Vidya Vikas Education Trust's
Universal College of Engineering, Kaman Road,
Vasai-401212 Accredited by B+ Grade by NAAC

Experiment No.04:CDMA

Roll No: 80	**Name: Kashyap Patel**	**Div: B**	**Batch: B1**

AIM: To implement a basic function of Code Division Multiple Acces (CDMA) using python.

Theory: Code-division multiple access (CDMA) is a channel access method used by various radio communication technologies. CDMA is an example of multiple access, where several transmitters can send information simultaneously over a single communication channel. This allows several users to share a band of frequencies (see bandwidth). To permit this without undue interference between the users, CDMA employs spread spectrum technology and a special coding scheme (where each transmitter is assigned a code). CDMA is used as the access method in many mobile phone standards. IS-95, also called "cdmaOne", and its 3G evolution CDMA2000, are often simply referred to as "CDMA", but UMTS, the 3G standard used by GSM carriers, also uses "wideband CDMA", or W-CDMA, as well as TD-CDMA and TD-SCDMA, as its radio technologies. The intended 4G successor to CDMA2000 was UMB (Ultra Mobile Broadband); however, in November 2008, Qualcomm announced it was ending development of the technology, favouring LTE instead CDMA Orthogonality: Techniques generally used are direct sequence spread spectrum modulation (DS-CDMA), frequency hopping or mixed CDMA detection (JDCDMA). Here, a signal is generated which extends over a wide bandwidth. A code called spreading code is used to perform this action. Using a group of codes, which are orthogonal to each other, it is possible to select a signal with a given code in the presence of many other signals with different orthogonal codes. CDMA Autocorrelation: Autocorrelation of the sequence, determines the ability to synchronize and lock the spreading code for the received signal.

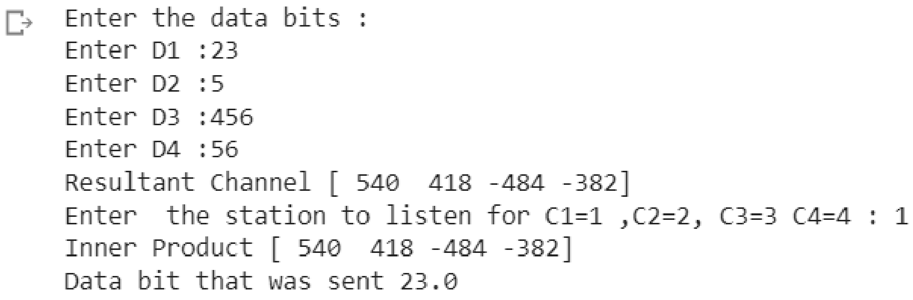
Code:

```
import numpy as np
c1=[1,1,1,1]
c2=[1,-1,1,-1]
c3=[1,1,-1,-1]
c4=[1,-1,-1,1]
rc=[]

print("Enter the data bits :")

d1=int(input("Enter D1 :"))
d2=int(input("Enter D2 :"))
```

```
d3=int(input("Enter D3 :"))
d4=int(input("Enter D4 :"))
r1=np.multiply(c1,d1)
r2=np.multiply(c2,d2)
r3=np.multiply(c3,d3)
r4=np.multiply(c4,d4)
resultant_channel=r1+r2+r3+r4;
print("Resultant Channel",resultant_channel)
Channel=int(input("Enter  the station to listen for C1=1 ,C2=2, C3=3 C4=4 : "))

if Channel==1:
  rc=c1
elif Channel==2:
  rc=c2
elif Channel==3:
  rc=c3
elif Channel==4:
  rc=c4
inner_product = np.multiply(resultant_channel,rc)

print("Inner Product",inner_product)
res1=sum(inner_product)

data = res1/len(inner_product)
print("Data bit that was sent",data)
```

GitHub Link: https://github.com/jayparekh1290/Mobile-Computing-Lab/blob/main/Exp%204%20(CDMA).ipynb

OUTPUT:



```
Enter the data bits :
Enter D1 :23
Enter D2 :5
Enter D3 :456
Enter D4 :56
Resultant Channel [ 540  418 -484 -382]
Enter  the station to listen for C1=1 ,C2=2, C3=3 C4=4 : 1
Inner Product [ 540  418 -484 -382]
Data bit that was sent 23.0
```

Conclusion: The experiment was about the CDMA which is successfully implemented and verified.