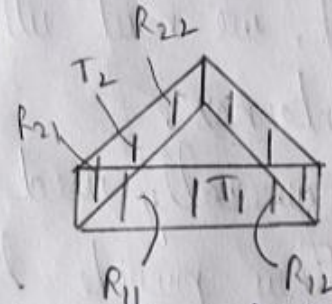
1) Determine the role of directional antennas used for interference reduction.

Ans:- When the frequency reuse scheme must be used, cochannel interference will occur. The cochannel interference reduction factor $q = D/R = 4.6$ is based on the assumption that the terrain is flat. Because actual terrain is seldom flat, we must either increase q or use directional antennas.

Directional antennas are generally used for reducing unwanted interference. They provide higher gain than omnidirectional antennas. These antennas have the capability to transmit / receive more energy in a particular direction as compared to other antennas. The types of directional antennas that can be used for interference reduction are a 120° corner reflection / plane reflector and a 60° corner reflector used in 120° sector cell and 60° sector cell respectively.

Normal antenna (mature system) configuration

1) K=7 cell pattern (120° sectors). In a K=7 cell pattern for frequency reuse, if 333 channels are used, each cell would have about 45 radios. Each 120° sector would have one transmitting antenna and two receiving antennas and would serve 16 radios. The two receivers are used for diversity.



Directional antenna arrangement (a) 120° sector (45 radios)

2) K=4 cell pattern (60° sectors). We do not use K=4 in an omnicell system because the cochannel reuse distance is not adequate. Therefore, in a K=4 cell pattern, 60° sectors are used. There are 24 sectors. In this K=4 cell-pattern system, two approaches are used.

(a) Transmitting-receiving 60° sectors: Each sector has a transmitting antenna carrying in its own set of frequency radios and hands off frequencies to other neighbouring sectors or other cells. It

333 channels are used, with 13 radios per sector, there will be one transmitting antenna and one receiving antenna in each sector. At the receiving end, two of six receiving antennas are selected for an angle diversity for each radio channel.

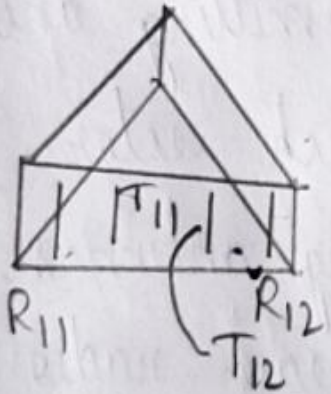
(b) Receiving 60° sectors: Only 60°-sector receiving antennas are used to locate mobile units and hand off to a proper neighbouring cell with a high degree of accuracy. All the transmitting antennas are omni-directional within each cell.

Directional antenna arrangement (b) 60° sector

Sectorial antenna configuration

If the call traffic is gradually increasing, there is an economic advantage in using the existing cell systems rather than the new splitting cell system (splitting into smaller cells). In the former, each site is capable of adding more radios. In a K=7 cell pattern with 120° sectors, two transmitting

antennas at each sector are used.



Directional antenna arrangement (c)

120° sector (90 radius)