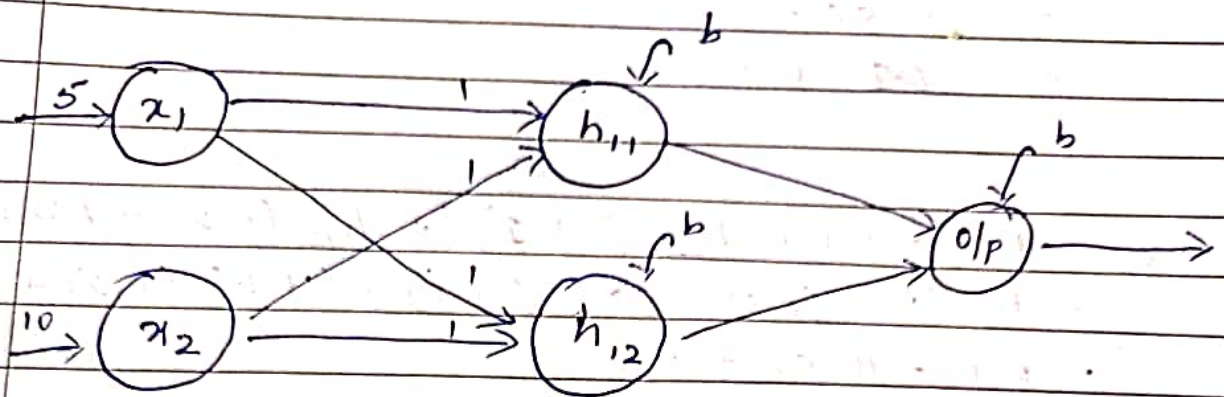


- ① Calculate o/p for the MLP assuming ReLU activation at all layers



Assume the weights & bias at layers = 1

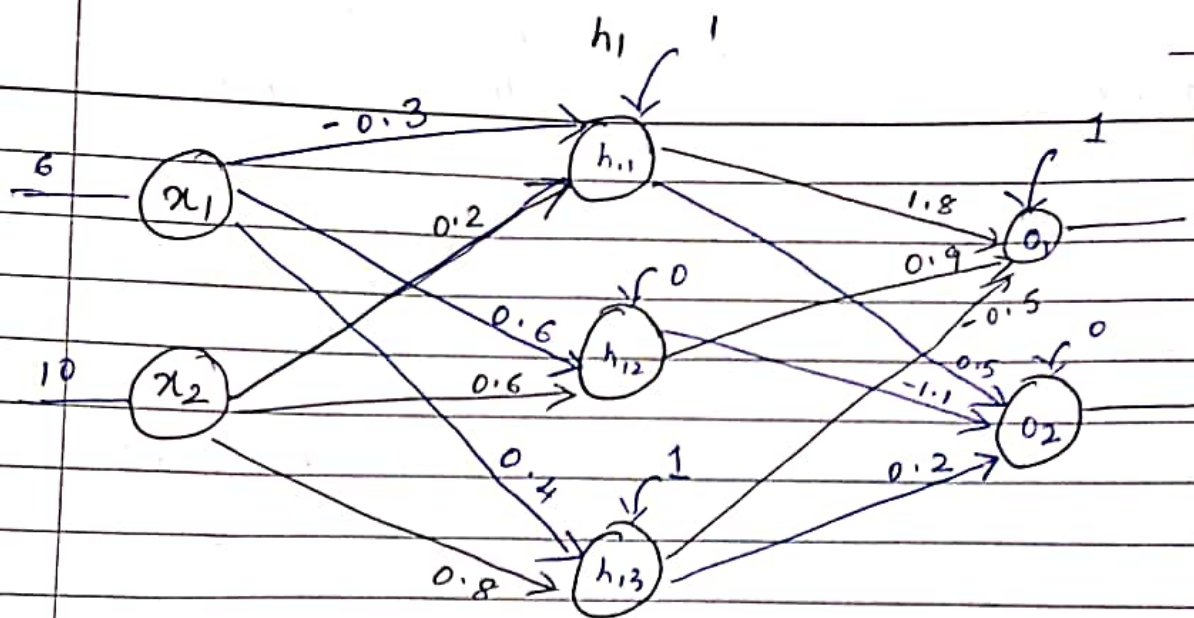
$$\begin{aligned}
 \text{i/p to } h_{11} &= x_1(1) + x_2(1) + b \\
 &= 5(1) + 10(1) + 1 \\
 &= 5 + 10 + 1 \\
 &= 16
 \end{aligned}$$

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

$$\begin{aligned}
 \text{o/p of } h_{11} &= \max(0, 16) = 16 \\
 h_{12} &= \max(0, 16) = 16
 \end{aligned}$$

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

$$\text{final o/p} = 33$$



O/p of h_1

$$\begin{aligned} h_{11} &= x_1(-0.3) + x_2(0.2) + \text{bias} \\ &= 6(-0.3) + 10(0.2) + 1 \\ &= -1.8 + 2 + 1 \\ &= 1.2 \end{aligned}$$

$$\begin{aligned} h_{12} &= x_1(0.6) + x_2(0.6) + \text{bias} \\ &= 6(0.6) + 10(0.6) + 0 \\ &= 3.6 + 6 \\ &= 9.6 \end{aligned}$$

$$\begin{aligned} h_{13} &= x_1(0.4) + x_2(0.8) + \text{bias} \\ &= 6(0.4) + 10(0.8) + 1 \\ &= 2.4 + 8 + 1 \\ &= 11.4 \end{aligned}$$

Since activation function is ReLU,

$$\begin{aligned} \text{o/p of } h_{11} &= \max(0, 1.2) = 1.2 & h_{12} &= \max(0, 9.6) = 9.6 \\ \text{and } h_{13} &= \max(0, 11.4) = 11.4 \end{aligned}$$

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

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

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

$$= 11.80 - 5.7$$

$$= \cancel{6.1} \quad 6.1$$

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

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

$$= 0.6 - 10.56 + 2.28$$

$$= -8.88$$

Since ReLU is activation

O_2 will output 0