Unit-2

3) (a) Prove that $k=7$ cell patterns didn't provide a sufficient frequency reuse distance, even when an ideal condition of flat terrain is assumed?

Ans:- The worst case is at the location where the mobile unit would receive the weakest signal from its own cell site but strong interference from all other interfering cell sites. In the worst case, the mobile unit is at the cell boundary R and the distances from all six cochannel interfering sites is two distances of D-R, two distances of D, and two

distances of D+R. We already know that in the mobile Radio environment,

$$C \propto R^{-4}$$

$$I \propto D^{-4}$$

Then, the carrier to interference ratio is

$$\frac{C}{I} = \frac{R^{-4}}{2(D-R)^{-4} + 2D^{-4} + 2(D+R)^{-4}} \quad \text{---(1)}$$

$$= \frac{1}{2(q-1)^{-4} + 2q^{-4} + 2(q+1)^{-4}}$$

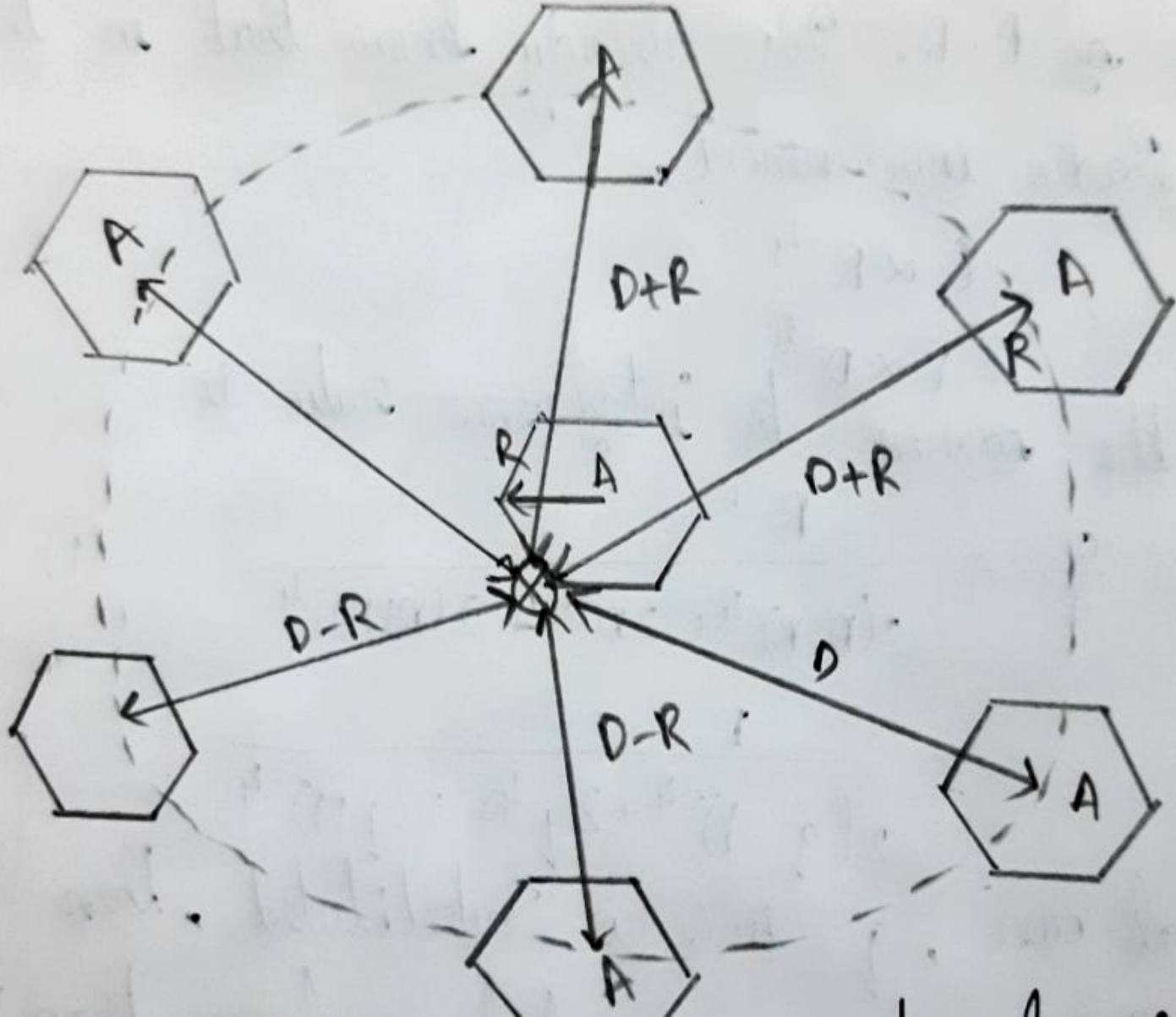
In normal case, $q = 4.6$ is substituted, then

$\frac{C}{I} = 54$ or 17 dB, which is lower than 18 dB.

For worst case, we may use the shortest distance D-R for all six interference, then the equation is replaced by,

$$\frac{C}{I} = \frac{R^{-4}}{6(D-R)^{-4}} = \frac{1}{6(q-1)^{-4}} = 28 = 14.47 \text{ dB}$$

In reality, because of the imperfect site locations & rolling nature of terrain configuration, the C/I received is always worse than 17dB and 14 dB & lower in a heavy traffic situation. A cochannel interference reduction factor of $q = 4.6$ is insufficient.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