Name : Jayant S

USN : 1MS19IS051

In [1]:

```
import numpy as np
```

In [2]:

```
class Gate:
    wts = []
    levels = []
    theta = 0
    def __init__(self, bias,  theta,wts : list, *args):
        i = 1
        for j in range(len(wts)): wts[j].insert(0,bias[0])
        self.wts, self.theta = np.array(wts), theta
        for a in args:
            arr = a
            for j in range(len(arr)):
                arr[j].insert(0,bias[i])
            self.levels.append(np.array(arr))
            i += 1
    def answer(self,vals):
        sol = []
        sol = np.matmul(np.array([1] + vals),self.wts.transpose())
        i = 0
        while i < len(self.levels):
            ans = [1 if x >= 0 else 0 for x in sol]
            sol = np.matmul(np.array([1] + ans), self.levels[i].transpose())
            i += 1
        return 1 if sol[0] >= self.theta else 0
```

In [3]:

```
vals = [[0,0],[0,1],[1,0],[1,1]]
```

In [4]:

```
notGate = Gate([1],1,[[-1]])
print('NOT of',0,'is',notGate.answer([0]))
print('NOT of',1,'is',notGate.answer([1]))
```

```
NOT of 0 is 1
NOT of 1 is 0
```

In [5]:

```
andGate = Gate([-1.5],0,[[1,1]])
for v in vals:
    print('AND of',v,'is',andGate.answer(v))
```

```
AND of [0, 0] is 0
AND of [0, 1] is 0
AND of [1, 0] is 0
AND of [1, 1] is 1
```

In [6]:

```
orGate = Gate([-0.5],0,[[1,1]])
for v in vals:
    print('OR of',v,'is',orGate.answer(v))
```

```
OR of [0, 0] is 0
OR of [0, 1] is 1
OR of [1, 0] is 1
```

```
OR of [1, 0] is 1
OR of [1, 1] is 1
```

In [7]:

```
norGate = Gate([1],1,[[-1,-1]])
for v in vals:
    print('NOR of',v,'is',norGate.answer(v))
```

```
NOR of [0, 0] is 1
NOR of [0, 1] is 0
NOR of [1, 0] is 0
NOR of [1, 1] is 0
```

In [8]:

```
nandGate = Gate([1],0,[[-1,-1]])
for v in vals:
    print('NAND of',v,'is',nandGate.answer(v))
```

```
NAND of [0, 0] is 1
NAND of [0, 1] is 1
NAND of [1, 0] is 1
NAND of [1, 1] is 0
```

In [9]:

```
xorGate = Gate([-0.5,-0.5],0,[[1,-1],[-1,1]],[[1,1]])
for v in vals:
    print('XOR of',v,'is',xorGate.answer(v))
```

```
XOR of [0, 0] is 0
XOR of [0, 1] is 1
XOR of [1, 0] is 1
XOR of [1, 1] is 0
```