

## 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**

<b>MOV</b>	Move a 32-bit value into a register	$Rd = N$
<b>MOVN</b>	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).

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## **Microcontroller Lab Manual Vtu 4th Sem:**

**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 *Microcontrollers And Applications With Lab Manual* Kalpathi Ramani, 2010-09 *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 8051 Core 8051 Interfacing and Applications Microcontroller Lab Robert E. Glaser,2005-09-01 This is a two semester undergraduate course in microcontrollers Generic information on the 68HC908JK3 C8051F330D Z8F0421 and 68HC908QT4 is provided along with excerpts from the manufacturer documentation sufficient for students to program these parts with no additional references required Includes hands on assignments to be performed on the University Microcontroller Trainer model UMT 1 from www ICEngineering com Microcontroller programming Mathan,2019-08-07 How to program microcontroller All the steps are mentioned clearly and a lot of exercises are provided to carry out the programming This is similar to a microcontroller lab manual The Hands-on ARM mbed Development Lab Manual Agus Kurniawan, This book helps you to get started with ARM mbed development Several codes samples are provided to illustrate how to work with ARM mbed boards using online mbed Compiler The following is highlight topics in this book Setting Up Development Environment mbed Digital I O ARM mbed UART mbed Analog I O mbed I2C TWI mbed SPI mbed and Bluetooth Low Energy BLE Controlling Servo Motor **Introduction to Embedded Systems** Manuel Jiménez,Rogelio Palomera,Isidoro Couvertier,2013-09-11 This textbook serves as an introduction to the subject of embedded systems design using microcontrollers as core components It develops concepts from the ground up covering the development of embedded systems technology architectural and organizational aspects of controllers and systems processor models and peripheral devices Since microprocessor based embedded systems tightly blend hardware and software components in a single application the book also introduces the subjects of data representation formats data operations and programming styles The practical component of the book is tailored around the architecture of a widely used Texas Instrument s microcontroller the MSP430 and a companion web site offers for download an experimenter s kit and lab manual along with Powerpoint slides and solutions for instructors **PIC LAB Manual. Examples for Experiments Using Microcontrollers** Anoop B. K.,2016 ADuC841 Microcontroller Design Manual Shlomo Engelberg,2011-08-31 Microcontrollers & Applications Ramani Kalpathi,2008-01-01 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 8051 Core 8051 Interfacing and Applications A Microcontroller Laboratory on the Internet Bryan Devin Infanger,1998 **Remote M68HC11 Microcontroller Laboratory** Adrian Lattanzio,1999

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