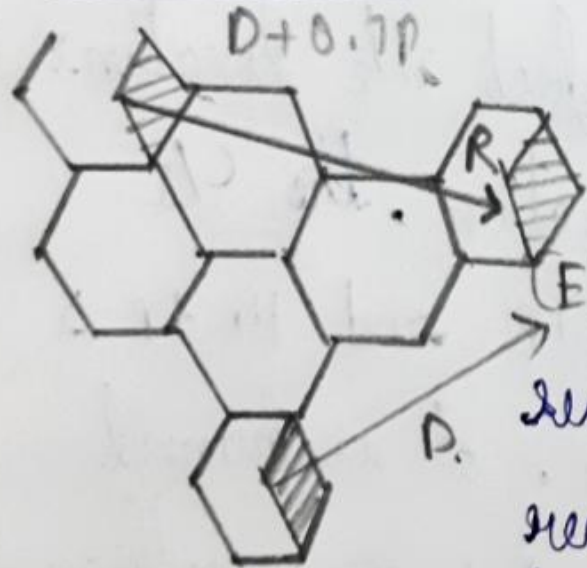


(b), Design a directional antenna system for 3 sector and 6 sector case when  $k=7$ ,  $k=4$ .

Ans:- Directional antennas in  $k=7$  cell patterns

(a) 3 sector case:-



The mobile unit at position E will experience greater interference in the lower shaded cell sector than in the upper shaded cell sector because the mobile receiver receives the weakest signal from its own cell but fairly strong interference from the

interfering cell.

11/11/11 install

→ In a 3 sector case, the interference is effective only in one direction because the front to back ratio of cell site directional antenna is at least 10 dB or more in mobile radio environment.

→ Because of the use of directional antennas, the number of principal interferers is reduced from six to two, then the value of  $\frac{C}{I}$  can be obtained by the following expression,

$$\frac{C}{I} = \frac{R^{-4}}{(D+0.7R)^{-4} + D^{-4}} = \frac{1}{(q+0.7)^{-4} + q^{-4}}$$

Let  $q = 4.6$ ,  $\frac{C}{I} = 285$  (or) 24.5 dB

→ Here the  $C/I$  is received by mobile unit from the  $120^\circ$  directional antenna sector system greatly exceeds 18 dB in worst case.



Six sector case:- We have to divide a cell into six sectors by using  $60^\circ$  beam directional antennas. In this case only <sup>one</sup> instance of interference can occur in each

sector

$$\frac{C}{I} = \frac{R^{-4}}{(D+0.7R)^{-4}} = (q+0.7)^4$$

For  $q = 4.6$  then  $\frac{C}{I} = 794 \approx 29 \text{ dB}$

which shows a further reduction of cochannel interference.

