

EE461 Microprocessor-based Digital Design

I/O Ports

Assignment 8 Solutions

1. Suppose bits PCFG3, PCFG2, PCFG1, and PCFG0 have the values 1, 0, 0, and 1 respectively. Name the bits of Port E that are available for digital input and output.

SOLUTION

The Register 11-2 table on page 128 of the data sheet shows that with this setting the analog inputs AN7 and AN6 are not available, although AN5 is. Table 4-9 on page 49 shows that AN7 and AN6 use the same pins as RE2 and RE1, so these bits in Port E are available for digital I/O. The AN5 input is associated with RE0, so this bit of Port E is *not* available for digital I/O.

2. Figure 4-1 in the user guide shows the circuitry associated with four of the six pins of Port A in the PIC16F874A, namely, RA3–RA0. Actually, this figure also applies to RA5 in the PIC16F874, which we are using in the lab. Assume that these five pins of Port A all are being used to support analog input and that the RA4 pin has been tied to +5 V by means of a pull-up resistor.

Study the figure and state the contents of the W register after the following code fragment has been executed:

```
1      #include <p16f874.inc>
2 TRISA mask      equ      B'00101111'
3 TestData        equ B'11111111'
4 ...
5      bcf        STATUS,RP1
6      bsf        STATUS,RP0
7      movlw     TRISA mask
8      movwf     TRISA
9      bcf        STATUS,RP0
10     movlw     TestData
11     movwf     PORTA
12     movf      PORTA,W
```

SOLUTION

Lines 5 through 9 have the effect of setting Port A Bit 4 for output; all other Port A bits are set for input. Lines 10 and 11 appear to transfer eight 1-bits to PORTA. However, Figure 4-1 shows that when Port A bits are selected for analog use, as they all are in this problem, the AND gate that supplies the D input of the latch at the bottom of the figure always outputs a 0 and this is the value read whenever the bit is read. Thus, all the analog bits appear to have the digital value 0 when Port A is read. Furthermore, bits 7 and 6 are not implemented. Table 2-1 on page 15 of the data sheet shows that these bits, too, are read as zeroes. Only bit 4, which has no analog use, will be read correctly, as Figure 4-2 on page 42 of the data sheet shows. Consequently, the W register will hold the bit pattern 0001 0000 = $10_{16} = 16_{10}$.