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Practice Problems

Programme	:	**B.Tech (ECE)**	Semester	:	**WS 2023-24**
Course	:	**Wireless and Mobile Communications**	Code	:	**BECE307L**
Faculty	:	**Dr. Hemanth C**	Slot	:	**A1**

Q1.

Prove that for a hexagonal geometry, the co-channel reuse ratio is given by $Q = \sqrt{3N}$, where $N = i^2 + ij + j^2$. (Hint: use the cosine law and the hexagonal cell geometry).

Q2.

Assume each user of a single base station mobile radio system averages three calls per hour, each call lasting an average of 5 minutes.

(a) What is the traffic intensity for each user?
(b) Find the number of users that could use the system with 1% blocking if only one channel is available.
(c) Find the number of users that could use the system with 1% blocking if five trunked channels are available.
(d) If the number of users you found in (c) is suddenly doubled, what is the new blocking probability of the five channel trunked mobile radio system? Would this be acceptable performance? Justify why or why not.

Q3.

Show that if $n = 4$, a cell can be split into four smaller cells, each with half the radius and 1/16 of the transmitter power of the original cell. If extensive measurements show that the path loss exponent is 3, how should the transmitter power be changed in order to split a cell into four smaller cells? What impact will this have on the cellular geometry? Explain your answer and provide drawings that show how the new cells would fit within the original macrocells. For simplicity use omni-directional antennas.

Q4. Calculate the signal-to-interference ratio at the mobile receiver located at the boundary of its operating cell under the influence of first-tier interfering cells. Consider that a 6-sector directional antenna is used for cellular system with a frequency reuse factor of 7. Assume the path loss exponent as 4. Compare the scenario, when a 3-sector system is used.