Ex: Find the sum of the following hexadecimal numbers and express the answer in binary and Binary Coded Decimal (BCD).

A3 + 7F

Sol'n: Hexadecimal is base 16. A = 10 and F = 15 decimal. Convert to decimal:

\[ A3 + 7F = A \cdot 16 + 3 \cdot 1 + 7 \cdot 16 + F \cdot 1 = 10 \cdot 16 + 3 \cdot 1 + 7 \cdot 16 + 15 \cdot 1 \]

or

\[ A3 + 7F = 160 + 3 + 112 + 15 = 290 \text{ decimal} \]

For BCD we encode each digit with four bits of binary:

290 = 0010 1001 0000 BCD

For binary, we divide by two repeatedly and write down remainders (r).

\[
\begin{align*}
\frac{290}{2} &= 145r0 \\
\frac{145}{2} &= 72r1 \\
\frac{72}{2} &= 36r0 \\
\frac{36}{2} &= 18r0 \\
\frac{18}{2} &= 9r0 \\
\frac{9}{2} &= 4r1 \\
\frac{4}{2} &= 2r0 \\
\frac{2}{2} &= 1r0 \\
\frac{1}{2} &= 0r1 \\
\end{align*}
\]

We read off remainders from bottom to top

1 0010 0010 binary