Question_02

R =

0	0	0	0	0	0	0	0	0	0
0	1	2	1	0	3	1	1	2	0
0	3	1	2	1	1	1	2	2	0
0	2	0	1	1	2	0	1	1	0
0	1	0	0	1	1	2	1	1	0
0	2	2	0	1	1	0	2	2	0
0	1	0	1	2	1	1	3	0	0
0	1	1	2	3	1	0	0	1	0
0	1	1	1	2	1	2	2	1	0
0	0	0	0	0	0	0	0	0	0

G =

0	0	0	0	0	0	0	0	0	0
0	1	1	3	1	2	1	1	2	0
0	2	1	2	1	3	3	2	1	0
0	1	1	0	0	0	1	2	2	0
0	1	1	2	2	2	2	1	1	0
0	3	1	0	0	1	1	1	1	0
0	0	1	0	0	0	2	1	1	0
0	1	0	0	1	2	1	2	1	0
0	1	2	1	1	0	1	2	1	0
0	0	0	0	0	0	0	0	0	0

B =

0	0	0	0	0	0	0	0	0	0
0	1	1	1	2	2	2	1	2	0
0	1	1	1	0	0	1	1	2	0
0	2	2	1	1	0	0	1	1	0
0	1	1	0	1	1	1	1	1	0
0	3	2	1	3	1	2	1	2	0
0	1	2	2	1	1	1	1	2	0
0	1	1	1	2	2	2	0	1	0
0	1	1	0	0	0	1	1	1	0
0	0	0	0	0	0	0	0	0	0

Conv1 :-

Padding = Yes (Type zero padding),

stride = 1,

Each bias weight = 1

Filter1 =

0	1	0
0	0	0
0	-1	0

Filter2 =

0	0	0
-1	0	1
0	0	0

R = After Applying Filter_1

-3	-1	-2	-1	-1	-1	-2	-2
-1	2	0	-1	1	1	0	1
2	1	2	0	0	-1	1	1
0	-2	1	0	1	0	-1	-1
0	0	-1	-1	0	1	-2	1
1	1	-2	-2	0	0	2	1
0	-1	0	0	0	-1	1	-1
1	1	2	3	1	0	0	1

G =

-2	-1	-2	-1	-3	-3	-2	-1
0	0	3	1	2	0	-1	0
1	0	0	-1	1	1	1	0
-2	0	0	0	-1	0	1	1
1	0	2	2	2	0	0	0
2	1	0	-1	-1	0	-1	0
-1	-1	-1	-1	0	1	-1	0
1	0	0	1	2	1	2	1

B =

+1	+1	+1	+2	+2	+1	+1	+2
-1	-1	0	1	2	2	0	1
0	0	1	-1	-1	0	0	1
-1	0	0	-2	-1	-2	0	-1
0	-1	-2	0	0	0	0	-1
2	1	0	1	-1	0	1	1
0	1	2	1	1	0	0	1
1	1	1	2	2	2	0	1

After Applying Filter_2

2	0	-2	2	1	-2	1	-1
1	-1	0	-1	0	1	1	-2
0	-1	1	1	-1	-1	1	-1
0	-1	1	1	1	0	-1	-1
2	-2	-1	1	-1	1	2	-2
0	0	2	0	-1	2	-1	-3
1	1	2	-1	-3	-1	1	0
1	0	1	0	0	1	-1	-2

1	2	0	1	0	-1	1	-1
1	0	0	1	2	2-1	-1	-2
1	-1	-1	0	1	2	-1	-2
1	1	1	0	0	-1	-1	-1
1	-3	-1	1	1	0	0	-1
1	0	-1	0	2	1	-1	-1
0	-1	1	2	0	0	0	-2
2	0	-1	-1	0	2	0	-2

1	0	1	1	0	-1	0	-1
1	0	-1	-1	1	1	1	-1
2	-1	-1	-1	-1	1	1	-1
1	-1	0	1	0	0	0	-1
2	-2	1	0	-1	0	0	-1
2	1	-1	-1	0	0	-1	-1
1	0	1	1	0	-2	-1	0
1	-1	-1	0	1	1	0	-1

After adding bias weight :-

channel-1

-3	0	-2	1	-1	-2	-2	-2
1	4	6	4	8	6	2	5
6	4	6	1	2	5	5	5
0	1	4	1	1	0	3	2
4	2	2	4	4	1	1	3
6	6	1	1	1	5	5	5
2	2	4	8	4	3	3	3
6	5	6	9	8	6	5	6

channel-2

7	5	2	7	4	-1	5	0
6	2	2	2	6	4	3	-2
6	0	2	3	2	5	4	-1
5	2	5	5	4	2	1	0
8	-4	2	5	2	4	5	-1
6	4	3	2	4	6	0	-2
5	3	7	3	0	0	3	1
7	2	2	2	4	7	2	-2

Pool-1

Padding = Null, stride = 2, Filter size = 2, Max Pooling

4	6	8	5
6	6	5	5
6	4	5	5
6	9	8	6

7	7	6	5
6	5	5	4
8	5	6	5
7	7	7	3

Conv2:-

Padding = Yes (same)

stride = 1,

Each bias weight = 0.1

0.1	0	0
0	0	0
0	0	-0.1

After padding

channel#1

4	4	6	8	5	5
4	4	6	8	5	5
6	6	6	5	5	5
6	6	4	5	5	5
6	6	9	8	6	6
6	6	9	8	6	6

channel#02

7	7	7	6	5	5
7	7	7	6	5	5
6	6	5	5	4	4
8	8	5	6	5	5
7	7	7	7	3	3
7	7	7	7	3	3

After padding :

Apply Filter on channel 1, and channel 2 :-

channel 1

-0.2	-0.1	0.1	0.3
0	-0.1	0.1	0.3
-0.3	-0.2	0	-0.1
-0.3	-0.2	-0.2	-0.1

channel 2

0.2	0.2	0.3	0.2
0.2	0.1	0.2	0.1
-0.1	-0.1	0.2	0.2
0.1	0.1	0.2	0.3

After adding bias weight

channel 1

-0.1	0	0.2	0.4
0.1	0	0.2	0.4
-0.2	-0.1	0.1	0
-0.2	-0.1	-0.1	0

channel 2

0.3	0.3	0.4	0.3
0.3	0.2	0.3	0.2
0	0	0.3	0.3
0.2	0.2	0.3	0.4

Pool 2:-

Padding = Null, stride = 2, Filter size = 2, Max pooling

channel_1

0.1	0.4
-0.1	0

channel_2

0.3	0.4
0.2	0.4

FC3:-

Number of units = 2,

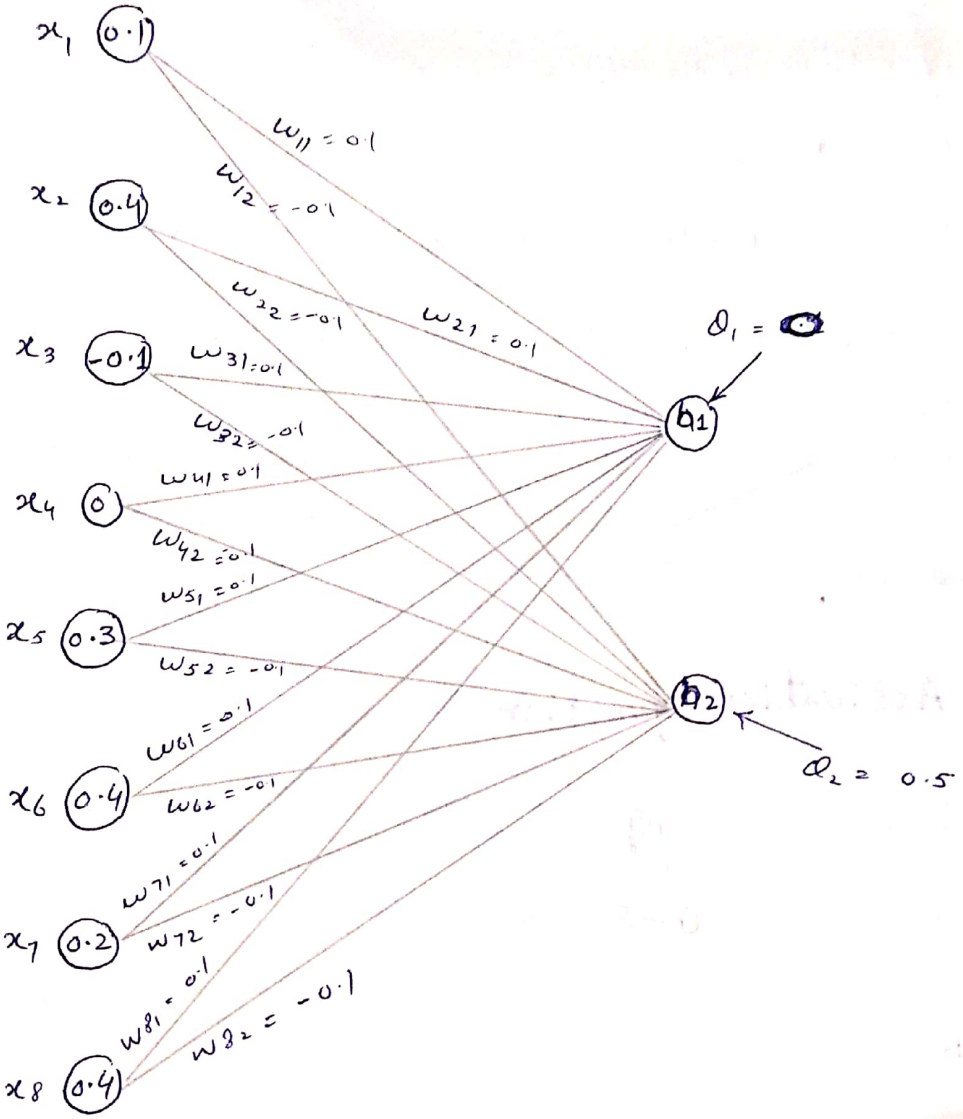
First hidden unit weight = 0.1,

First hidden unit bias weight = 0,

second hidden unit weight = -0.1

second hidden unit bias weight = 0.5,

Activation function = Relu,



$$h_1 = (0.1)(0.1)(x_1)(w_{11}) + (x_2)(w_{21}) + x_3(w_{31}) + x_4(w_{41}) + x_5(w_{51}) + x_6(w_{61}) + x_7(w_{71}) + x_8(w_{81}) + \theta_1$$

$$h_1 = (0.1)(0.1) + (0.4)(0.1) + (-0.1)(0.1) + (0)(0.1) + (0.3)(0.1) + (0.4)(0.1) + (0.2)(0.1) + (0.4)(0.1) + 0$$

$$h = 0.01 + 0.04 + 0.01 + 0 + 0.03 + 0.04 + 0.02 + 0.04$$

$$h_1 = 0.29$$

$$h_2 = x_1 \cdot w_{12} + x_2 \cdot w_{22} + x_3 \cdot w_{32} + w_{42} \cdot x_4 + x_5 \cdot w_{52} + x_6 \cdot w_{62} + x_7 \cdot w_{72} + x_8 \cdot w_{82} + \theta_2$$

$$h_2 = (0.1)(-0.1) + (0.4)(-0.1) + (-0.1)(-0.1) + 0(-0.1) + (0.3)(-0.1) + (0.4)(-0.1) + (0.2)(-0.1) + (0.4)(-0.1) + 0.5$$

$$h_2 = -0.01 - 0.04 + 0.01 - 0 - 0.03 - 0.04 - 0.02 - 0.04 + 0.5$$

$h_2 = $ ~~0.17~~ 0.33

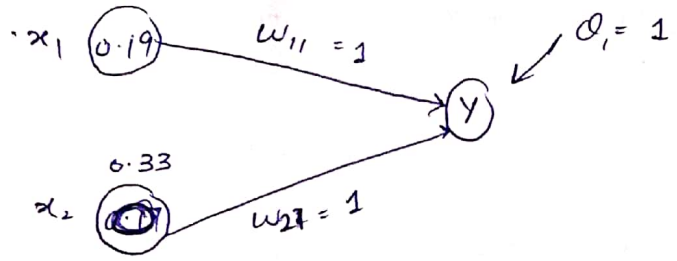
Apply Activation function

Relu (h_1) = 0.19

Relu (h_2) = ~~0~~ 0.33

Output :-

Number of units = 1, output unit weight = 1, Bias = 1 Activation : sigmoid



$$Y = x_1 \cdot w_{11} + x_2 \cdot w_{21} + \theta_1$$

$$= (0.19)(1) + (0.33)(1) + 1$$

$Y = 1.52$

Activation function:- (Sigmoid)

$$\frac{1}{1 + e^{-1.52}} \Rightarrow 0.820$$

1. Forward pass: make a table where the activation shape (dimension + value), activation size and number of trainable Parameters are clearly visible.

Hyper Parameters	Activation Shape	Activation size	# parameters
Input : (8,8,3)	(8,8,3)	192	0
Conv1 :- No. of filters = 2 Filter size = 3, stride = 1	(8,8,2)	128	
Pool1: P = null, s = 2 Filter size = 2	(4,4,2)	32	
Conv2 :- Padding = Yes stride = 1 Filter size = 3 No. of filters = 1	(4x4,1)	16	
Pool2 :- Padding = Null stride = 2 Filter size = 2	(2,2,1)	4	
FC3:- units = 2	(2,1)	2	(4+1) x 2 = 10
Output :- units = 1 Activation = sigmoid	(1,1)	1	(2+1) x 1 = 3

2. Calculate the cost/error value using the cost function.

actual output = 1

Predicted output = 0.820

Cost/error value :-

$$y_i - \log(p_i)$$

y = actual output

p = predicted output

$1 - \log(0.820) \Rightarrow$ **1.086**

3. Backpropagate the error and update the weights.