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Sec-A CT-4

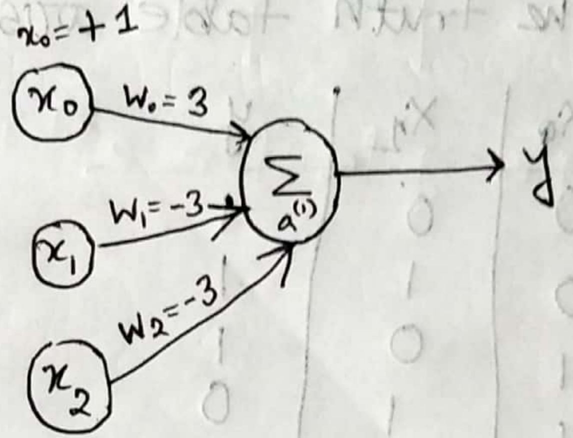
Answer to the question no: 1

$n = (17101007 \% 3) + 1 = 3$

$m = (17101007 \% 4) + 2 = 5$

input

x_1	x_2
0	0
0	1
1	0
1	1



$\Sigma_{(0,0)} = 1 \times 3 + 0 \times -3 + 0 \times -3 = 3$

Using sigmoid function, $= \frac{1}{1+e^{-3}} = 0.95 \geq 0.5 = 1$

$\therefore y = 1$

$\Sigma_{(0,1)} = 1 \times 3 + 0 \times -3 + 1 \times -3 = 0$

Using sigmoid function $= \frac{1}{1+e^{-0}} = 0.5 \geq 0.5 \therefore y = 1$

$\Sigma_{(1,0)} = 1 \times 3 + 1 \times -3 + 0 \times -3 = 0$

Using sigmoid function $= \frac{1}{1+e^{-0}} = 0.5 \geq 0.5 \therefore y = 1$

$$\Sigma_{(1,1)} = 1\times 3 + 1\times(-3) + 1\times(-3) = -3$$

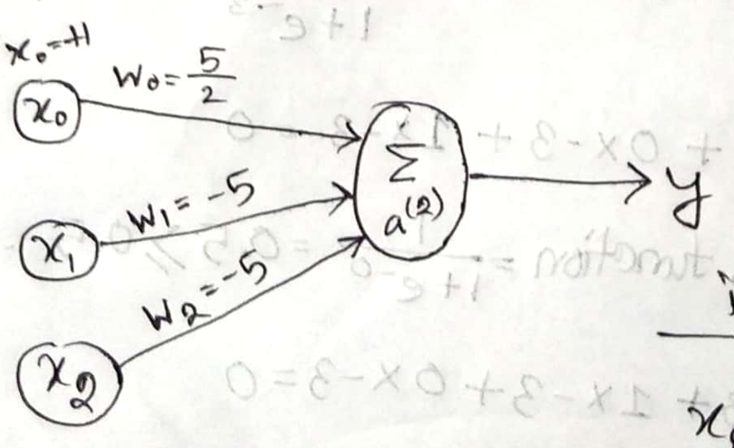
Using sigmoid function, $\frac{1}{1+e^{+3}} = 0.04 < 0.5$

$\therefore y = 0$

So, the truth table arises,

x_1	x_2	y
0	0	1
0	1	1
1	0	1
1	1	0

logic gate for $a^{(1)}$ is NAND gate.



input

x_1	x_2
0	0
0	1
1	0
1	1

$$\sum_{(0,0)} = 1\times\frac{5}{2} + 0\times -5 + 0\times -5 = 2.5$$

Using sigmoid function,

$$\frac{1}{1+e^{-2.5}} = 0.92 \geq 0.5 \quad \therefore y=1$$

$$\sum_{(0,1)} = 1\times\frac{5}{2} + 0\times -5 + 1\times -5 = -2.5$$

Using sigmoid function,

$$\frac{1}{1+e^{+2.5}} = \cancel{0.92 \geq 0.5} \quad 0.07 < 0.5 \quad y=0$$

$$\sum_{(1,0)} = 1\times\frac{5}{2} + 1\times -5 + 0\times -5 = -2.5$$

Using sigmoid function

$$\frac{1}{1+e^{+2.5}} = \cancel{0.92 \geq 0.5} \quad 0.07 < 0.5 \quad \therefore y=0$$

$$\sum_{(1,1)} = 1\times\frac{5}{2} + 1\times -5 + 1\times -5 = -7.5$$

$$\frac{1}{1+e^{-(-7.5)}} = 0.005 < 0.5 \quad \therefore y=0$$

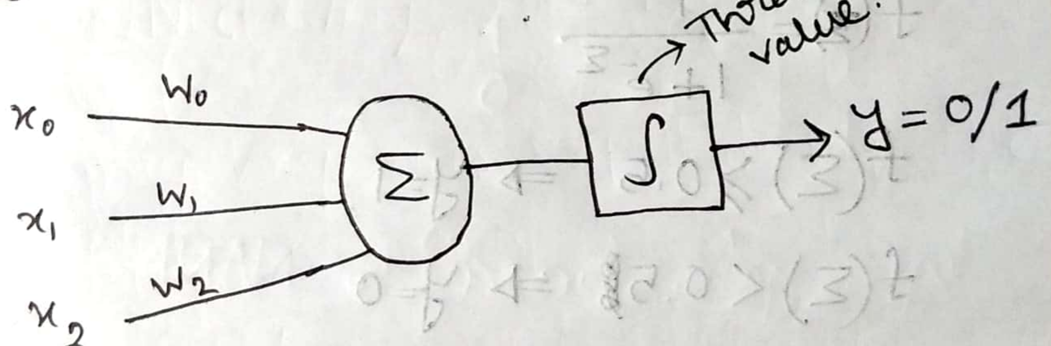
So the truth table;

x_1	x_2	y
0	0	1
0	1	0
1	0	0
1	1	0

$\therefore$ Logic gate for $a^{(2)}$ is ~~NAND~~ NOR gate.

Answer to the question no: 2

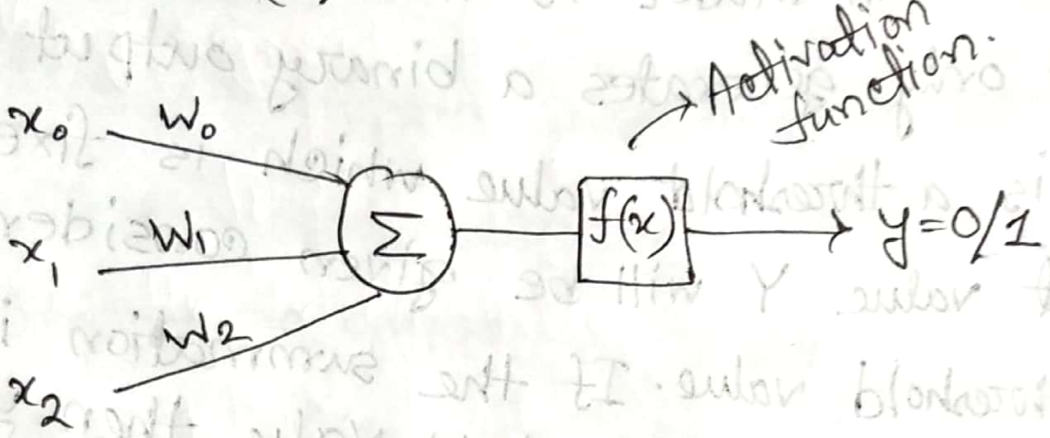
McCulloch ~~an~~ model is the simplest model which only generates a binary output and there is a threshold value which is fixed. Output value Y will be given considering the threshold value. If the summation is greater than the threshold value then y=1 and otherwise output y=0



if $\Sigma > \int \Rightarrow y = 1$

if $\Sigma \leq \int \Rightarrow y = 0$

On the other hand, in single neuron perception model, there is an activation function. Output y will be given considering the value of activation function. If we use sigmoid function as an activation function then output y will be 1 for $f(x) \geq 0.5$ and output y will be 0 for $f(x) < 0.5$.



$$\Sigma = x_0 w_0 + x_1 w_1 + \dots + x_n w_n$$

$$f(\Sigma) = \frac{1}{1 + e^{-\Sigma}}$$

$$f(\Sigma) \geq 0.5 \Rightarrow y = 1$$

$$f(\Sigma) < 0.5 \Rightarrow y = 0$$

So the main difference is, McCulloch model use threshold value and single neuron perception use activation function.