DIGITAL LOGIC DESIGN

Number System

Week-5

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CONCEPT OF NUMBER SYSTEM

i. **Decimal Number System:**

0, 1, 2, 3, 4, 5, 6, 7, 8, 9 (10 basic variations)

10, 11, 12 ….19, 20, 21 …….

ii. **Binary Number System:**

0, 1 (2 basic variations)

10, 11, 100, 101 ….

iii. **Octal Number System:**

0, 1, 2, 3, 4, 5, 6, 7, (8 basic variations)

10, 11, 12, …. 17, 20, 21 ….27, 30

iv. **Hexadecimal Number System:**

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F (16 basic variations)
10, 11,…. 18, 19, 1A, 1B…. 1F, 20, 21,…

The decimal system is used as the basis of all number system.

You will find the answer once you learn all the conversion process in the curriculum

CONVERTING FROM DECIMAL $(??)_{10}$ TO BINARY $(??)_2$, OCTAL $(??)_8$ AND HEXADECIMAL $(??)_{16}$

$$(ABC)_{10} = (??)_S$$

$$\rightarrow \frac{ABC}{S} = DE.FG \qquad 0.FG \times S = U$$

$$\rightarrow \frac{DE}{S} = HI.JK \qquad 0.JK \times S = V$$

$$\rightarrow \frac{HI}{S} = 0.LM \qquad 0.LM \times S = W$$

LSB

MSB

$$(ABC)_{10} = (WVU)_S$$

CONVERTING FROM DECIMAL $(??)_{10}$ TO BINARY $(??)_2$

$$(29)_{10} = (??)_2$$

$$\rightarrow \frac{29}{2} = 14.5 \qquad 0.5 \times 2 = 1$$

$$\rightarrow \frac{14}{2} = 7.0 \qquad 0.0 \times 2 = 0$$

$$\rightarrow \frac{7}{2} = 3.5 \qquad 0.5 \times 2 = 1$$

$$\rightarrow \frac{3}{2} = 1.5 \qquad 0.5 \times 2 = 1$$

$$\rightarrow \frac{1}{2} = 0.5 \qquad 0.5 \times 2 = 1$$

LSB

MSB

$$(29)_{10} = (11101)_2$$

CONVERTING FROM DECIMAL $(??)_{10}$ TO OCTAL $(??)_8$

$(365)_{10} = (??)_8$

$\rightarrow \frac{365}{8} = 45.625 \quad 0.625 \times 8 = 5$ (LSB)

$\rightarrow \frac{45}{8} = 5.625 \quad 0.625 \times 8 = 5$

$\rightarrow \frac{5}{8} = 0.625 \quad 0.625 \times 8 = 5$ (MSB)

$(365)_{10} = (555)_8$

CONVERTING FROM DECIMAL $(??)_{10}$ TO HEXADECIMAL $(??)_{16}$

$(125)_{10} = (??)_{16}$

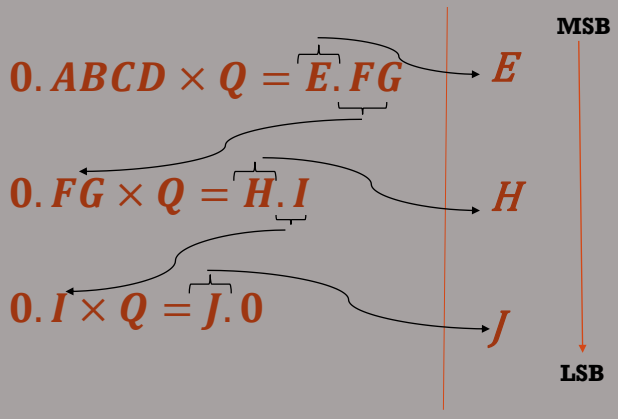
$\rightarrow \frac{125}{16} = 7.8125 \quad 0.8125 \times 16 = 13 = D$ (LSB)

$\rightarrow \frac{7}{16} = 0.4375 \quad 0.4375 \times 16 = 7$ (MSB)

$(125)_{10} = (7D)_{16}$

CONVERTING FROM DECIMAL $(??)_{10}$ TO BINARY $(??)_2$, OCTAL $(??)_8$ AND HEXADECIMAL $(??)_{16}$ (FLOATING POINTS)

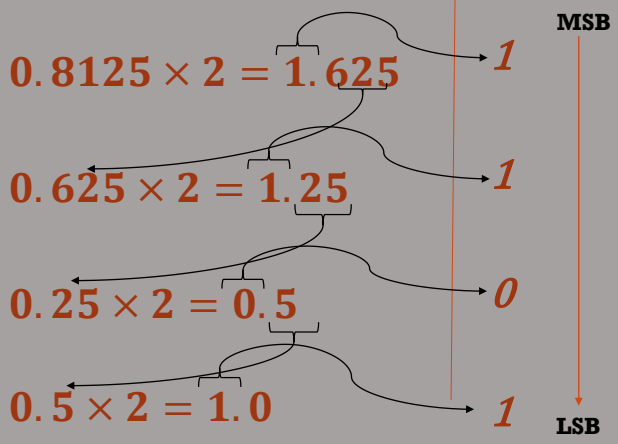
$$(0.ABCD)_{10} = (0.??)_Q$$



$$(0.ABCD)_{10} = (0.EHJ)_Q$$

CONVERTING FROM DECIMAL $(??)_{10}$ TO BINARY $(??)_2$, (FLOATING POINTS)

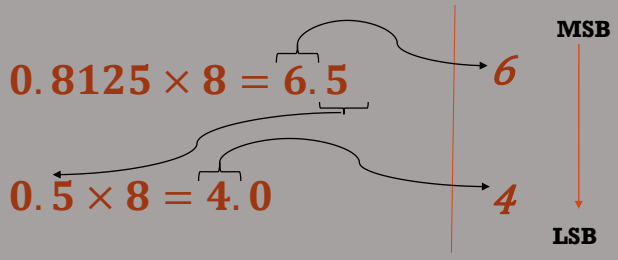
$$(0.8125)_{10} = (0.??)_2$$



$$(0.8125)_{10} = (0.1101)_2$$

CONVERTING FROM DECIMAL $(??)_{10}$ TO OCTAL $(??)_8$, (FLOATING POINTS)

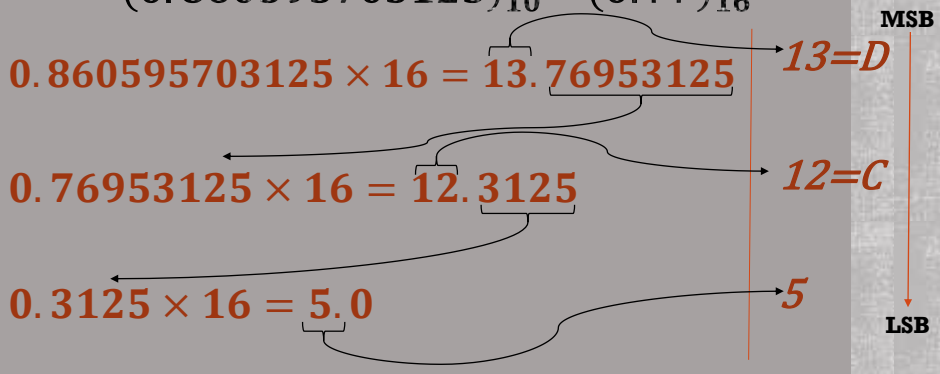
$$(0.8125)_{10} = (0.??)_8$$



$$(0.8125)_{10} = (0.64)_8$$

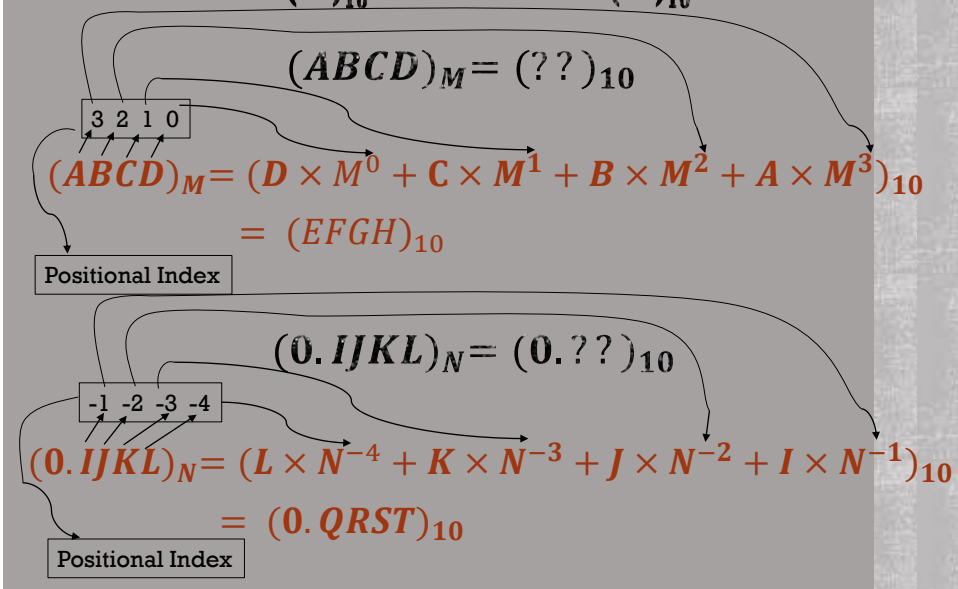
CONVERTING FROM DECIMAL $(??)_{10}$ TO HEXADECIMAL $(??)_{16}$, (FLOATING POINTS)

$$(0.860595703125)_{10} = (0.??)_{16}$$



$$(0.860595703125)_{10} = (0.DC5)_{16}$$

CONVERTING FROM BINARY $(??)_2$, OCTAL $(??)_8$ AND HEXADECIMAL $(??)_{16}$ TO DECIMAL $(??)_{10}$



CONVERTING FROM BINARY $(??)_2$, OCTAL $(??)_8$ AND HEXADECIMAL $(??)_{16}$ TO DECIMAL $(??)_{10}$

$$(100110)_2 = (0 \times 2^0 + 1 \times 2^1 + 1 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + 1 \times 2^5)_{10}$$
$$= (38)_{10}$$

$$(A53)_{16} = (3 \times 16^0 + 5 \times 16^1 + A \times 16^2)_{10}$$
$$= (2643)_{10}$$

$$(725)_8 = (5 \times 8^0 + 2 \times 8^1 + 7 \times 8^2)_{10}$$
$$= (469)_{10}$$

CONVERTING FROM BINARY $(??)_2$, OCTAL $(??)_8$ AND HEXADECIMAL $(??)_{16}$ TO DECIMAL $(??)_{10}$

$$(0.10110)_2 = (0 \times 2^{-5} + 1 \times 2^{-4} + 1 \times 2^{-3} + 0 \times 2^{-2} + 1 \times 2^{-1})_{10}$$
$$= (0.6875)_{10}$$

$$(0.725)_8 = (5 \times 8^{-3} + 2 \times 8^{-2} + 7 \times 8^{-1})_{10}$$
$$= (0.916015625)_{10}$$

$$(0.C4)_{16} = (4 \times 16^{-2} + 12 \times 16^{-1})_{10}$$
$$= (0.765625)_{10}$$