SNS COLLEGE OF TECHNOLOGY

Coimbatore – 35

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

19ECT311 / Wireless Communication

III ECE/ VI SEMESTER

Unit I -**FUNDAMENTALS OF WIRELESS COMMUNICATION**

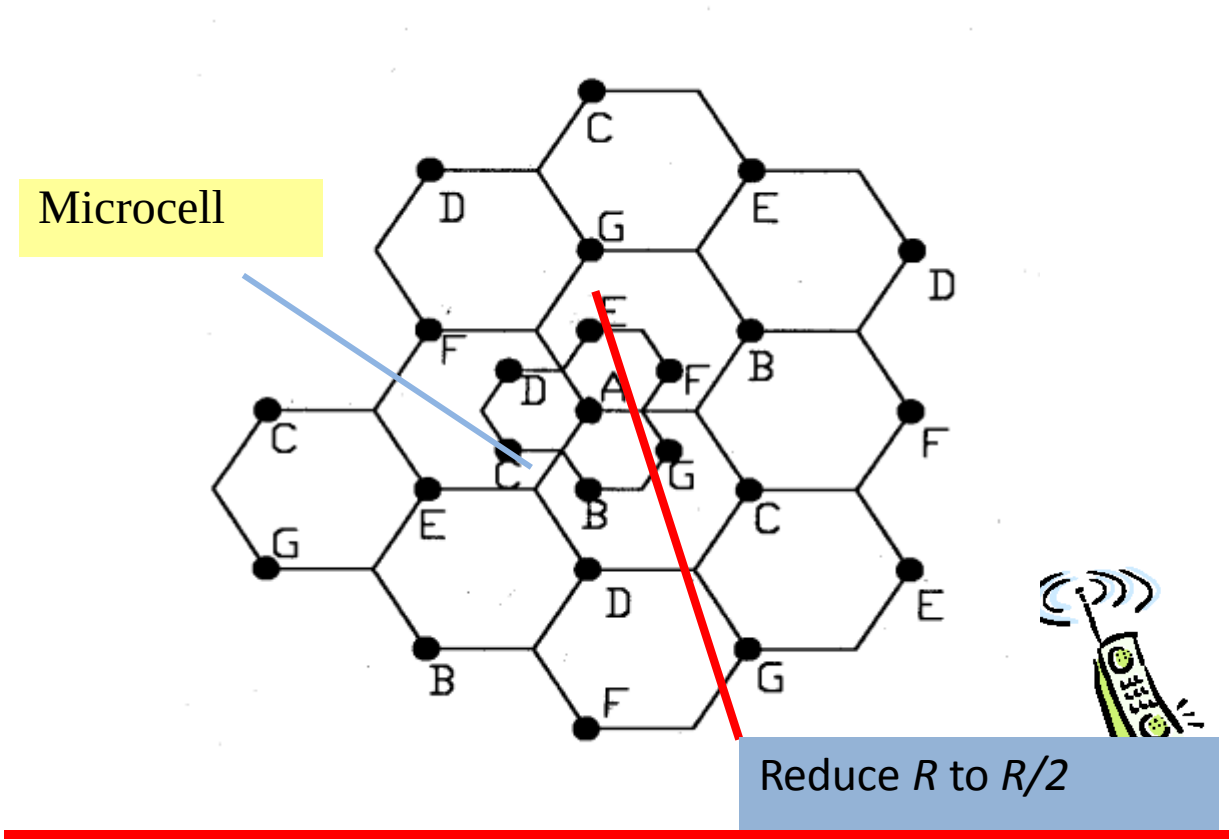
Topic 8 : Improving Coverage and Capacity

Improving Capacity in Cellular Systems

- Methods for improving capacity in cellular systems
  - Cell Splitting: subdividing a congested cell into smaller cell s
  - Sectoring: directional antennas to control the interference and frequency reuse
  - Coverage zone : Distributing the coverage of a cell and extends the cell boundary to hard-to-reach place

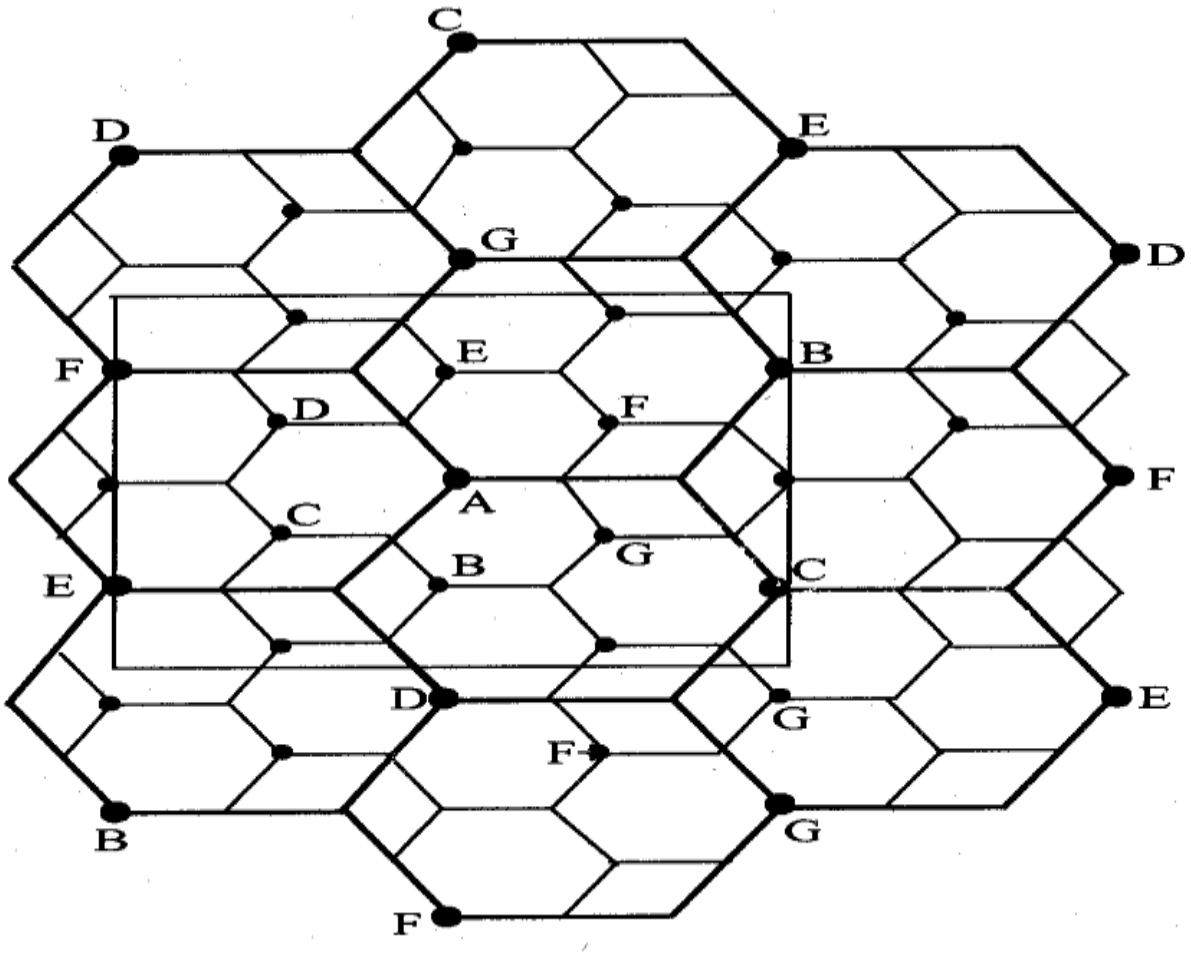
Cell Splitting

- Split congested cell into smaller cells
  - Preserve frequency reuse plan
  - Reduce transmission power



Cell Splitting

Illustration of cell splitting within a 3 km by 3 km square



Cell Splitting

- Transmission power reduction from P_{t1} to P_{t2}
- Examining the receiving power at the new and old cell boundary

$$P_r[\text{at old cell boundary}] \propto P_{t1} R^{-n}$$

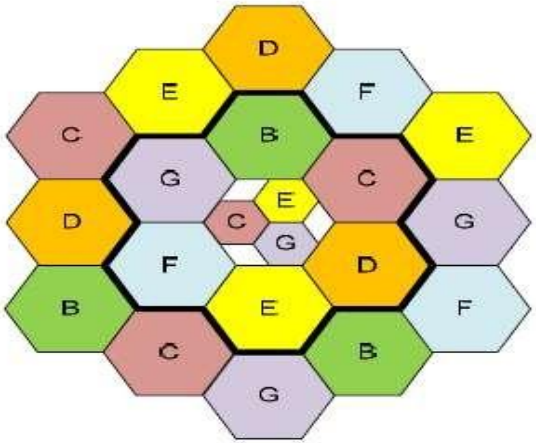
$$P_r[\text{at new cell boundary}] \propto P_{t2} (R/2)^{-n}$$

- If we take $n = 4$ and set the received power equal to each other

$$P_{t2} = \frac{P_{t1}}{16}$$

Cell Splitting

- The transmit power must be reduced by 12 dB in order to fill in the original coverage area
- Problem: if only part of the cells are splitted
  - Different cell sizes will exist simultaneously
- Handoff issues - high speed and low speed traffic can be simultaneously accommodated



Activity

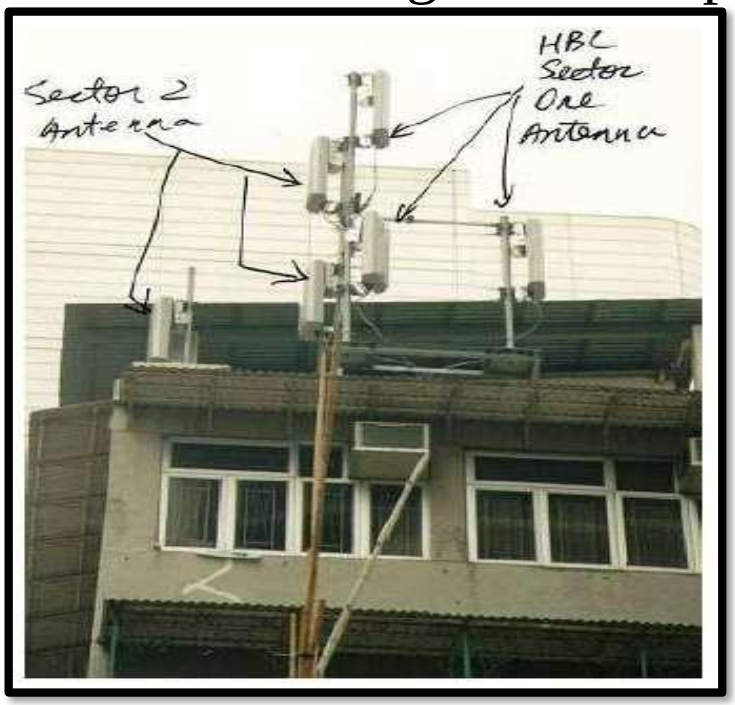
In class activity:

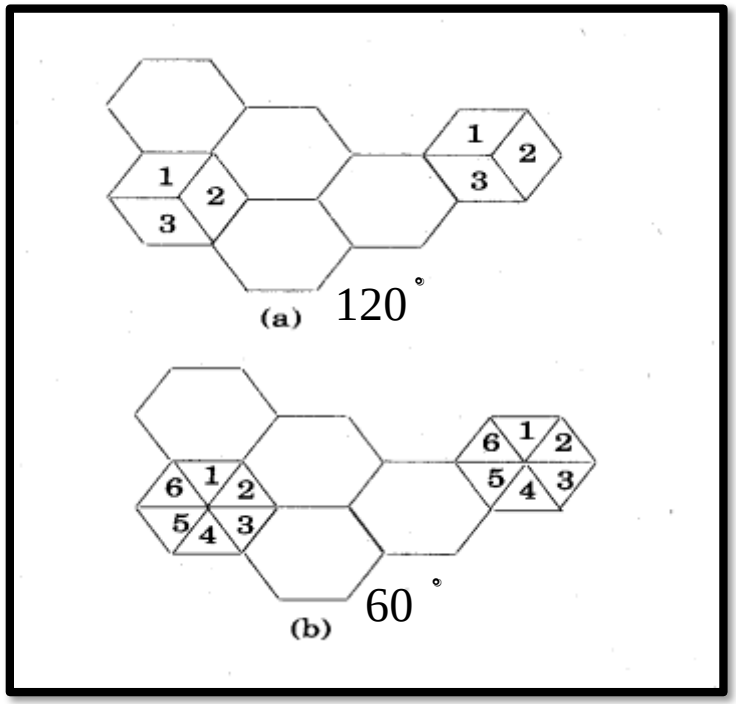
What are the next three numbers in this series?

4, 6, 12, 18, 30, 42, 60, 72, 102, 108, ?, ?, ?

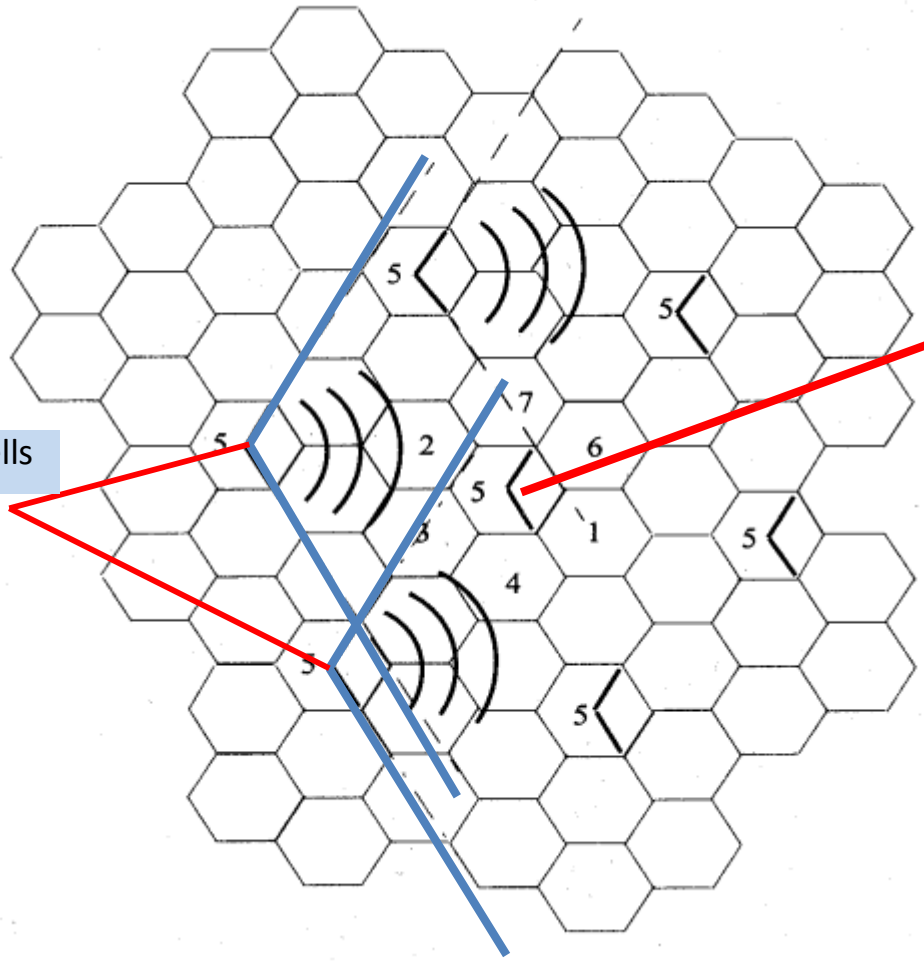
Sectoring

- Decrease the *co-channel interference* and keep the cell radius *R* unchanged
  - Replacing single omni-directional antenna by several directional antennas
  - Radiating within a specified sector





Interference Reduction

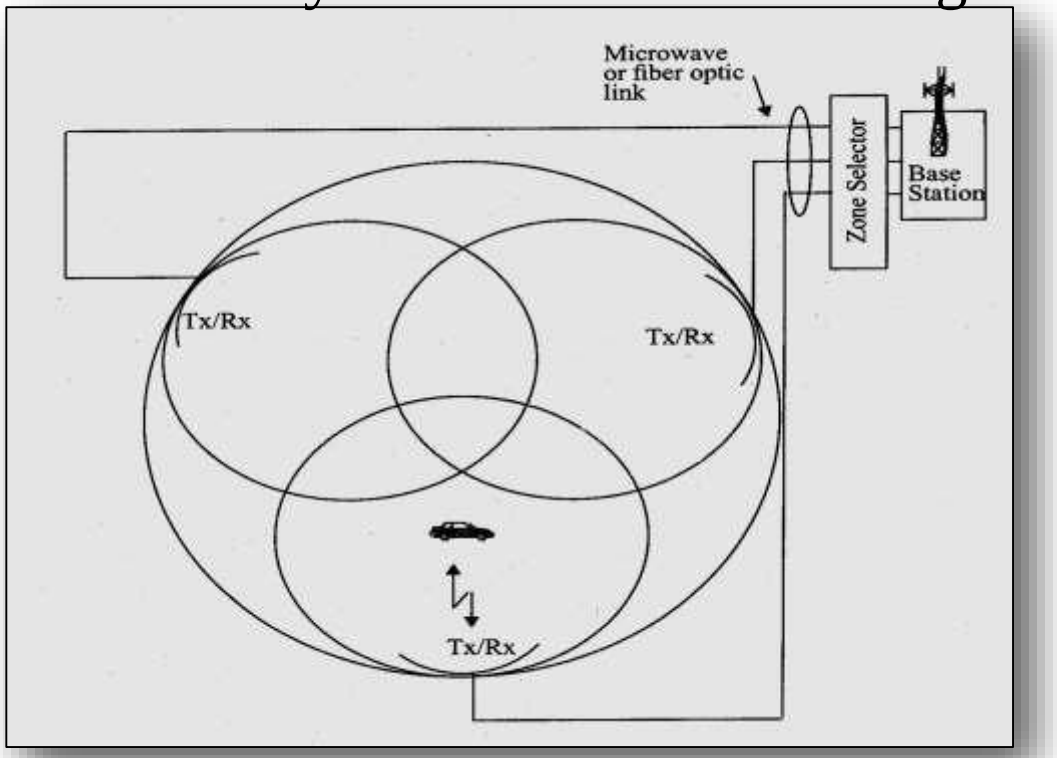


interference cells

position of the mobile

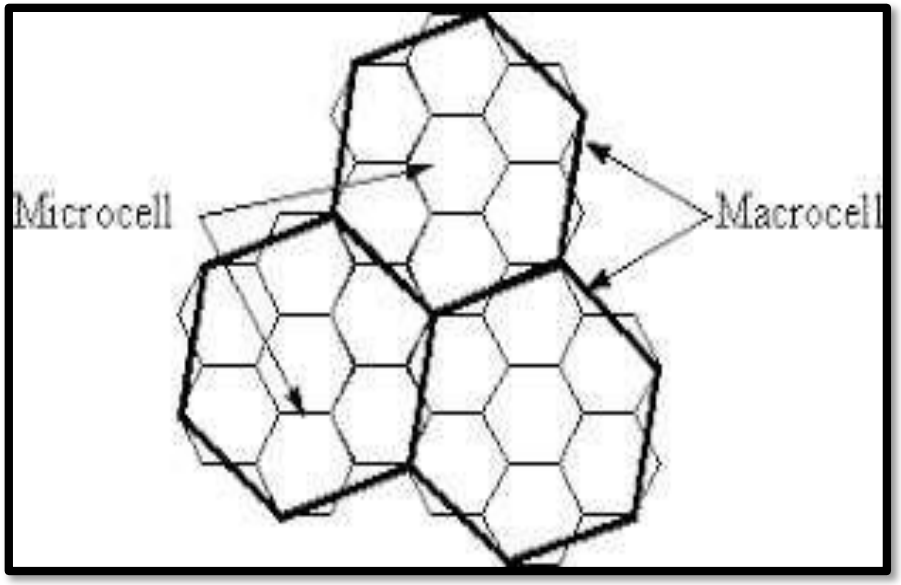
Microcell Zone Concept

- Antennas are placed at the outer edges of the cell
- Any channel may be assigned to any zone by the base station
- Mobile is served by the zone with the strongest signal



Microcell Zone Concept

- Handoff within a cell
  - No channel re-assignment
  - Switch the channel to a different zone site
- Reduce interference
  - Low power transmitters are employed



ASSESSMENT

Illustrate the cell splitting concept with suitable example.

Thank you