FACULTY OF ENGINEERING & TECHNOLOGY

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Topics Covered

Cellular concept
Cellular Approach
Shape of Cells

cellular concept

The immense potential of conventional telephone cannot be exploited to its maximum due to the limitation imposed by the connecting wires. But this restriction has been removed with the advent of the cellular radio.

Frequency Scarcity Problem

If we use dedicated RF loop for every subscriber, we need larger bandwidth to serve even a limited number of subsc in a single city.

Example

A single RF loop requires 50 kHz B/W; then for one lakh subscribers we need 1,00,000 x 50 kHz = 5 GHz.

To overcome this B/W problem, subscribers have to share the RF channels on need basis, instead of dedicated RF loops. This can be achieved by using multiple access methods FDMA, TDMA, or CDMA. Even then the number of RF channels required to serve the subscribers, works out to be impracticable.

Consider a subs density of 30Sq.Km., Grade of service as 1%, Traffic offered per mobile sub as 30m E. Then number of RF channels required are −

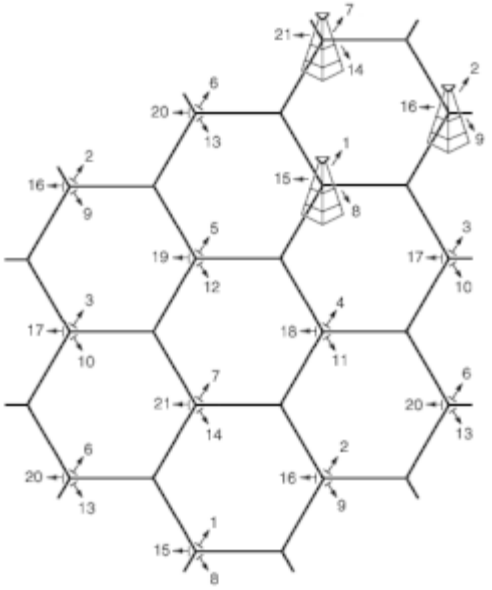
Radius(km)	Area in Sq.km	Subs	RF Channels
1	3.14	100	8
3	28.03	900	38
10	314	10000	360

For 10,000 subs to allot 360 radio channels we need a B/Wof 360 × 50 KHz = 18 MHz. This is practically not feasible.

Cellular Approach

With limited frequency resource, cellular principle can serve thousands of subscribers at an affordable cost. In a cellular network, total area is subdivided into smaller areas called “cells”. Each cell can cover a limited number of mobile subscribers within its boundaries. Each cell can have a base station with a number of RF channels.

Frequencies used in a given cell area will be simultaneously reused at a different cell which is geographically separated. For example, a typical seven-cell pattern can be considered.



Shape of Cells

For analytical purposes a “Hexagon” cell is preferred to other shapes on paper due to the following reasons.

A hexagon layout requires fewer cells to cover a given area. Hence, it envisages fewer base stations and minimum capital investment.

Other geometrical shapes cannot effectively do this. For example, if circular shaped cells are there, then there will be overlapping of cells.

Also for a given area, among square, triangle and hexagon, radius of a hexagon will be the maximum which is needed for weaker mobiles.

MCQ

Paging systems were based on
a. Simplex systems
b. Half duplex systems
c. Full duplex systems
d. None of the above

Paging systems could be used to
a. Send numeric messages
b. Send alphanumeric messages
c. Voice message
d. All of the above

Garage door opener is a
a. Transmitter
b. Receiver
c. Transceiver
d. None of the above

Carrier frequency of a TV remote control is in the range
a. of Infra red
b. < 100 MHz
c. < 1 GHz
d. < 2 GHz

Half duplex system for communication has
a. Communication in single direction
b. Communication in single direction at a time
c. Communication in both directions at the same time
d. None of the above