Date
Page

Assignment 1 (Chapter - 1)

Q.1 Explain organization of Microprocessor based system.

⇒ A microprocessor-based system includes the following components:

- CPU (Central Processing Unit): The microprocessor itself, which performs all arithmetic and logical operations.
- Memory:
  - RAM (Random Access Memory): Temporary storage for data and instructions during program execution.
  - ROM (Read-Only Memory): Permanent storage for instructions like firmware.
- Input/Output Devices: Used for communication between the system and external devices like a keyboard, monitor, etc.
- Buses: Channels for data transfer between components, categorized as address, data, and control buses.

Q.2 Explain Buses of Microprocessor

⇒
- Address Bus:
  - Used to specify the memory address where data is to be read or written.
  - Unidirectional (data flows only from the CPU)
- Data Bus:
  - Transfers data between the CPU, memory, and I/O devices

- Bidirectional (data flows in both directions)
- Control Bus :
- Carries control signals like read/write, interrupt requests, and status signals

Q.3 Define Microprocessor and explain the difference between Microprocessor and Microcontroller.

⇒ Microprocessor : A programmable, general-purpose CPU on a chip used for computing tasks.

Microcontroller : A single chip that integrates a microprocessor, memory, and I/O ports, designed for specific embedded applications like washing machines or cars.

Difference :

- Microprocessor : Requires external memory and I/O devices
- Microcontroller : Contains memory, I/O ports, and peripherals on the same chip.

Q.4 Classification of Microprocessor based on size, application, and speed

⇒ • Size :

- 4-bit, 8-bit, 16-bit, 32-bit, 64-bit : Refers to the size of the data bus and the amount of data the processor can handle at a time.

Date
Page

- Application :
  - General purpose Microprocessors : Used in personal computers and laptops.
  - Special-purpose Microprocessors : Used in specific tasks like signal processing or graphics rendering.
- Speed :
  - Measured in MHz or GHz ; higher speed means faster instruction execution.

Q.5 Explain languages for communication between microprocessor to other peripheral and vice-versa.

⇒ 1. Binary language :
- The fundamental language of microprocessors. Data is represented in binary and sent to peripherals as bits or bytes.
- Example : Turning an LED on or off by sending 1 or 0.

2. Machine Language :
- Low-level instructions directly understood by the microprocessor, executed to control peripherals.
- Example : sending instructions to a motor controller to adjust speed or direction

3. Assembly Language :
- A human-readable version of machine code used to control peripherals with precise instructions.
- Example : Writing assembly code to read data from a sensor and

store it in memory.

4. Hexadecimal Language:
- Data is represented in a more compact hexadecimal format for communication, often used in debugging or direct communication setups.
- Example: Sending 0xFF to set all bits of a peripheral register.

5. ASCII Language:
- Text-based language where data or commands are transmitted using ASCII codes.
- Examples: Communicating with a display module to print characters. (e.g., sending 0x41 for "A")
- These languages form the building blocks for higher-level communication protocols and enable direct interaction between microprocessors and peripherals.

Q.6 Briefly explain how does the micro-processor work?

⇒ A microprocessor is the central processing unit of a computer system, designed to execute instructions and manage tasks. Here's a brief overview of how it works:

1. Fetch:
- The microprocessor retrieves an instruction from memory (RAM) based on the program counter (PC),

which keeps track of the instruction address

2. Decode :
- The fetched instructions is decoded by the control unit to determine the operation (e.g., addition, subtraction, data movement)

3. Execute :
- The decoded instruction is carried out. This may involve arithmetic or logical operations, data transfer between registers, or interactions with peripherals.

4. Store :
- If required, the result of the operation is stored back in a register or memory.

The microprocessor operates in a continuous cycle of fetch-decode-execute-store, managing data flow between the memory, input/output devices, and itself using buses. It uses its Arithmetic Logic Unit for calculations and logical operations, and its Control Unit to coordinate activities.

Q.7 Explain in brief programming model of 8085 microprocessor

⇒ The 8085 microprocessor programming model refers to its internal structure and components used for executing instructions. It includes :

Date
Page

1. Registers:
- General-Purpose Registers: Six 8-bit registers (B, C, D, E, H, L) used for temporary data storage and operations. Pairs (BC, DE, HL) can be combined for 16-bit operations.
- Accumulator (A): An 8-bit register for arithmetic, logic, and data transfer operations.
2. Flag Register:
- A 5-bit register that indicates the result of operations (e.g., Zero (Z), Sign (S), Carry (CY), Parity (P), and Auxiliary Carry (AC))
3. Program Counter (PC):
- A 16-bit register that holds the address of the next instruction to be executed.
4. Stack Pointer (SP):
- A 16-bit register pointing to the top of the stack in memory.
5. Instruction Register and Decoder:
- Temporarily stores the fetched instruction and decodes it for execution.
6. ALU (Arithmetic & Logic Unit):
- Performs arithmetic and logical operations on data.
7. Control Unit:
- Coordinates fetching, decoding, and executing instructions, and manages data flow.
8. Address and Data Buses:
- Address Bus (16-bit): Specifies memory locations
- Data Bus (8-bit): Transfers data between

the processor, memory, and I/O devices. The programming model defines how these components interact, enabling efficient programming of the 8085 microprocessor.

Q.8 Write basic features of 8085 microprocessor.

⇒ 1. Clock Speed:

- Operates at a maximum clock frequency of 3MHz.

2. Data Bus:

- It has an 8-bit data bus, meaning it can process 8 bits of data at a time.

3. Address Bus:

- A 16-bit address bus, allowing it to access 64 KB (2**16) of memory

4. Memory

- Supports up to 64KB of memory

5. Number of instructions executed per second:

- At 3MHz, it can execute approximately 0.5 million instructions per second

6. Instruction set

- The 8085 has a total of 74 instructions divided into data transfer, arithmetic, logical, branching, and control operations

These features make the 8085 a versatile microprocessor for basic computing tasks and embedded system applications.

Date
Page

Q. 9 Write short questions

a. Define : bit, nibble, byte, word and instruction.

→ Bit : Smallest data unit

Nibble : Group of 4 bits

Byte : Group of 8 bits

Word : A data size unit, typically 16, 32 or 64

Instruction : A command that the processor executes.

b. What is the meaning of an 8-bit processor?

→ A processor that can handle 8 bits of data in a single operation

c. What is Mnemonics?

→ Symbolic names for machine instructions in assembly language, e.g., MOV, ADD

d. Define : Assembly language, machine language, high-level language

→ Assembly Language : Hardware-specific and uses Mnemonics

Machine Language : Binary code directly understood by the processor

High-level Language : User-friendly, platform-independent, e.g., Python, Java.

e. What is an assembler?

→ Converts assembly language into machine-language

f. What is a Compiler?

→ Converts high-level language into machine code.

Date
Page

g. Which information is given by the address line?
→ The specific memory location for data transfer
h. Data bus is always bidirectional : True / False
→
i. Microcontroller is faster than Microprocessor : Justify
→ A microcontroller is optimised for specific tasks, with all components integrated on a single chip
j. Why do we need a clock in a microprocessor?
→ To synchronize and control the timing of operations
k. Advantages of assembly language over high-level language
→ Faster execution and efficient memory usage
l. Write full name of : RAM, ROM, ALU, SSI, MSI, VLSI, ASCII
→ RAM : Random Access Memory
ROM : Read-Only Memory
ALU : Arithmetic Logic Unit
SSI : Small-Scale Integration
MSI : Medium-scale Integration
VLSI : Very-large scale Integration
ASCII : American Standard Code for Information Interchange

m. What is bus?
→ A pathway for transferring data, addresses or control signals

n. What do you mean by peripherals?
→ External devices like keyboard, mouse, printer, etc.
o. How much memory access by 8085 microprocessor?
→ 64KB (2^{16} addresses)
p. ALU stands for
→ Arithmetic Logic Unit
q. Purpose of Control Unit in Microprocessor
→ Coordinates & controls the execution of instructions
r. Justify "Microprocessor is a programmable device"
→ It can execute instructions written by users.
s. Address bus is unidirectional: Justify
→ The processor only sends addresses to memory, not the other way
t. Difference between 4-bit and 8-bit microprocessor
→ 4-bit can process 4 bits of data, while 8-bit can process 8 bits at a time.
u. Difference between assembly language & machine language
→ Assembly: Human-readable mnemonics
Machine: Binary code directly executed.
v. Use of Registers in Microprocessor
→ Temporary storage for data, instructions, and intermediate results.
w. What stands for CISC & RISC?
→ CISC: Complex Instruction Set Computer
RISC: Reduced Instruction Set Computer.
x. What is Op-code?
→ Part of an instruction that specifies

the operation to be performed.

4. What is Operand?

→ The data or memory location on which an operation is performed.

2. Difference between general purpose & special purpose microprocessors

→ General-purpose : Used in PCs, versatile

Special purpose : Optimized for specific tasks, e.g., signal processing