第一章布置习题参考解

1-1

This problem concerns wind measurements made by the wireless weather station illustrated in Example 1-1. The wind-speed measurement used a rotating anemometer connected by a shaft to an enclosed disk that is one-half clear and one-half black. There is a light above and a photodiode below the disk *in the enclosure*. The photodiode produces a 3 V signal when exposed to light and a 0 V signal when not exposed to light.

(a) Sketch the *relative* appearance of voltage waveforms produced by this sensor (1) when the wind is calm, (2) when the wind is 10 mph, and (3) when the wind is 100 mph.

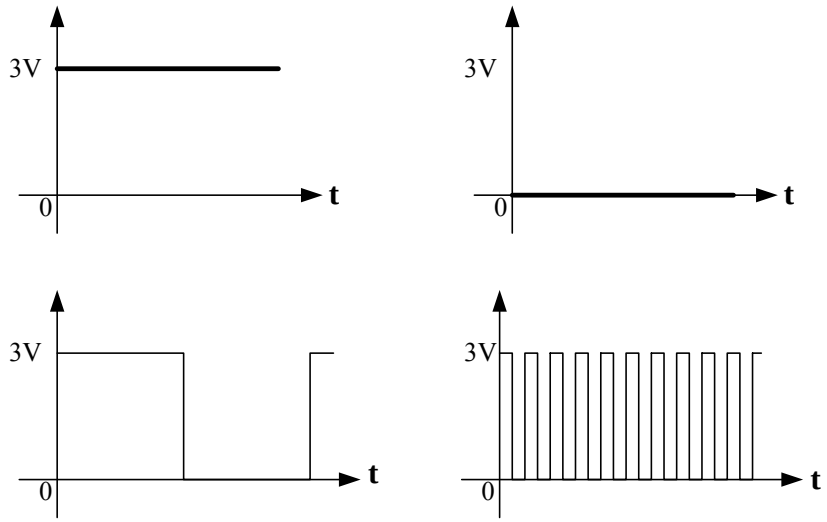
(b) Explain verbally what information the microcomputer must have available and the tasks it must perform to convert the voltage waveforms produced into a binary number representing wind speed in miles per hour.

这个问题涉及例 1-1 中所示无线天气站的风力测量。风速测量采用旋转的风速计，风速计通过轴连接到一个封闭的盘片，盘片一半透明（清晰）一半黑。在这个封闭体内，盘片上面有一个光源（灯），盘片下面有个光电二极管。当光电二极管暴露在光线下，产生一个 3 V 的信号，没有暴露在光线下产生 0 V信号。

（a）画出这种传感器产生的电压的波形相对形状

（1）当风是平静的，（2）当风力为 10 英里，和（3）当风是 100 英里。

（b）执行（传感器）产生的电压波形转换成二进制数的风速（用英里每小时表示），口头解释微机必须有那些有用信息。



1-2

Use the scheme in Example 1-1, find the discrete, quantized value of voltage and the binary code for each of the following Fahrenheit temperatures -34,+31,+77, and +108.

P9, Figure 1-4 :

-40° F~102° F→0V~16V→0000~1111

采样分辨率：(120-(-40))/16=° F 10/1V

温度模拟电压值：V=aF+b

取二个点列方程： $\begin{cases} 1= -30a+b \\ 11=70a+b \end{cases}$ $\begin{cases} a=0.1; \\ b= 4 \end{cases}$

V=0.1F+4

° F	-40	-30	-20	-10	-0	10	20	30	40	50	60	70	80	100	110	120
V	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Bin	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	11111
voltage		0.6V						7.1V					11.7V			14.8V
		-34						31					77			108

1-4

$96K=96\times2^{10}=98304$ Bits

$640M=640\times2^{20}=671088640$ Bits

$4G=4\times2^{30}=4294967296$ Bits

1-7

Decimal	Binary	Octal	Hexadecimal
369.3125	101110001.0101	561.24	171.5
189.625	10111101.101	275.5	BD.A
214.625	11010110.101	326.5	D6.A
62407.625	1111001111000111.101	171707.5	F3C7.A

1-12

a)

```
    1 1 0 1
  × 1 0 1 1
  ---------
    1 1 0 1
  1 1 0 1
0 0 0 0
+ 1 1 0 1
---------
1 0 0 0 1 1 1 1
```

b)

```
    0 1 0 1
  × 1 0 1 0
  ---------
    0 0 0 0
  0 1 0 1
0 0 0 0
+ 0 1 0 1
---------
  0 1 1 0 0 1 0
```

c)

```
      1 0 0 1 1 1
    × 0 1 1 0 1 1
    -------------
      1 0 0 1 1 1
    1 0 0 1 1 1
  0 0 0 0 0 0
1 0 0 1 1 1
+ 0 0 0 0 0 0
-------------
1 0 0 0 0 0 1 1 1 0 1
```

1-13

```
          0  0  1  0  0  0  1
      ┌──────────────────────
1  0  1 ╱ 1  0  1  0  1  1  0
         1  0  1
      ──────────
         0  0  0  0  1  1  0
                  1  0  1
               ──────────
                  0  0  1
```

算法：

	积	差	部分余	偏商
1	101×10000=1010000	1010110–1010000=**0000110**	**0000110**≥101≥0	10000
2	101×01000=0101000	**0000110**–0101000 <0	**0001110**≥101	00000
3	101×00100= 0010100	**0000110**–0010100<0	**0000110**≥ 101	00000
4	101×00100= 0010100	**0000110**–0010100<0	**0000110**≥ 101	00000
4	101×00001= 0000101	**0001110**–0000101=**001**≥ 0	**001**<101	00001
	Algorithm stops	**Partial Remainder < Divisor**	**001**	**10001**

1-15

a)

基数	基																		
20	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	J	H	I	J

b)

```
20 | 2   0   0   7   余数
   | 20  1   0   0       7
   |     20  5           0
   |         0           5
```

$$(2007)_{10}=(507)_{20}$$

c)

$$(BCI.G)_{20}=11\times20^2+12\times20^1+18\times20^0+16\times20^{-1}=(4658.8)_{10}$$

1-16

a)

(BEE)r = (2699)10

$$11\times r^2+14\times r^1+14\times r^0=2699$$

$$11\times r^2+14\times r-2685=0$$

解二次方程得：: r = 15 or $r \approx -16.27$

取： r = 15

b)

$(365)r = (194)10$

$3\times r^2+6\times r^1+5\times r^0=194$

$3\times r^2+6\times r-189=0$

解二次方程得： $= -9$ or $r=7$

取：$r = 7$

1-19

a)

$(694)_{10}=(0110\ 1001\ 0100)_{BCD}$

$(835)_{10}=(1000\ 0011\ 0101)_{BCD}$

b)

	0001		
	0110	**1001**	**0100**
	+1000	**+0011**	**+0101**
	1111	**1100**	**1001**
BCD 调整	**+0110**	**+0110**	**+0000**
	0001 0101	**1 0010**	**1001**