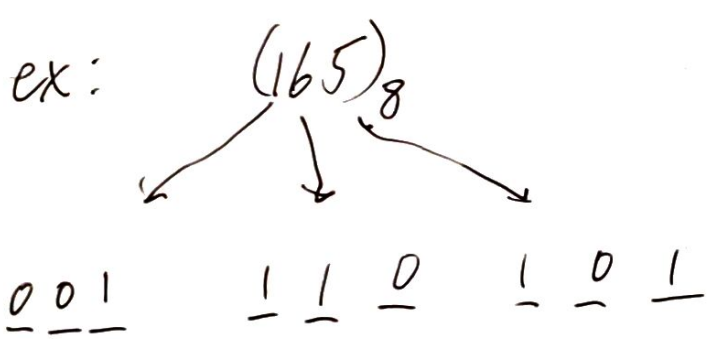
4.2 (Continued)

When converting from octal or hexadecimal to binary, break up the original octal or hexadecimal number in groups of three digits (for octal) or four digits (for hexadecimal) from right to left. Pad empty left most digits with zeros. Then convert each digit of original number to its three or four digit binary equivalent

ex: convert $(765)_8$ to binary.

ex: $(165)_8$



convert

ex $(A8D)_{16}$ to binary

Solution

1 0 1 0 1 0 0 0 1 1 0 1

$(1010\ 1000\ 1101)_2$

When converting from binary to octal or hexadecimal, group the original binary number, from right to left, in three digits (for octal) or four digits (for hexadecimal).
Also put left most empty digit slots with zeros.
Then convert each grouping to its octal or hexadecimal equivalent.

ex: convert $(11\ 111\ 010\ 111\ 100)_2$ to octal

011 111 010 111 100

3 7 2 7 4

$(37274)_8$

ex convert $(11\ 1110\ 1011\ 1100)_2$ to hexadecimal

0011 1110 1011 1100

3 14 11 12

3 E B C

$(3EBC)_{16}$

0-9 A B C D E F
10 11 12 13 14 15

ex: Convert $(ABC)_{16}$ to octal

10 11 12

Solution

convert to binary, then to octal

1010 1011 1100

5 2 7 4

$(5274)_8$

ex: Add $(1110)_2$ and $(1011)_2$

Solution:

$$\begin{array}{r} {\scriptstyle 1\ 1\ \ \ } \\ 1110 \\ +1011 \\ \hline 11101 \end{array}$$

$(11101)_2$

ex: Add $(1AE)_{16}$ and $(BBC)_{16}$

Solution:

$$\begin{array}{r} {\scriptstyle 1\ 1\ \ \ } \\ 1AE \rightarrow 1,10,14 \\ +BBC \quad +11,11,12 \\ \hline 13,6,10 \end{array}$$

$$\begin{array}{r} 26 \\ -16 \\ \hline 10 \end{array} \qquad \begin{array}{r} 22 \\ -16 \\ \hline 6 \end{array}$$

$(D6A)_{16}$

Ex: multiply $(110)_2$ and $(101)_2$

Solution:

convert to decimal, multiply, the convert back to binary

$(110)_2 = (6)_{10}$

$(101)_2 = (5)_{10}$

$$\begin{array}{r} 6 \\ \times 5 \\ \hline (30)_{10} \end{array}$$

$$2\overline{)30} \quad 15 \text{ r } 0$$

$$2\overline{)15} \quad 7 \text{ r } 1$$

$$2\overline{)7} \quad 3 \text{ r } 1$$

$$2\overline{)3} \quad 1 \text{ r } 1$$

$$2\overline{)1} \quad 0 \text{ r } 1$$

$$\boxed{(11110)_2}$$