**Question** - Design Neural Network with n =5, c = 3 and 1 hidden layer with 4 perceptron. Use Sigmoid Activation Function. Assume suitable weights and bias.

Diagram

Description automatically generated

**Solution** –

b11

X11 – Represent values in Input vector column 1. A(Z11) - Represents o/p of 1st perceptron of hidden layer 1

b2

b14

b13

b12

A(Z2) = Y

w4

w3

w2

w1

w34

w33

w32

w31

w24

w23

w22

w21

w14

w13

w12

w11

A(Z14)

A(Z13)

A(Z12)

A(Z11)

X12 – Represent values in Input vector column 2. A(Z12) - Represents o/p of 2nd perceptron of hidden layer 1

X13 – Represent values in Input vector column 3. A(Z13) - Represents o/p of 3rd perceptron of hidden layer 1

A(Z14) - Represents o/p of 4th perceptron of hidden layer 1

b11, b12, b13, b14 – Represents bias term for each perceptron in hidden layer 1

w11, w12, w13,w14, w21, w22,w23,w24,w31,w32,w33,w34 – Represents weights between input layer and hidden layer 1 o/p

b2 – Represents bias term for output layer

w1, w2, w3, w4 – Represents weights between hidden layer 1 and o/p layer

A(Z2) – Represents output of Neural Network which is nothing but Y^

Input: X= W1 = b1 = [ ]

Training for Feed Forward Network:  
  
First Layer = Z1 = X\*W1+ b1

Z1 = = \* + [ ]

Z1=

H1 = O/P of first Layer = A(Z1)

H1 = A(Z1) =

W2 = b2 = [b2]

Second Layer = Z2 = H1 \* W2 + b2

Z2 = \* + [b2]

Z2 =

Y^ = A(Z2)

**Example:**

Inputs:  
  
X = = W1= =

b1 = [ ]

First layer:

Z1 = = \* + [ ]

Z1=

Z1 =

S = Sigmoid function = f(x) = 1/1+e-x

H1 = A(Z1) = S(Z1) = =

**O/P layer**

Inputs = H1 =

Weights = W2 = [0.01, 0.02, 0.04, 0.03]

Bias =b2 = [0.2]

Z2 = (H1\*W2)+b2

Z2 = \* [0.01, 0.02, 0.04, 0.03] + [0.2] =

Y^ = A(Z2) = Sigmoid(Z2)

Y^ = =