MACHINE LEARNING
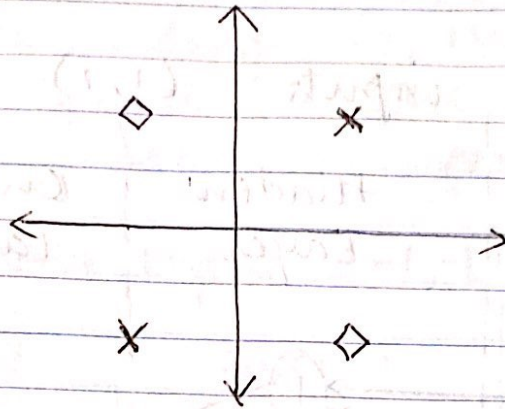## HOMEWORK-3

Qsn 2.]

In the Given classification problem, there are 2 classes, each of which lies in I and III Quadrant and II and IV Quadrant respectively

Let class 'x' be in Quad I and III and class '◇' be in Quad II and IV.

∴ class 'x' Co-ordinates = $(1,1)$, $(-1,-1)$
   class '◇' Co-ordinates = $(1,-1)$, $(-1,1)$

we need to construct a neural network that will have 0 training error and exactly 1 hidden layer and 2 hidden nodes.

we can achieve this by taking into consideration, the boolean expression of and Truth table of XOR gate.
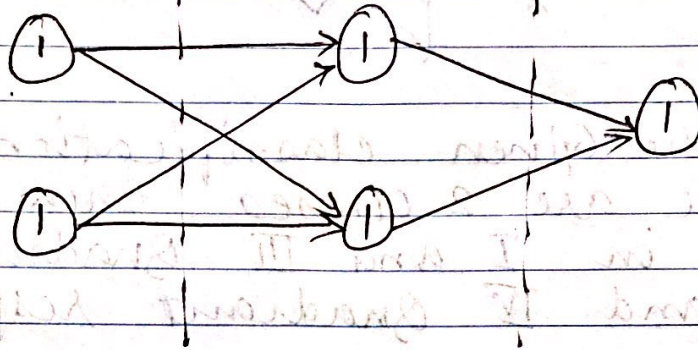
which states $A \oplus B = \bar{A} \cdot B + A \cdot \bar{B}$

This means, Activation functions of XOR returns 1 if both inputs are same and -1 if both inputs are different.
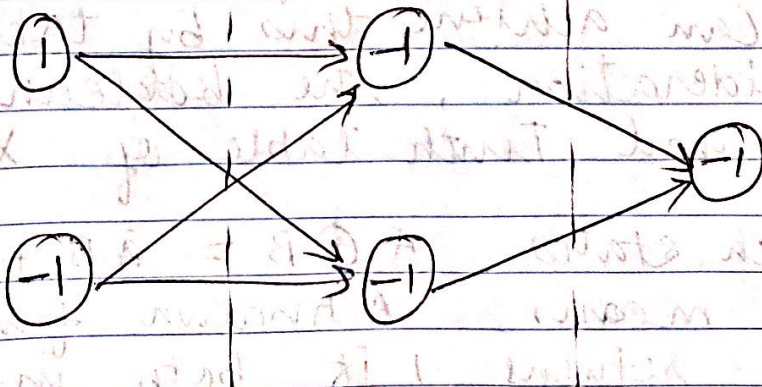
Ex -
- Consider inputs (1,1) for class 'x'

∴   Input   Hidden   Output
      Layer   Layer   Layer

We can see that there is no loss. Since y and y_predict are same. Hence satisfies the condition for 2 nodes and only 1 hidden layer.
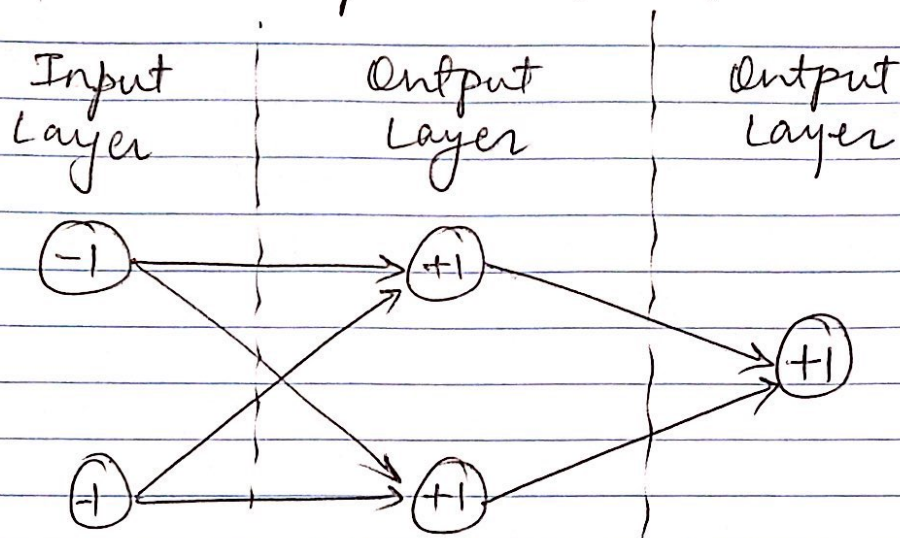
Consider inputs (1, -1) for class '◇'

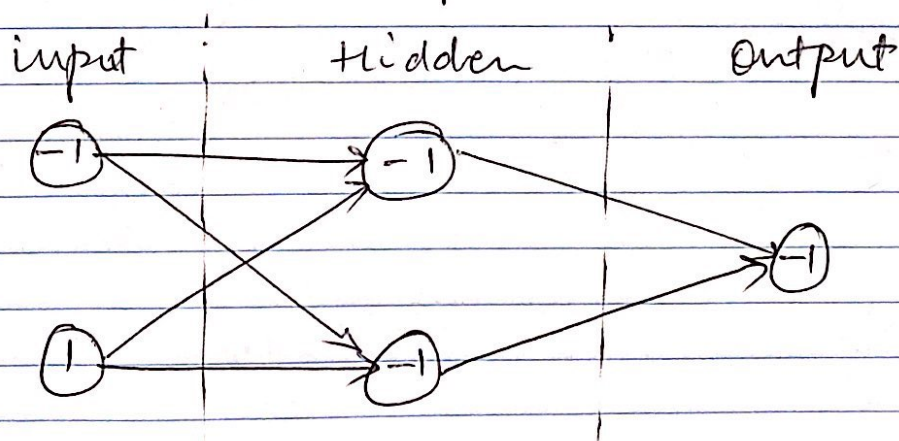Input   Hidden   Output
Layer   Layer   Layer

Here also there is no loss since y
and y-predict are same. Hence
satisfies condition for '◇' class.

- Consider input (-1,-1) for class 'X'.

Input Layer	Output Layer	Output Layer

- Similarly for input (-1,1) for class '◇'.

input	Hidden	output

Hence, there is no training loss in
this neural network using XOR
with 1 hidden layer and 2 nodes.