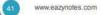
## CDMA

- Unlike TDMA, in CDMA all stations can transmit data simultaneously.
- CDMA allows each station to transmit over the entire frequency spectrum all the time.
- Multiple simultaneous transmissions are separated using coding theory.
- In CDMA, each user is given a unique code sequence.



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## **Working of CDMA**

- Let us assume that we have four stations: 1, 2, 3 and 4 that are connected to the same channel.
- The data from station 1 is d<sub>1</sub>, from station 2 is d<sub>2</sub> and so on.
- The code assigned to station 1 is c<sub>1</sub>, station 2 is c<sub>2</sub> and so on.
- These assigned codes have two properties:
  - If we multiply each code by another, we get 0.
  - If we multiply each code by itself, we get 4, (no. of stations).



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## **Working of CDMA**

- When these four stations send data on the same channel, then station 1 multiplies its data by its code i.e. d<sub>1</sub>.c<sub>1</sub>, station 2 multiplies its data by its code i.e. d<sub>2</sub>.c<sub>2</sub> and so on.
- The data that goes on the channel is the sum of all these terms:

 Any station that wants to receive data from the channel multiplies the data on the channel by the code of the sender.



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## Working of CDMA

- For e.g.: suppose station 2 wants to receive data from station1.
- It multiplies the data on the channel by c<sub>1</sub>, (code of station 1).
- Because (c<sub>1</sub>.c<sub>1</sub>) is 4, but (c<sub>2</sub>.c<sub>1</sub>), (c<sub>3</sub>.c<sub>1</sub>) and (c<sub>4</sub>.c<sub>1</sub>) are all 0s, station 2 divides the result by 4 to get the data from station 1.

data = 
$$(d_1.c_1 + d_2.c_2 + d_3.c_3 + d_4.c_4).c1$$
  
=  $d_1.c_1.c_1 + d_2.c_2.c_1 + d_3.c_3.c_1 + d_4.c_4.c_1$   
=  $d_1.4 + 0 + 0 + 0$   
=  $(d_1.4)/4 = d_1$ 

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