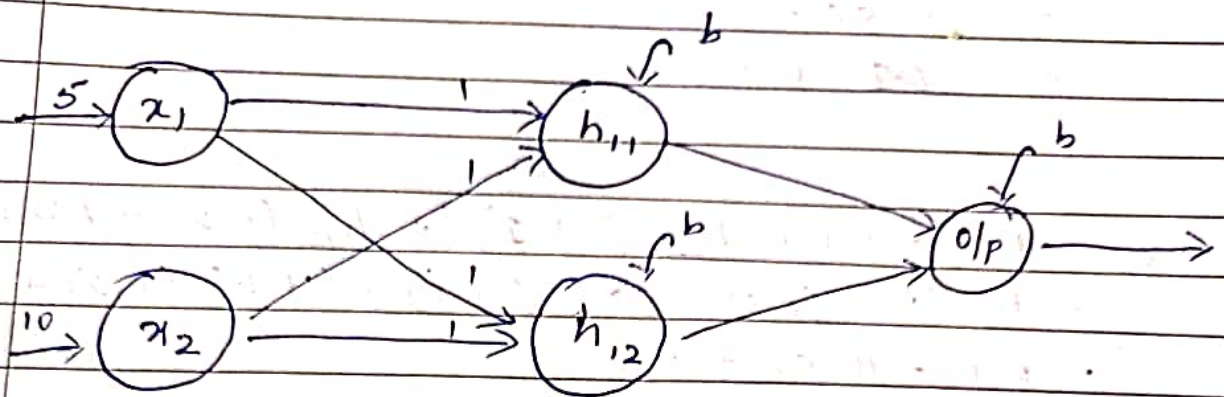① calculate o/p for the MLP assuming ReLU activation at all layers

Assume the weights & bias at layers = 1
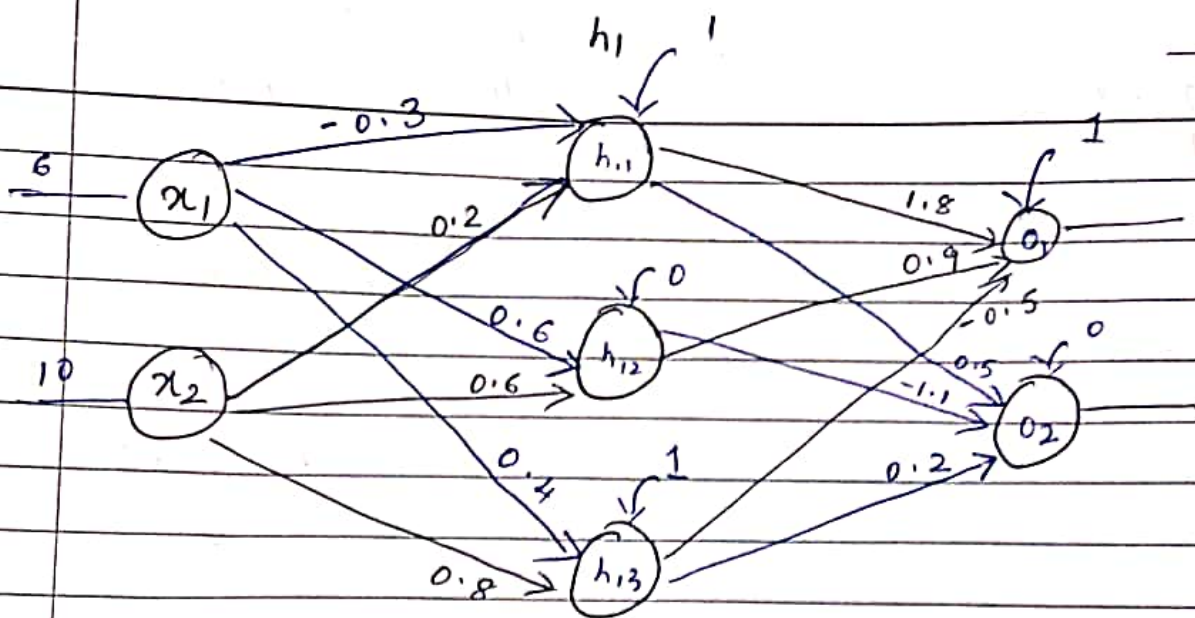
$$\text{i/p to } h_{11} = \begin{aligned} & x_1(1) + x_2(1) + b \\ & 5(1) + 10(1) + b \\ =\; & 5 + 10 + 1 \\ =\; & 16 \end{aligned}$$

$$\text{i/p to } h_{12} = \begin{aligned} & x_1(1) + x_2(1) + b \\ =\; & 5(1) + 10(1) + 1 \\ =\; & 16 \end{aligned}$$

$$\text{O/p of } h_{11} = \max(0, 16) = 16$$
$$h_{12} = \max(0, 16) = 16$$

$$\text{i/p of o/p} = \begin{aligned} & h_{11}(1) + h_{12}(1) + b \\ =\; & 16(1) + 16(1) + 1 \\ =\; & 33 \end{aligned}$$

final o/p = 33

Neural network diagram with inputs $x_1 = 6$, $x_2 = 10$, hidden nodes h_{11}, h_{12}, h_{13} and outputs o_1, o_2. Weights shown: -0.3, 0.2, 0.6, 0.6, 0.4, 0.8, 1.8, 0.9, -0.5, 0.5, -1.1, 0.2, biases 1, 0, 1, 1.

o/p of h_1

$$h_{11} = x_1(-0.3) + x_2(0.2) + bias$$
$$= 6(-0.3) + 10(0.2) + 1$$
$$= -1.8 + 2 + 1$$
$$= 1.2$$

$$h_{12} = x_1(0.6) + x_2(0.6) + bias$$
$$= 6(0.6) + 10(0.6) + 0$$
$$= 3.6 + 6$$
$$= 9.6$$

$$h_{13} = x_1(0.4) + x_2(0.8) + bias$$
$$= 6(0.4) + 10(0.8) + 1$$
$$= 2.4 + 8 + 1$$
$$= 11.4$$

Since activation function is ReLU,

o/p of $h_{11} = max(0, 1.2) = 1.2$ $h_{12} = max(0, 9.6)$
$= 9.6$ & $h_{13} = max(0, 11.4) = 11.4$

$O_1 = h_{11}(1.8) + h_{12}(0.9) + h_{13}(-0.5) + bias$

$= (1.2)(1.8) + (9.6)(0.9) + (11.4)(-0.5) + 1$

$= 2.16 + 8.64 + (-5.7) + 1$

$= 11.80 - 5.7$

$= 6.1$

$O_2 = h_{11}(0.5) + h_{12}(-1.1) + h_{13}(0.2) + bias$

$= (1.2)(0.5) + (9.6)(-1.1) + (11.4)(0.2) + 0$

$= 0.6 - 10.56 + 2.28$

$= -8.88$

Since ReLU is activation

O_2 will output $\underline{\underline{0}}$