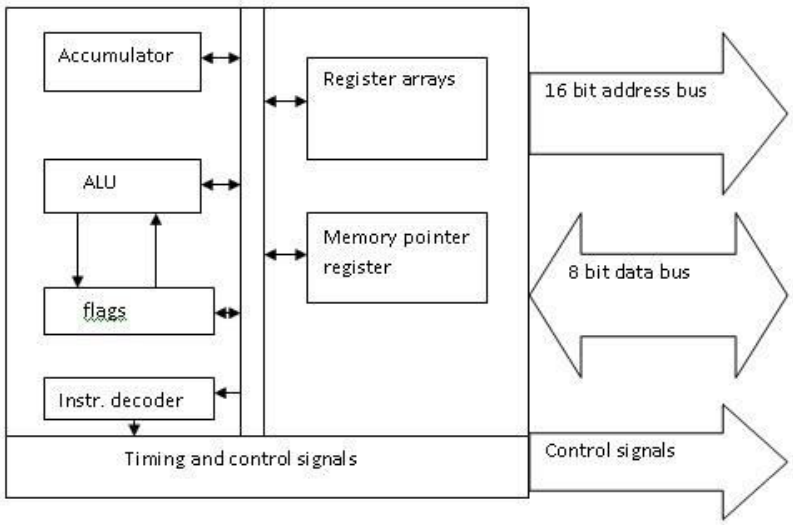
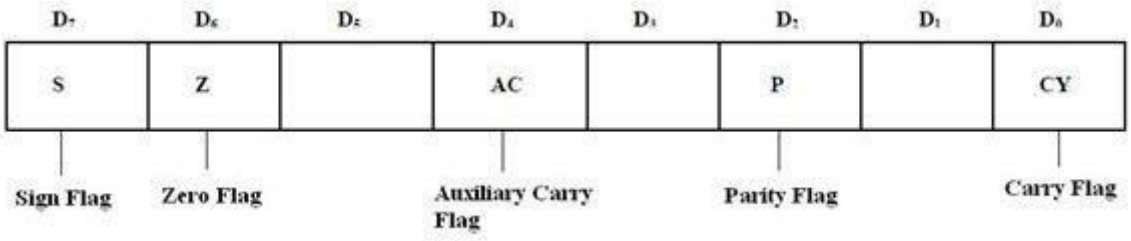


Fig. hardware model

2. Describe the different types of flag registers. 5

A flag is a flip flop. It indicates some condition produced by the execution of an instruction. The flag register of 8085 microprocessor consists of 5 flags. The flag register is connected to ALU. When an operation is performed by ALU the result is transferred on data bus and status of result will be stored in flip flops. The different flags and their positions in flag register are shown in following.



a) **The carry flag(CY):**

This flag is set whenever there has been a carry out of, or a borrow into, the higher order bit of the result. The flag is used by the instructions that add amd subtract instruction.

1-carry out from MSB bit on addition or borrow into MSB bit on subtraction

0-no carry out or borrow into MSB bit

b) **The parity flag(P)-**

This flag is set whenever the result has even parity, an even number of 1 bits. If parity is odd, PF is cleared.

1-low byte has even number of 1 bits

0-low byte has odd parity

c) **The auxiliary carry flag(AC):**

This flag is set whenever there has been a carry out of the lower nibble into the higher nibble or a borrow from higher nibble into the lower nibble of an 8 bit quantity, else AF is reset. This flag is used by decimal arithmetic instructions.

1-carry out from bit 3 on addition or borrow into bit 3 on subtraction

0-otherwise

d) **The zero flag(Z):**

This flag is set, when the result of operation is zero, else it is reset.

1-zero result

0-non-zero result

e) **The sign flag(S):**

This flag is set, when MSB (Most Significant Bit) of the result is 1. Since negative binary numbers are represented in the 8085 CPU in standard two's complement notation, S indicates sign of the result.

1-MSB is 1 (negative)

0-MSB is 0 (positive)

3. Write an assembly level language program for 8 bit add operation 5

Here, the HL register pair is first initialized to the start address of memory at which the data is stored. Then data is brought to accumulator A and the other one is added from memory itself. The result from A is then stored into memory again using the HL register.

LXI H,3000

MOV A,M

INX H

ADD M

INX H

MOV M,A

HLT

The given data are present at memory locations 3000_H and 3001_H and the result is stored at memory location 3002_H

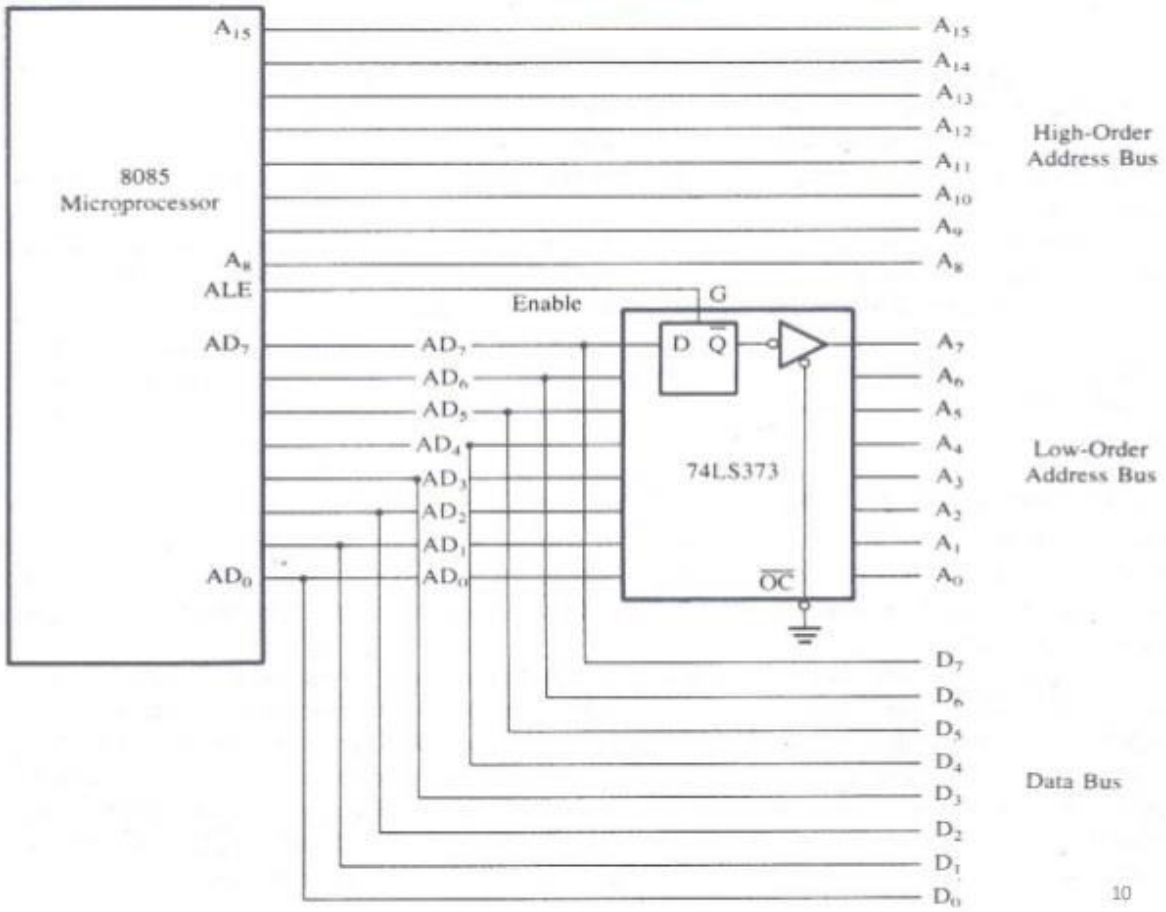
4. Explain the demultiplexing process of address and data buses in 8085. 5

Whenever an instruction is executed by MPU first of all MPU sends ALE signal to address latch IC to enable all D Latches to receive new address from MPU.

In first T state Microprocessor generates the address on Address Bus, half portion of address (lower order address) is generated on AD0-AD7 . This Address bits are captured by D latches and stored in.

During next cycles say T2, T3 and so on, MP can use AD0-AD7 as Data Bus to send receives data. During this period the initially generated Address is also available at output

pins of D Latches .The IC 74LS373is used as Address Latch it contains 8 D Latches to store lower half of address.(8 bits).



5 Write short notes on: 5

(a) Stack Pointer:

A stack pointer is a small register that stores the address of the last program request in a stack. The Stack pointer is a sixteen bit register used to point at the stack.In read write memory the locations at which temporary data and return addresses are stored is known as the stack.In simple words stack acts like an auto decrement facility in the system.The initialization of the stack top is done with the help of an instruction LXI SP. In order to avoid program crashes a program should always be written at one end and initialized at the other.

(b) LDAX:

LDAX(Load accumulator indirect): The contents of the designated register pair point to a memory location. This instruction copies the contents of that memory location into the accumulator. The contents of either the register pair or the memory location are not altered.

LDAX B

(c) LHLD

LHLD(Load H and L register direct): - this instruction loads the contents of the 16- bit memory location into the HL register pair.

LHLD 3000H (the content of location 3000h is copied into the HL reg pair

(d) STA

STA: the content of accumulator are copied into the memory location.

STA 3000H (the content of accumulator is stored into the memory location 3000h)

(e) XRA

The content of accumulator are exclusive OR with specified register or memory location.

. XRA B :ExOR register B with accumulator

XRA M :ExOR data pointed to by HL pair with accumulator.

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I / II -MID TERM PAPER ANSWER SHEET

Semester: IV

Subject : DMS

Branch : CS

Submitted by : Ms. Daljeet Kaur

1. Statement :- Let n- pigeons are assigned R pigeonholes, then one of the pigeonholes must contain at least $\left\lfloor \frac{n-1}{R} \right\rfloor + 1$ pigeons, where $\left\lfloor \frac{n-1}{R} \right\rfloor$ is the floor of $\frac{n-1}{R}$.

Proof! We have n- pigeons and R- pigeonholes such that $n > R$. Assuming that each of R pigeonhole contains not more than $\left\lfloor \frac{n-1}{R} \right\rfloor$ pigeons, then total number of pigeons in the R pigeonholes must be less than or equal to

$$R \times \left\lfloor \frac{n-1}{R} \right\rfloor \leq R \times \frac{n-1}{R} = n-1$$

but there are n- pigeons, so this contradicts our assumptions that a pigeonhole contains not more than $\left\lfloor \frac{n-1}{R} \right\rfloor$ pigeons. So, one of the pigeonhole must contain at least $\left\lfloor \frac{n-1}{R} \right\rfloor + 1$ pigeons.

2. Assuming $f(x)$ to be real number, domain will consists of those values of x for which :

(a) $f(x)$ does not tend to ∞.

(b) $f(x)$ does not becoming involving $\sqrt{-1}$

(c) $f(x)$ does not become indeterminate

(i) $f(x) = \frac{x}{x^2+1}$ is well defined $\forall x \in R$.

So domain of $f(x)$ = set of real number R.

(ii) $g(x) = \frac{x}{x-5} \longrightarrow \infty$ for $x = 5$

So domain $g(x) = R - \{5\}$

Contd....

(3) To prove $A \times (B \cup C) = (A \times B) \cup (A \times C)$

we have to show that (i) $A \times (B \cup C) \subseteq (A \times B) \cup (A \times C)$

(ii) $(A \times B) \cup (A \times C) \subseteq A \times (B \cup C)$

(i) Let $(x, y) \in A \times (B \cup C) \Rightarrow x \in A$ and $y \in B \cup C$

$\Rightarrow x \in A$ and $y \in B$ or $y \in C$

Therefore, either $x \in A$ and $y \in B$ or $x \in A$ and $y \in C$

$\Rightarrow (x, y) \in A \times B$ or $(x, y) \in A \times C$

$\Rightarrow (x, y) \in (A \times B) \cup (A \times C)$

So $A \times (B \cup C) \subseteq (A \times B) \cup (A \times C)$

(ii) Now, let $(x, y) \in (A \times B) \cup (A \times C)$

$\Rightarrow (x, y) \in (A \times B)$ or $(x, y) \in (A \times C)$

$\Rightarrow (x \in A, y \in B)$ or $(x \in A, y \in C)$

It means $x \in A$ always & y may $\in B$ or C.

So $x \in A$ and $y \in B$ or $y \in C$

$\Rightarrow x \in A$ and $y \in (B \cup C)$

$\Rightarrow (x, y) \in A \times (B \cup C)$

so $(A \times B) \cup (A \times C) \subseteq A \times (B \cup C)$

From (i) and (ii) $\Rightarrow A \times (B \cup C) = (A \times B) \cup (A \times C)$

(9) Given $A = \{a, b, c, d, e\}$ and $B = \{c, e, f, h, k, m\}$

Then $A \cup B = \{a, b, c, d, e, f, h, k, m\}$

$A \cap B = \{c, e\}$

$\therefore |A| = 5$, $|B| = 6$, $|A \cup B| = 9$ $|A \cap B| = 2$

L.H.S. $= |A \cup B| = 9$

R.H.S. $= |A| + |B| - |A \cap B| = 5 + 6 - 2 = 9$

$\therefore$ L.H.S = R.H.S.

Hence $|A \cup B| = |A| + |B| - |A \cap B|$

contd...

(5) Let O be the set of odd positive integers and N be the set of natural numbers.

Consider a function $f : N \to O$

such that $f(n) = 2n-1$, $n \in N$

We need to show that f is bijection.

One-one : Let $f(n_1) = f(n_2)$

$\Rightarrow 2n_1 - 1 = 2n_2 - 1$

$\Rightarrow 2n_1 = 2n_2$

$\Rightarrow n_1 = n_2$

$\therefore$ f is one-one

Onto : Let $y \in O$. then y is an odd positive integer

$\Rightarrow y+1$ is an even positive integer

$\Rightarrow \frac{y+1}{2}$ is a positive integer

$\Rightarrow \frac{y+1}{2} \in N$

Now for each $y \in O$ $\exists \left(\frac{y+1}{2}\right) \in N$ such that

$$f\left(\frac{y+1}{2}\right) = 2\left(\frac{y+1}{2}\right) - 1 = (y+1) - 1 = y$$

so each element of O has its preimage in N. Thus f is onto.

Hence f is a bijection between N and O.

$|N| = |O|$

$\therefore$ O is countable,

ie. the set of odd positive integers is a countable set.