Application Programs

ELEC 330

Digital Systems Engineering

Dr. Ron Hayne

Images Courtesy of Ramesh Gaonkar and Delmar Learning

THE CITADEL

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Application Programs

- BCD to Binary Conversion
- Binary to BCD Conversion
- ASCII Code to Binary Conversion
- Binary to ASCII Code Conversion
- Multiplication of 16-bit Numbers
- Division of Two Unsigned Numbers

BCD to Binary Conversion

- Data often entered in decimal format
- A through F are invalid
- Special care taken to process the data in BCD
  - Sometimes necessary to convert the BCD data into binary numbers

BCD to Binary Conversion

- Problem statement
  - Given a packed BCD number in WREG
    - Write a subroutine to unpack the number
    - Convert it into its equivalent binary number
    - Return the number in WREG

BCD to Binary Conversion

- Problem analysis
  - The BCD numbers include only ten digits from 0 to 9
  - The value of the digit is based on its position
    - Example, in decimal number 97, the value of 9 is 90
  - To find the binary value of 97_{BCD} = 1001 0111
    - Unpack the number
      - 9 (00001001) and 7 (00000111)
    - Multiply high-order digit by 10 and add low-order digit
      - (00001001) x 10 + (0000111)

Unpack

Opcode	Operands	Comments
MOVWF	REG1	;Save BCD
ANDLW	0x0F	;Mask high digit
MOVWF	BCD0	;Save low digit
MOVF	REG1,W	;Get saved BCD
SWAPF	WREG,W	;Swap digits
ANDLW	0x0F	;Mask low digit
MOVWF	BCD1	;Save high digit

Convert

Opcode	Operands	Comments
MULLW	D’10’	;Multiply high digit
MOVFF	PRODL,WREG	;Move product
ADDWF	BCD0,W	;Add low digit
RETURN		

PIC18 Simulator