Q1) Let $x = 5.125$ and $y = 7.625$. Using Normalized system $\beta = 2$, and $m = 5$. Find,

(a) $fl(x)$ & $fl(y)$

(b) $fl(x * y)$

(d) $x = (5.125)_{10} \rightarrow (101.001)_2 \times 2^0$

Normalized form $\rightarrow (1.01001)_2 \times 2^2$

$m = 5$

$(1.01001)_2 \times 2^2$

* Since we can represent x with $m = 5$, so it is rounded to same value, with no error $x = (5.125)_{10}$

$fl(x) = (5.125)_{10}$

$y = (7.625)_{10} \rightarrow (111.101)_2 \times 2^0$

↓

Normalized form → $(1.11101)_2 \times 2^2$

$m=5$

↓ $m=5$

$(1.11101)_2 \times 2^2$

$y = 7.625$

$fl(y) = 7.625$

(b) $fl(x*y) = 5.125 \times 7.625$

$= (39.078125)_{10}$

↓

$(100111.000)_2 \times 2^0$

↓

Normalized form = $(1.00111000)_2 \times 2^5$

$m=5$

↓ $m=5$

$$(1.\underbrace{00111}_{m=5})_2 \times 2^5$$

$(1.00111)_2 \times 2^5$ — fl(x*y)

$xy = 39.078125$

$(1.00111)_2 \times 2^5$ → $(100111.)_2 \times 2^0$ → $(39)_{10}$

$(39.5)_{10}$

~~1.001~~ $(1.01000)_2 \times 2^5$ → $(101.000.)_2 \times 2^0$ → $(40)_{10}$

$$fl(x*y) = (40)_{10}$$

$$= (1.01000)_2 \times 2^5$$

(Q2) Same as before but now $m = 4$.

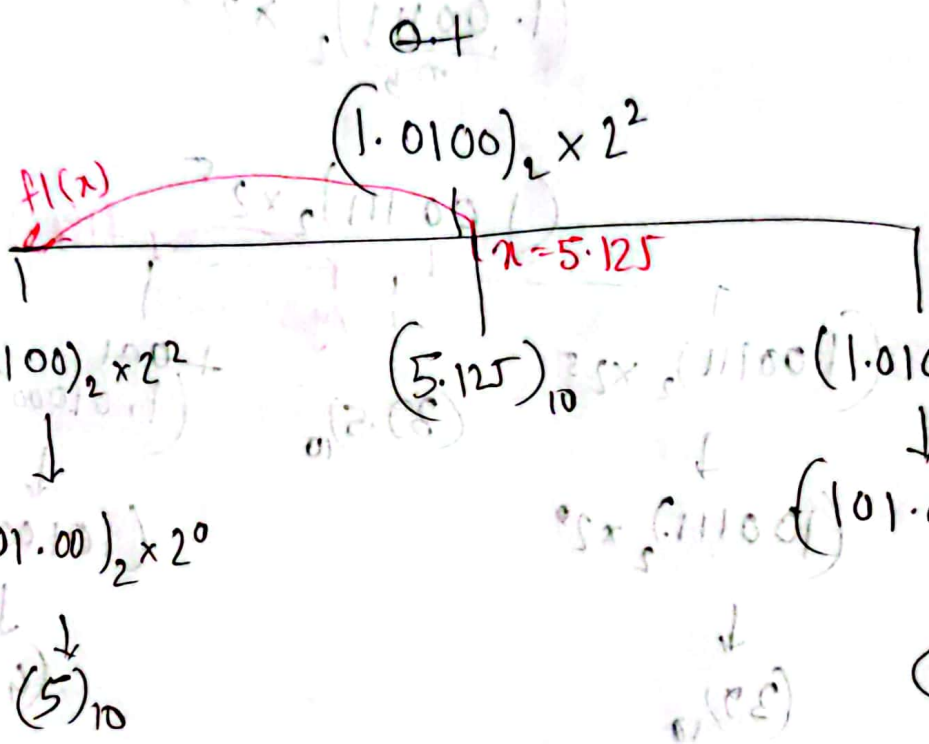
(a) $x = (5.125)_{10} \rightarrow (101.001)_2 \times 2^0$

$$\downarrow$$

$$(1.\underbrace{01001}_{m=4})_2 \times 2^2$$

$$\downarrow m=4$$

$$(1.0100)_2 \times 2^2$$



$$\text{Avg} = \frac{5 + 5.25}{2} = (5.125)_{10}$$

Since $x = (5.125)_{10}$ which is exactly at the central (mid point) so mapped to the nearest even no. so $fl(x) = (5.00)_{10}$

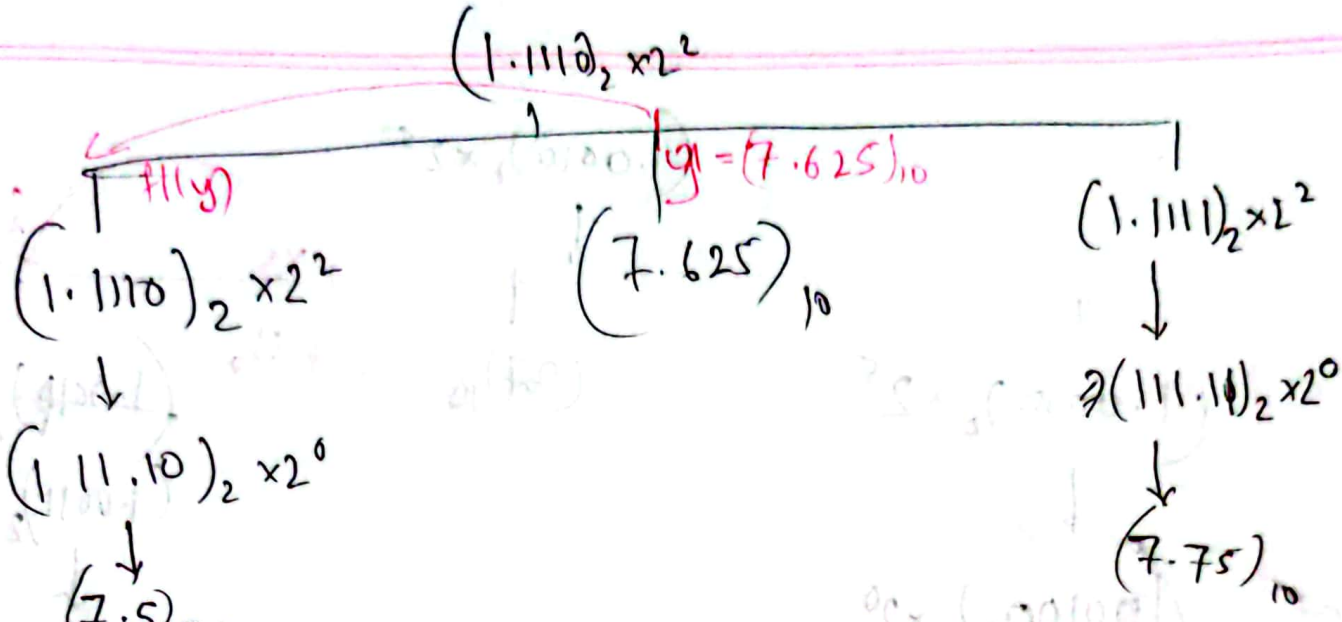
$$8 = (7.625)_{10} \rightarrow (111.101)_2 \times 2^0$$

$$\downarrow$$

Normalized form $\rightarrow (1.\underbrace{11101}_{m=4})_2 \times 2^2$

$$\downarrow m=4$$

$$(1.1110)_2 \times 2^2$$



$$\text{Avg} = \frac{7.5 + 7.75}{2} = (7.625)_{10}$$

Same logic as x, so

$$y = (7.625)_{10}$$

$$fl(y) = (7.5)_{10}$$

(b) $fl(x * y) = (5 \times 7.5)$

$= (37.5)_{10}$

$\downarrow$

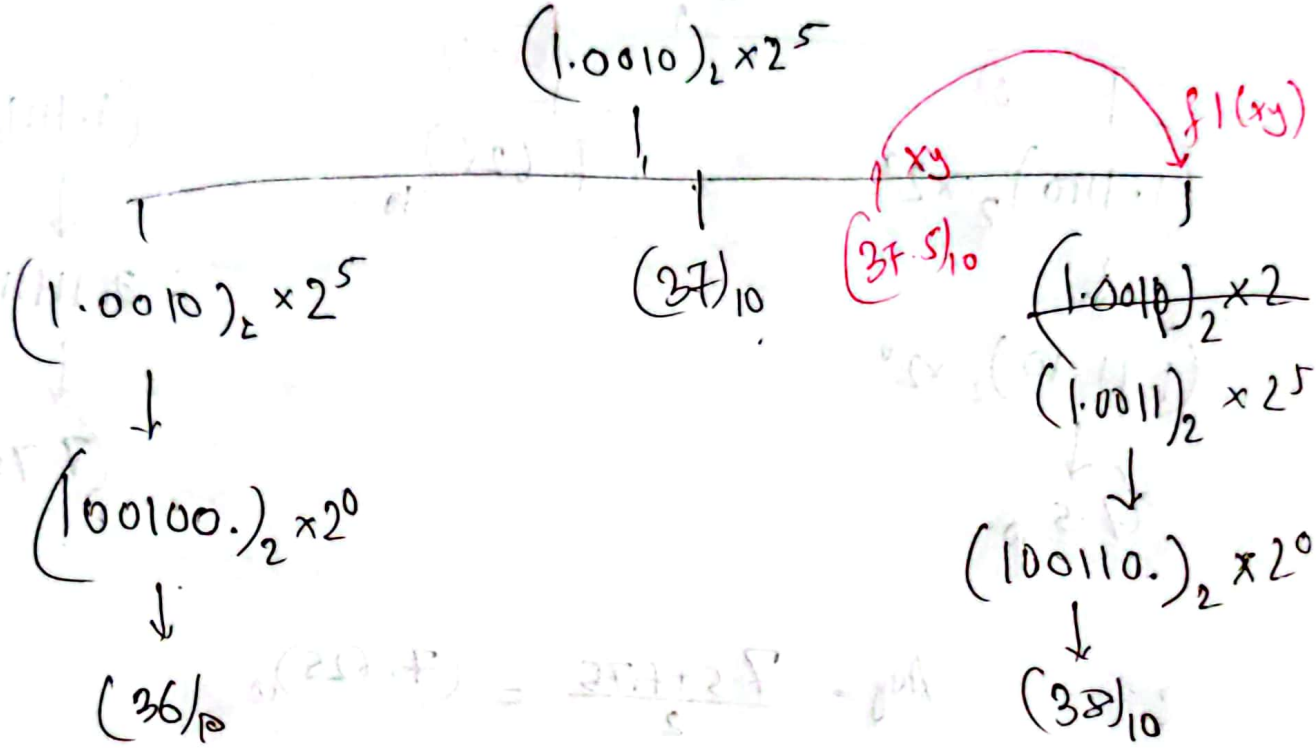
$(100101.1)_2 \times 2^0$

$\downarrow$

Normalized form $\rightarrow (1.\underbrace{00101}_{m=4}1)_2 \times 2^5$

$\downarrow$

$(1.0010)_2 \times 2^5$



$$\text{Avg.} = \frac{36+38}{2} = 37$$

$$fl(xy) = (38)_{10}$$

$$= (1.0011)_2 \times 2^5$$