Matemática Discreta II

Mauro Polenta Mora

Ejercicio 1

Consigna

1. Escribir en las bases 2, 4, 8 y 16 los números decimales: 137, 6243 y 12354.
2. Escribir en la base 28 el número decimal 16912.
3. Escribir en las bases 2 y 10 los números hexadecimales: A7, 4C2, 1C2B y A2DFE.
4. Escribir en las bases 10 y 16 los números binarios: 11001110, 00110001, 11110000 y 01010111.
5. Pasar los siguientes números, dados en las bases indicadas, a decimal: $(BACK)_{21}$ y $(OJO)_{25}$.

Resolución

Parte 1

- 137:
  - Base 2:

$$
\begin{aligned}
137 &= 2 \times 68 + 1 \\
137 &= 2 \times (2 \times 34 + 0) + 1 \\
137 &= 2 \times (2 \times (2 \times 17 + 0) + 0) + 1 \\
137 &= 2 \times (2 \times (2 \times (2 \times 8 + 1) + 0) + 0) + 1 \\
137 &= 2 \times (2 \times (2 \times (2 \times (2 \times 4 + 0) + 1) + 0) + 0) + 1 \\
137 &= 2 \times (2 \times (2 \times (2 \times (2 \times (2 \times 2 + 0) + 0) + 1) + 0) + 0) + 1 \\
137 &= 2^7 + 2^3 + 2^0 \\
137 &= (10001001)_2
\end{aligned}
$$

  - Base 4:

$$
\begin{aligned}
137 &= 2^7 + 2^3 + 2^0 \\
137 &= 4 \cdot 2^5 + 4 \cdot 2 + 4^0 \\
137 &= 4^2 \cdot 2^3 + 4 \cdot 2 + 4^0 \\
137 &= 4^3 \cdot 2 + 4 \cdot 2 + 4^0 \cdot 1 \\
137 &= (2021)_4
\end{aligned}
$$

  - Base 8:

$$137 = 2^7 + 2^3 + 2^0$$
$$137 = 2^3 \cdot 2^4 + 2^3 + 2^0$$
$$137 = 2^6 \cdot 2 + 2^3 + 2^0$$
$$137 = 8^2 \cdot 2 + 8 \cdot 1 + 8^0$$
$$137 = (211)_8$$

  - Base 16:

$$137 = 4^3 \cdot 2 + 4 \cdot 2 + 4^0 \cdot 1$$
$$137 = 4^2 \cdot 4 \cdot 2 + 8 + 1$$
$$137 = 16 \cdot 8 + 9$$
$$137 = (89)_{16}$$

- 12354:
  - Base 16:

$$12354 = 16 \cdot 772 + 2$$
$$12354 = 16 \cdot (16 \cdot 48 + 4) + 2$$
$$12354 = 16 \cdot (16 \cdot (16 \cdot 3 + 0) + 4) + 2$$
$$12354 = 16^3 \cdot 3 + 16^2 \cdot 0 + 16^1 \cdot 4 + 16^0 \cdot 2$$
$$12354 = (3042)_{16}$$

  - Base 4:

$$12354 = 16^3 \cdot 3 + 16^2 \cdot 0 + 16^1 \cdot 4 + 16^0 \cdot 2$$
$$12354 = 4^6 \cdot 3 + 4^4 \cdot 0 + 4^2 \cdot 4 + 4^0 \cdot 2$$
$$12354 = 4^6 \cdot 3 + 4^3 + 4^0 \cdot 2$$
$$12354 = (3001002)_4$$

  - Base 2:

$$12354 = 4^6 \cdot 3 + 4^3 + 4^0 \cdot 2$$
$$12354 = 2^{12} \cdot 3 + 2^6 + 2^0 \cdot 2$$
$$12354 = 2^{12} \cdot (2 + 1) + 2^6 + 2^1$$
$$12354 = 2^{13} + 2^{12} + 2^6 + 2^1$$
$$12354 = (11000001000010)_2$$

  - Base 8:

$$12354 = 2^{13} + 2^{12} + 2^6 + 2^1$$
$$12354 = 2^{12} \cdot 2 + 2^{12} + 2^6 + 2^1$$
$$12354 = 8^4 \cdot 2 + 8^4 + 8^2 + 2$$
$$12354 = 8^4 \cdot 3 + 8^2 + 8^0 \cdot 2$$
$$12354 = (30102)_8$$

Para esta parte, lo más simple es utilizar las representaciones de una base potencia de dos para ir representando otras.

Parte 3

- Escribir en las bases 2 y 10 los números hexadecimales: A7, 4C2, 1C2B y A2DFE.
- $(A7)_{16}$:

  - Base 10:

$$(A7)_{16} = 16^1 \cdot 10 + 16^0 \cdot 7$$
$$(A7)_{16} = 167$$

  - Base 2:

$$(A7)_{16} = 16^1 \cdot 10 + 16^0 \cdot 7$$
$$(A7)_{16} = 2^4 \cdot 10 + 2^0 \cdot 7$$
$$(A7)_{16} = 2^4 \cdot (2^3 + 2^1) + 2^0 \cdot (2^2 + 3)$$
$$(A7)_{16} = 2^7 + 2^5 + 2^2 + 2^1 + 1$$
$$(A7)_{16} = 2^7 + 2^5 + 2^2 + 2^1 + 2^0$$
$$(A7)_{16} = (10100111)_2$$

- $(4C2)_{16}$:
  - Base 10:

$$(4C2)_{16} = 16^2 \cdot 4 + 16 \cdot 12 + 2$$
$$(4C2)_{16} = 1218$$

  - Base 2:

$$(4C2)_{16} = 16^2 \cdot 4 + 16 \cdot 12 + 2$$
$$(4C2)_{16} = 2^8 \cdot 4 + 2^4 \cdot 12 + 2$$
$$(4C2)_{16} = 2^8 \cdot 2^2 + 2^4 \cdot (2^3 + 4) + 2^1$$
$$(4C2)_{16} = 2^8 \cdot 2^2 + 2^4 \cdot (2^3 + 2^2) + 2^1$$
$$(4C2)_{16} = 2^{10} + 2^7 + 2^6 + 2^1$$
$$(4C2)_{16} = (10011000010)_2$$