

## MODULE 5

**Data Processing Instructions**

- The data processing instructions manipulate data within registers. They are move instructions, arithmetic instructions, logical instructions, compare instructions and multiply instructions.
- Most data processing instructions can process one of their operands using the barrel shifter.
- If S is suffixed on a data processing instruction, then it updates the flags in the cpsr.

**MOVE INSTRUCTIONS:**

- It copies N into a destination register Rd, where N is a register or immediate value. This instruction is useful for setting initial values and transferring data between registers.

**Syntax: <instruction> {<cond>} {S} Rd, N**

MOV	Move a 32-bit value into a register	$Rd = N$
MVN	move the NOT of the 32-bit value into a register	$Rd = \sim N$

- In the example shown below, the MOV instruction takes the contents of register r5 and copies them into register r7.

```

PRE    r5 = 5
        r7 = 8
        MOV    r7, r5    ; let r7 = r5
POST   r5 = 5
        r7 = 5
  
```

**USING BARREL SHIFTER WITH DATA TRANSFER INSTRUCTION:**

- Data processing instructions are processed within the arithmetic and logic unit (ALU).
- A unique and powerful feature of the ARM processor is the ability to shift the 32-bit binary pattern in one of the source registers left or right by a specific number of positions before it enters the ALU.
- This shift increases the power and flexibility of many data processing operations.
- For example, We apply a logical shift left (LSL) to register Rm before moving it to the destination register.

```

PRE    r5=5
        r7=8
        MOV r7, r5, LSL #2
POST   r5=5
        r7=20
  
```

- The above example shift logical left r5=5 (00000101 in binary) by two bits and then r7=20 (00010100 in binary).

# Microcontroller Lab Manual For 4th Sem Vtu University

**Ramani Kalpathi**



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Microcontrollers And Applications With Lab Manual Kalpathi Ramani,2010-09 *Getting Started with Tiva ARM Cortex M4 Microcontrollers* Dhananjay V. Gadre,Sarthak Gupta,2017-10-16 The book presents laboratory experiments concerning ARM microcontrollers and discusses the architecture of the Tiva Cortex M4 ARM microcontrollers from Texas Instruments describing various ways of programming them Given the meager peripherals and sensors available on the kit the authors describe the design of Padma a circuit board with a large set of peripherals and sensors that connects to the Tiva Launchpad and exploits the Tiva microcontroller family s on chip features ARM microcontrollers which are classified as 32 bit devices are currently the most popular of all microcontrollers They cover a wide range of applications that extend from traditional 8 bit devices to 32 bit devices Of the various ARM subfamilies Cortex M4 is a middle level microcontroller that lends itself well to data acquisition and control as well as digital signal manipulation applications Given the prominence of ARM microcontrollers it is important that they should be incorporated in academic curriculums However there is a lack of up to date teaching material textbooks and comprehensive laboratory manuals In this book each of the microcontroller s resources digital input and output timers and counters serial communication channels analog to digital conversion interrupt structure and power management features are addressed in a set of more than 70 experiments to help teach a full semester course on these microcontrollers Beyond these physical interfacing exercises it describes an inexpensive BoB break out board that allows students to learn how to design and build standalone projects as well a number of illustrative projects *MSP430 Microcontroller Lab Manual* James Kretzschmar,Jeffrey Anderson,Steven F. Barrett,2023-05-23 This book is a practical reference for using Texas Instruments MSP430 microcontrollers It provides a series of hands on laboratory exercises The labs may be completed in a traditional laboratory setting or at home using the Digilent Analog Discovery 2 Test Instrument This book can be used as a reference for planning future projects using the MSP430 microcontroller The authors focus on applications of the main peripheral modules available on the MSP430 microcontroller CPU clock Basic Input Output Timer Analog to Digital Converter They also provide examples of how to develop Pulse Width Modulation signals and how to use Interrupts **Microcontrollers & Applications With Lab Manual** Ramani Kalpathi,2009-01-01 This book is a comprehensive guide for students and practicing engineers which enables them to master the fundamentals of embedded systems programming and will guide them through the steps of creating powerful real world applications Features Simple structured approach to learning with well focused chapter sections Numerous concise examples demonstrate the principles and practices involved in creating full featured real world applications Problems are graded to meet the university standards Secrets to unleashing the full power of Embedded systems design revealed Contents Microprocessors and Micro controllers The 8051 Architecture Addressing Modes and Moving Data Logical Operations Arithmetic Operations and Jump Operations Timer and Counter Programming Interrupts Programming Serial Communications The 8052 Family Special Features with

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