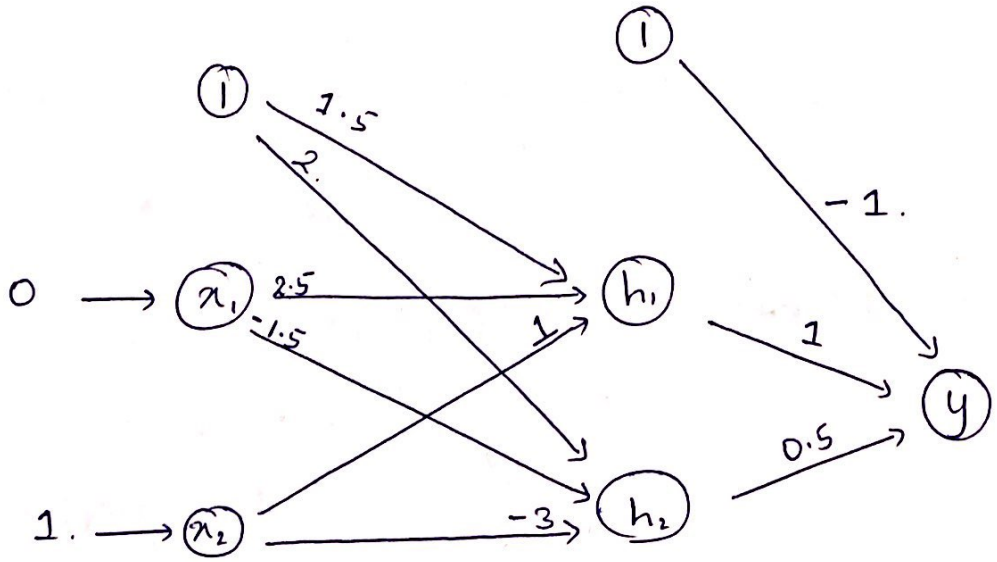
Problem 1

(a).



$x_1 = 0$ & $x_2 = 1$.

Input to $h_1 \rightarrow (h_1)_{in} \rightarrow 2.5(x_1) + (1)(x_2) + 1.5$

$\rightarrow 0 + 1 + 1.5$

$\rightarrow 2.5$

Input to $h_2 \rightarrow (h_2)_{in} \rightarrow -1.5(x_1) + (-3)x_2 + 2$

$\rightarrow 0 - 3x_2 + 2$

$\rightarrow -1.$

$(h_1)_{out} \rightarrow g((h_1)_{in}) \rightarrow \frac{1}{1+e^{-2.5}} \rightarrow 0.92414182$

$(h_2)_{out} \rightarrow g((h_2)_{in}) \rightarrow \frac{1}{1+e^{1}} \rightarrow 0.26894214214.$

Input to $\hat{y} \rightarrow (h_1)_{out} * 1 + (h_2)_{out} * 0.5 - 1.$

$\rightarrow 0.92414182 + 0.134470711 - 1$

$\rightarrow 0.058612531$

$\therefore$, Output $\hat{y} \rightarrow \frac{1}{1+e^{-0.058612531}} \rightarrow$ ~~0.485351061~~ 0.514648939 09

= Ans.

(b). $T_1 = 1$, $\alpha = 0.1$, $O_1 \rightarrow 0.5146489391$.

$$\Delta w_{jk} = \alpha a_j \cdot (T_k - O_k) \times O_k \cdot (1 - O_k)$$

$$= \alpha a_j \cdot \Delta_k$$

$$\Delta_{k_0} = (1 - 0.5146489 3) * 0.51464893 * (1 - 0.51464893)$$

$$= 0.121233$$

for output node

$$\Delta w_{1,y} \rightarrow 0.1 * 0.92414 * 0.121233$$

$$= 0.0112036$$

$$\Delta w_{2y} \rightarrow 0.1 * 0.26894 * 0.121233$$

$$= 0.003260$$

$$\Delta w_{by} \rightarrow 0.1 * 0.121233$$

$$= 0.0121233$$

for hidden node 1

$$\Delta_{k_{h_1}} = g'(in_j) \sum w_{jk} \cdot \Delta_k.$$

$$= 0.92414 (1 - 0.92414) * 0.121233$$

$$= 0.0084990 71.$$

$$\Delta w_{bh_1} = 0.1 * 0.0084990 71 = 0.0008499071$$

$$\Delta w_{x_1 h_1} = \alpha a_j \Delta_{k_{h_1}} = 0$$

$$\Delta w_{x_2 h_1} = 0.1 * 1 * 0.0084990 71$$

$$= 0.0008499071.$$

for hidden node 2

$$\Delta_{kh_2} = 0.26894 * (1-0.26894) * 0.5 * 0.121233$$

$$= 0.01191788$$

$$\Delta w_{bh_2} = \alpha a_j \Delta_{kh_2}$$

$$= (0.1)(0.01191788)$$

$$= 0.001191788$$

$$\Delta w_{x_1h_2} = 0$$

$$\Delta w_{x_2h_2} = (0.1)(1)(0.09191788)$$

$$= 0.0011917 88.$$

∴, updated weights are:-

$w_{yh_1} \rightarrow 1.0112036$

$w_{yh_2} \rightarrow 0.50326$

$w_{yb} \rightarrow -0.9878767$

$w_{h_1b} \rightarrow 1.508499071$

$w_{h_1x_1} \rightarrow 2.5$

$w_{h_1x_2} \rightarrow 1.000849071$

$w_{h_2b} \rightarrow 2.001191788$

$w_{h_2x_1} \rightarrow -1.5$

$w_{h_2x_2} \rightarrow -2.998808212$

: Ans.