



CMR INSTITUTE OF TECHNOLOGY		USN								
Internal Assessment Test – 1										
Sub: Mechatronics							Code: 18ME744			
Date:02/12/2022	Duration: 90 mins	Max Marks: 50	Sem: 8 A & B		Branch (sections): ME					
<b>Answer all FIVE questions.</b>										
Part A is compulsory. Answer any three questions from part B							Marks	OBE		
								CO	RBT	
<b>PART A</b>										
1	With a neat sketch explain Intel 8085 architecture.						[20]	CO2	L3	
<b>PART B</b>										
2	What are Microcontrollers? Explain the classification of microcontrollers.						[10]	CO2	L2	
3	Explain the structure of PLC with a neat block diagram.						[10]	CO3	L2	
4	Explain various requirements for selecting PLC.						[10]	CO3	L2	
5	What is register? Explain various types of registers.						[10]	CO2	L2	



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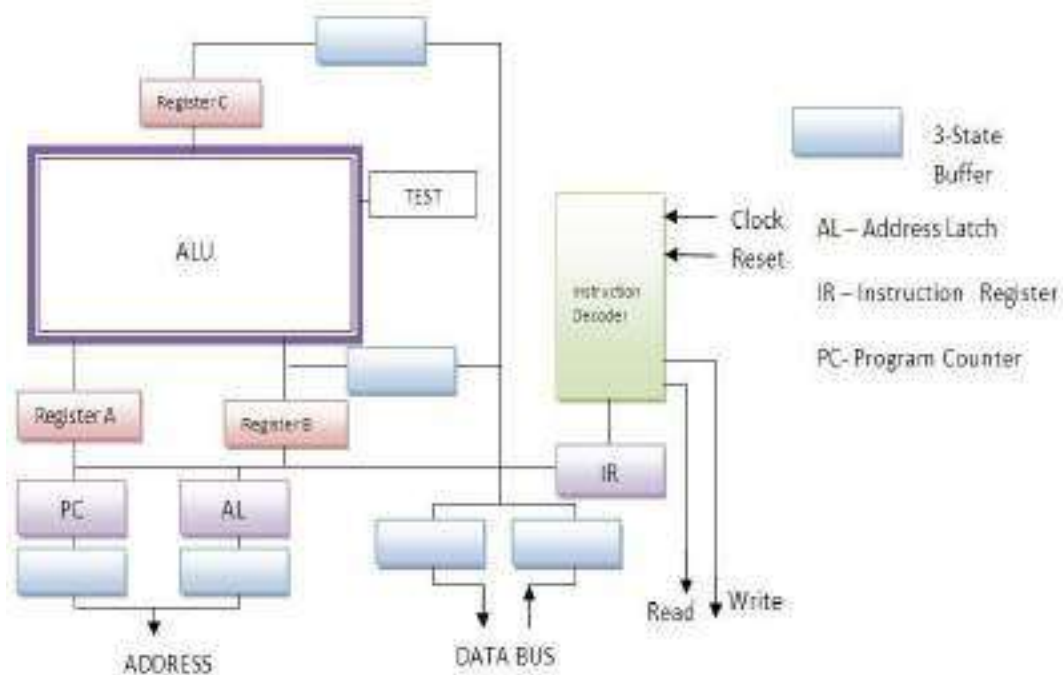
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## SOLUTIONS

1



- **ALU:** ALU stands for Arithmetical Logical Unit. As name indicates it has two parts:
  - Arithmetical unit which is responsible for mathematical operations like addition, subtraction, multiplication and division,
  - Logical unit which is dedicated to take logical decisions like greater than, less than, equal to, not equal to etc. (Basically AND/OR/NOT Operations)
- **Register Array:** Registers are small storage devices that are available to CPU or processors. They act as temporary storage for processing of intermediate data by mathematical or logical operations.
- **Control:** This part of CPU is dedicated to coordinate data flow and signal flow through various types of buses i.e. Data Bus, Control Bus, and Address Bus etc. It directs data flow between CPU and storage and I/O devices.
- **Memory:** There are two different types of memory segments being used by the CPU. First is the ROM which stands for Read Only Memory while other is R/W which stands for Read and Write Memory or Random Access Memory (RAM).

**ROM:** From this memory unit, CPU can only read the stored data. No writing operations can be done in this part of memory. Thus it is used to store the programs that need no alteration or changes like Monitor Program or Keyboard driver etc.

**R/W:** As name indicates it is opposite to ROM and used for both reading and writing operations. In general User's program and instruction are stored in this

segment of memory unit.

- **Input Devices:** Input devices are used to enter input data to microprocessor from Keyboard or from ADC which receives data from sensors/signal conditioning systems.
- **Output Devices:** These devices display the results/conclusions coming out from ALUs either in soft copy (Monitor) or in Hard Copy (Printer).

## 1. 2. Microcontroller

Microcontroller is a microprocessor based system. It is a data processing system that employs a microprocessor as its central unit. Based on the input it takes decisions. These decisions are further used to control a system or to actuate an action or operation.

### Microprocessor based programmable controller



Figure 4 Schematic of microcontroller.

It is a microprocessor-based system. It implements the functions of a computer and a controller on a single chip. Generally microcontroller is programmed for one specific application and it is dedicated to a specific control function.

Microcontrollers find applications in automobiles, aircraft, medical electronics and home appliances. They are small in size and can be embedded in an electromechanical system without taking up much space. Thus we can have a system with its functions completely designed into a chip. However microcontrollers have very little user programmable memory. Various types of microcontroller chips available in market are: Motorola 68HC11, Zilog Z8 and Intel MCS51 and 96 series.

3. The differences are listed below and are considered as a major distinguishing parameters between the two

**Table 2: Microprocessor and microcontroller comparison**

<b>Microcontroller</b>	<b>Microprocessor</b>
Micro Controller is a heart of the embedded system	The microprocessor is the heart of Computer system
Microcontroller has an external processor along with internal memory and input/output components	It is just a processor. Memory and I/O components have to be connected externally
Since memory and I/O are present internally, the circuit is small.	Since memory and I/O has to be connected externally, the circuit becomes large
The cost of the entire system is low	Cost of the entire system increases
The microcontroller has a number of registers, hence the programs are easier to write	Microprocessor has less number of registers, hence more operations are memory based
Used mainly in the washing machine, MP3 players	Mainly used in personal computers

## 5 Number System

Number system is a way of representing the value of any number with respect to a base value. Number System can be classified on the basis of its “base”. Each number has a unique representation in a number system. Different number systems have different representation of the same number. In general Binary, Octal, Decimal and Hexadecimal Number systems are used in microprocessor programming. Table 3 shows different numbering systems and their details.

Table 3: Numbering systems

Number System	Base	Allowable Digits/Characters	Examples
Binary	2	0,1	(11001010001010) <sub>2</sub>
Octal	8	0,1,2,3,4,5,6,7	(5671235246214) <sub>8</sub>
Decimal	10	0,1,2,3,4,5,6,7,8,9	(9823654178523) <sub>10</sub>
Hexadecimal	16	0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F	(A852F6DB) <sub>16</sub>


### Number representation

#### Conversion of any number system to decimal number system:

Let B be the base of number system and  $A_n, A_{n-1}, \dots, A_1, A_0$  be the digits of given number. Then to convert it into decimal equivalent we can use the following formula:

$$N = A_n \cdot B^n + A_{n-1} \cdot B^{n-1} + \dots + A_1 \cdot B + A_0 \cdot B^0$$

Example: what is the decimal equivalent of  $(11101011)_2$  ?

 Here, we have taken  $A_n = 1, A_{n-1} = 1, \dots, A_{n-3} = 0$ , while  $n=8$  and B

= 2. Then the decimal equivalent is  $(235)_{10}$ .