

Microprocessor Fundamentals Worksheet: Embedded Coding

Arduino pin defs are on page 2. Write a line (or so) of code to do each of the following:

1. Set bits 2 and 3 of Port B to output mode while leaving the remaining bits at their current state.
2. Set bit 1 of Port D to output mode with all other bits set to input mode.
3. Write a high to bit 3 of Port D.
4. Write a low to bits 4 and 5 of Port B.
5. Read the digital value input at bit 7 of Port D and store it in a variable called X.
6. Read the analog value input at bit 1 of Port C and store it in a variable called Z.

Assume that the system variables are initialized as follows: DDRD=0, PORTB=0x81, PINC=0x05. Indicate the results of each line. Treat each line separately, not 7 through 10 as one program.

7. `DDRD |= 0x70;`
8. `DDRD = 0xf1;`
9. `PORTB |= 0x23;`
10. `PORTB &= (~0xf0);`

Arduino Designator	General Purpose IO Designator	Comment
A0	PORTC bit 0	ADC input 0
A1	PORTC bit 1	ADC input 1
A2	PORTC bit 2	ADC input 2
A3	PORTC bit 3	ADC input 3
A4	PORTC bit 4	ADC input 4
A5	PORTC bit 5	ADC input 5
0	PORTD bit 0	RX
1	PORTD bit 1	TX
2	PORTD bit 2	
3	PORTD bit 3	PWM
4	PORTD bit 4	
5	PORTD bit 5	PWM
6	PORTD bit 6	PWM
7	PORTD bit 7	
8	PORTB bit 0	
9	PORTB bit 1	PWM
10	PORTB bit 2	PWM
11	PORTB bit 3	PWM
12	PORTB bit 4	
13	PORTB bit 5	Built-in LED

Arduino Pin Definitions

Answers

1. Set bits 2 and 3 of Port B to output mode while leaving the remaining bits at their current state.

```
DDRB |= 0x0C; // or use 2 calls to pinMode()
```

2. Set bit 1 of Port D to output mode with all other bits set to input mode.

```
DDRD = 0x02; // or use 8 calls to pinMode()
```

3. Write a high to bit 3 of Port D.

```
PORTD |= 0x08; // or a call to digitalWrite()
```

4. Write a low to bits 4 and 5 of Port B.

```
PORTB &= (~0x30); // or 2 calls to digitalWrite()
```

5. Read the digital value input at bit 7 of Port D and store it in a variable called X.

```
X = PINB & 0x80; // or a call to digitalRead()
```

6. Read the analog value input at bit 1 of Port C and store it in a variable called Z.

```
Z = analogRead(1);
```

Assume that the system variables are initialized as follows: DDRD=0, PORTB=0x81, PINC=0x05. Indicate the results of each line.

7. DDRD |= 0x70;

DDRD becomes 0x70. This sets PORTD/PIND bits 4, 5 and 6 to output mode leaving the others unchanged.

8. DDRD = 0xf1;

DDRD becomes 0xf1. This sets PORTD/PIND bits 0, 4, 5, 6 and 7 to output mode, the others to input mode.

9. PORTB |= 0x23;

PORTB becomes 0xa3. This sets bits 0, 1 and 5 of PORTB high, leaving all other bits unchanged.

10. PORTB &= (~0xf0);

PORTB becomes 0x01. This clears the top four bits of this port (5->7), writing zeroes to those bits, while leaving the bottom four bits (0->3) as they were.