Experiment No. –

AIM: **To implement CDMA system where 2 users, transmit data over single carrier by assigning unique orthogonal code to each user.**

Theory: In CDMA system, the narrowband information signal is multiplied by a very large bandwidth signal called as the spreading signal. The spreading signal is a pseudo code sequence, which is generated by using PN sequence generator. PN sequence is generated at a very high rate as compared to information signal. PN sequence provides orthogonality to user. Therefore, all users in a CDMA system can modulate same carrier frequency and may transmit simultaneously. The receiver performs a time correlation operation to detect only the specified user data. All other code words appear as noise due to decorrelation. For detection of message signal, the receiver needs to know the PN sequence used by the transmitter. Therefore, each user operates independently with no knowledge of other users.
In CDMA, the power of multiple user at receiver determines the noise floor after decorrelation. If the power of each user within a cell is not controlled such that they do not appear equal at the base station receiver then, the near-far problem occurs.

Example: user 1= 101
user 2= 110
PN sequence 1= 1010
PN sequence 2= 1001

User 1	1	0	1
PN sequence 1	1010	1010	1010
	1010	0101	1010
User 2	1	1	0
PN sequence 2	1001	1001	1001
	1001	1001	0110
User 1(vector)	1 -1 1 -1	-1 1 -1 1	1 -1 1 -1
+ User 2(vector)	1 -1 -1 1	1 -1 -1 1	-1 1 1 -1
Transmitted =	2 -2 0 0	0 0 -2 2	0 0 2 -2

User 1 data decoding:

Received	2 -2 0 0	0 0 -2 2	0 0 2 -2
Multiply with PN sequence 1	1 -1 1 -1	1 -1 1 -1	1 -1 1 -1
=	2 2 0 0	0 0 -2 -2	0 0 2 2
Add the bits	2+2+0+0= 4	-2-2+0+0= -4	0+0+2+2= 4

Divide the answer obtained by total no. of bits in PN sequence	4/4= 1	-4/4= -1	4/4= 1
Converting to binary, we get	**1**	**0**	**1**

User 2 data decoding:

Received Multiply with PN sequence 2	2 -2 0 0 1 -1 -1 1	0 0 -2 2 1 -1 -1 1	0 0 2 -2 1 -1 -1 1
=	2 2 0 0	0 0 2 2	0 0 -2 -2
Add the bits	2+2+0+0= 4	-2-2+0+0= 4	0+0-2-2= -4
Divide the answer obtained by total no. of bits in PN sequence	4/4= 1	4/4= 1	-4/4= -1
Converting to binary, we get	**1**	**1**	**0**

Problem:

user 1= 101
user 2= 111
PN sequence 1= 1001
PN sequence 2= 1010

Answer the following questions:

1. Compare FDMA, TDMA and SSMA.
2. Advantages of CDMA over TDMA & FDMA

Result Analysis and Conclusion: