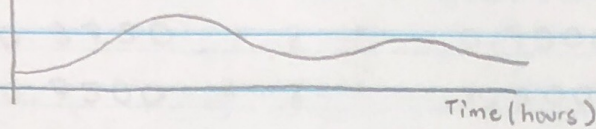


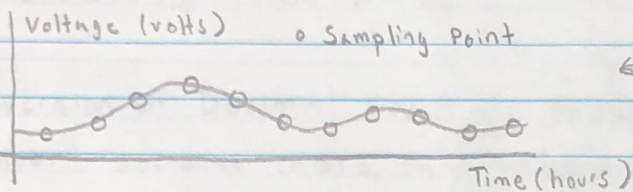
Chapter 1 Problems

1-1 Temperature Measurement and Display

Temperature
(degrees Fahrenheit)



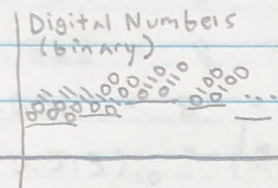
(a) Analog temperature



Sensor and Signal
Conditioning

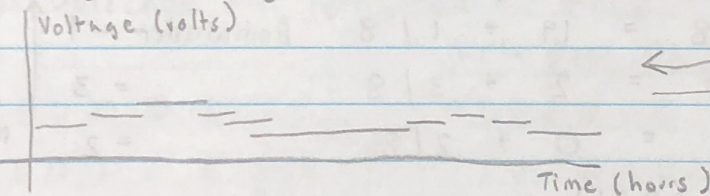
Analog-to-Digital (A/D)
Conversion

(b) Continuous (analog) voltage



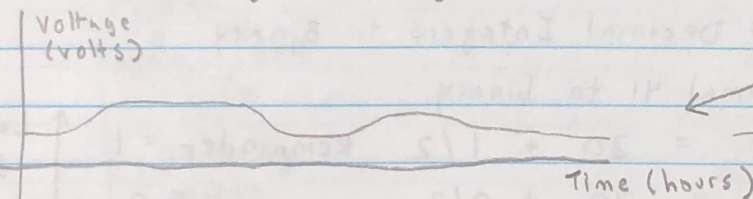
Digital-to-Analog (D/A)
Conversion

(c) Digital voltage



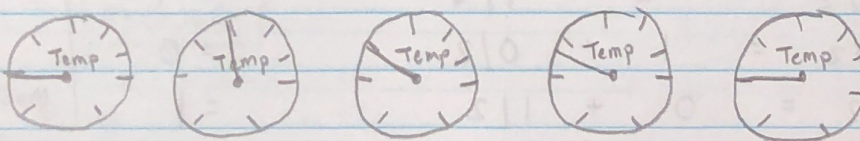
Signal Conditioning

(d) Discrete (digital) voltage



(e) Continuous (analog) voltage

Output



(f) Continuous (analog) readout

1-2 Hexadecimal Addition

$$\begin{array}{r} 1 1 \\ 5 9 F \\ + E 4 6 \\ \hline 1 3 E 5 \end{array}$$

1-3 Octal Multiplication

$$\begin{array}{r} 4_3 3_3 1 \\ 7 6 2 \\ \times 4 5 \\ \hline 4 6 7 2 \\ 3 7 0 8 \\ \hline 4 3 7 7 2 \end{array}$$

1-4 Conversion of Decimal Integers to Octal

Convert decimal 153 to octal

$$\begin{array}{lcl} 153 / 8 = 19 + 1/8 & \text{Remainder} = 1 & \uparrow \text{Least significant digit} \\ 19 / 8 = 2 + 3/8 & = 3 & \\ 2 / 8 = 0 + 2/8 & = 2 & \text{Most significant digit} \end{array}$$

$$(153)_{10} = (231)_8$$

1-5 Conversion of Decimal Integers to Binary

Convert decimal 41 to binary

$$\begin{array}{lcl} 41 / 2 = 20 + 1/2 & \text{Remainder} = 1 & \uparrow \text{Least significant digit} \\ 20 / 2 = 10 + 0/2 & = 0 & \\ 10 / 2 = 5 + 0/2 & = 0 & \\ 5 / 2 = 2 + 1/2 & = 1 & \\ 2 / 2 = 1 + 0/2 & = 0 & \\ 1 / 2 = 0 + 1/2 & = 1 & \text{Most significant digit} \end{array}$$

$$(41)_{10} = (101001)_2$$

1-6

Conversion of Decimal Fractions to Binary

Convert decimal 0.6875 to binary

$$0.6875 \times 2 = 1.3750 \quad \text{Integer} = 1$$

$$0.3750 \times 2 = 0.7500 \quad = 0$$

$$0.7500 \times 2 = 1.5000 \quad = 1$$

$$0.5000 \times 2 = 1.0000 \quad = 1$$

$$(0.6875)_{10} = (0.1011)_2$$

Most significant digit

Least significant digit

1-7

Conversion of Decimal Fractions to Octal

Convert decimal 0.513 to a three-digit octal fraction

$$0.513 \times 8 = 4.104 \quad \text{Integer} = 4$$

$$0.104 \times 8 = 0.832 \quad = 0$$

$$0.832 \times 8 = 6.656 \quad = 6$$

$$0.656 \times 8 = 5.248 \quad = 5$$

$$(0.513)_{10} = (0.407)_8$$

Most significant bit

Least significant bit

1-8

Error Detection and Correction for ASCII Transmission

	With Even Parity	With Odd Parity
1 0 0 0 0 0 1	0 1 0 0 0 0 0 1	1 1 0 0 0 0 0 1
1 0 1 0 1 0 0	1 1 0 1 0 1 0 0	0 1 0 1 0 1 0 0

