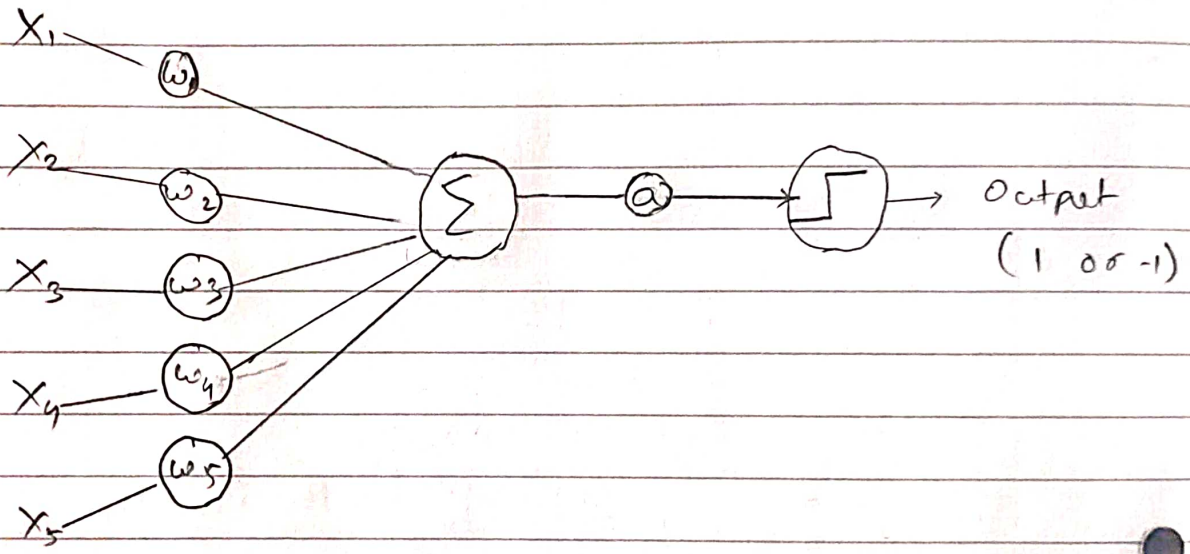
Q1)

→ Neural Networks are a model of simulation of human nervous system. Nervous system is composed of neurons.
Perceptron is a model of single neuron.
The perceptron algorithm is a two class (Binary) classification algorithm.

Perceptron



In this algorithm we mimic behaviour of neuron. We calculate an activation score based on the synaptic connections and this activation score is then this activation score is compared against some threshold value. If the activation score is larger than threshold value it gives output as +1 else negative -1.

Mathematical notation

Input object $\bar{x} = (x_1, x_2, x_3 \ldots x_d)$

Weights $\bar{w} = (w_1, w_2, w_3 \ldots w_d)$

Activation score $a = \sum_{i=1}^{d} w_i x_i = \bar{w}^T \bar{x}$

output 1 if $a > 0$, and -1 if $a < 0$

Pseudocode

PerceptronTrain (D, MaxIter)

1. $w_d \leftarrow 0$, for all $d = 1 \ldots D$ ... // initialize weights
2. $b \leftarrow 0$ // initialize bias
3. for iter = 1 ... MaxIter do
4. for all $(x, y) \in D$ do
5. $a \leftarrow \sum_{d=1}^{D} w_d x_d + b$ ... // Compute activation for this example
6. if $ya \leq 0$ then
7. $w_d \leftarrow w_d + yx_d$ . . for all $d = 1 \ldots D$ ... // Update weights
8. $b \leftarrow b + y$
9. end if
10. end for
11. end for
12. return $w_0, w_1, \ldots w_D, b$

PerceptronTest ($w_0, w_1, \ldots w_D, b, \hat{x}$)

1. $a \leftarrow \sum_{d=1}^{D} w_d \hat{x}_d + b$ . . // compute activation for test example
2. return SIGN (a)