SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade (III Cycle)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

19AUT301 – AUTOMOTIVE EMBEDDED SYSTEMS

III YEAR/V SEM

UNIT 1 – INTRODUCTION TO EMBEDDED SYSTEMS

TOPIC 1 – INTERFACING TO EXTERNAL MEMORY

INTRODUCTION

- The 8051 microcontroller is a popular microcontroller used in various applications, ranging from small embedded systems to larger industrial applications.
- While the 8051 has a limited amount of internal memory, it is possible to extend the memory capacity by interfacing it with external memory devices.
- External memory interfacing in 8051 microcontroller involves connecting external memory devices such as RAM and ROM to the microcontroller to provide additional memory space.
- This allows the microcontroller to execute larger and more complex programs, store more data, and perform more complex operations.

INTERFACING TO EXTERNAL MEMORY

- To interface with external memory, the 8051 microcontroller uses dedicated pins such as ALE (Address Latch Enable), PSEN (Program Store Enable), and RD (Read) and WR (Write) signals. These signals are used to control the flow of data between the microcontroller and the external memory device.
- For minimal memory applications, the 8051 has internal data and code memory

WHY NEED EXTERNAL MEMORY INTERFACING IN 8051 MICROCONTROLLER ?

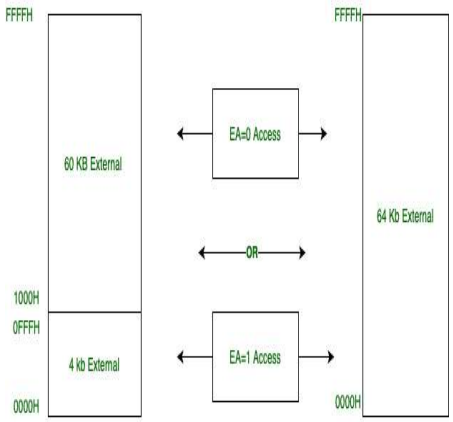
- **Limited internal memory:** The 8051 microcontroller has a limited amount of internal memory, including 128 bytes of RAM and 4KB of on-chip ROM. This memory may not be sufficient for some applications that require larger program memory or more data storage.
- **Larger programs:** For applications that require larger programs, such as complex algorithms or multiple functions, external memory interfacing can provide the necessary program memory space to store these programs.

WHY NEED EXTERNAL MEMORY INTERFACING IN 8051 MICROCONTROLLER ?

- **Data storage:** Applications that require the storage of large amounts of data, such as data logging or data analysis, may require external memory interfacing to store the data.
- **Flexibility:** External memory interfacing provides greater flexibility in the design of embedded systems, allowing for customization and adaptability to meet specific application requirements.
- **Cost-effective:** External memory devices such as RAM and ROM are relatively inexpensive, making it cost-effective to interface them with the microcontroller instead of using more expensive on-chip memory.

EXTERNAL PROGRAM MEMORY

- The program fetches to addresses 0000H through OFFFH are directed to the internal ROM in the 8051.
- When the EA pin is attached to VCC, and program fetches to addresses 1000H through FFFFH are directed to the external ROM/EPROM.
- When the EA pin is grounded, all addresses fetched by the program (0000H to FFFFH) are led to it.



INSTRUCTIONS TO ACCESS EXTERNAL ROM / PROGRAM MEMORY

Mnemonic	Operation
MOVC A, @ A+DPTR	Copy the contents of the external ROM address formed by adding A and the DPTR, to A
MOVC A, @ A + PC	This operation will do copy This operation contents of the external ROM address formed by adding A and the PC, to A.

INSTRUCTIONS TO ACCESS EXTERNAL DATA MEMORY

Mnemonic	Operation
MOVX A, @Rp	In this operation, it will copy the contents of the external address in Rp to A.
MOVX A, @DPTR	Copy the contents of the external address in DPTR to A.
MOVX @Rp. A	Copy data from A to the external address in Rp
MOVX DPTR, A	Copy data from A to the external address in DPTR.

ASSESSMENT-Let's Recap

1. How to access external memory?

2. The input and output operations are respectively similar to the operations,
a) read, read
b) write, write
c) read, write
d) write, read

Thank You