Ans:- Dropped call means the user experiences a termination of a call, which was not requested by either party in the call. If the call is terminated due to unavailability of voice channel, then it is considered as call is blocked not as dropped call. If the call is terminated due to weak signal of the allocated voice channel then it is considered as dropped call.

The relationship between system capacity, voice quality and dropped call rate can be expressed using a common C/I parameter.

The capacity of the cellular system is denoted by 'm' and is given as,

$$m = \frac{B_T/B_C}{\sqrt{\frac{2}{3}(C/I)_S}} \quad \cdots (1)$$

$B_t \rightarrow$ Total Bandwidth
$B_C \rightarrow$ Channel Bandwidth

where B_T/B_C = Total number of voice channels
$(C/I)_S$ = Required parameter to design a system.

Equation (1) is obtained by taking in to consideration six co-channel interferers that occur during busy hour that is the equation acquired in worst case conditions. The above equation can be changed as $\left(\frac{C}{I}\right)_S = \frac{3}{2}\left(\frac{B_T/B_C}{m}\right)^2 = \frac{3}{2}\left(\frac{B_T}{B_C}\right)^2 \frac{1}{m^2}$ ... (2)

→ The voice quality is based on $(C/I)_S$.

→ When the specified $(C/I)_S$ is reduced, the radio capacity increases. When the measured $(C/I)_S$ is less than the specified $(C/I)_S$ then both poor voice quality and dropped calls can occur.

Formula for Dropped Call Rate

δ = Probability that the signal is below the specified receiver threshold (in noise limited system)

μ = Probability that the signal is below the specific cochannel interference level (in an interference limited system)

τ = Probability that no traffic channel is available upon handoff attempt when moving into a new cell.

θ = Probability that the call will return to the original cell

β = Probability of blocking circuits between BSC and MSC during handoff

α_n = The weighted value for those calls having n handoffs is $\sum_{n=0}^{N} \alpha_n = 1$

N = N is the highest number of handoffs for those calls.

→ The general formula of dropped call rate P in a whole system can be expressed as

$$P = 1 - \sum_{n=0}^{N} \alpha_n X^n$$

$$= \sum_{n=0}^{N} \alpha_n \cdot P_n \quad \text{--- (3)}$$

Here $X = (1-\delta)(1-\mu)$ --- (5)

where $P_n = 1 - X^n$ --- (4)

→ In a commonly used formula of dropped call rate, the values of τ, θ, β are assumed to be very small and neglected, then the equation ⑤ becomes, $\chi = (1-\delta)(1-\mu)$

In noise limited system, $\mu \to 0$ then equation ③ becomes, $P_A = \sum_{n=0}^{N} \alpha_n \cdot P_n = \Sigma \alpha_n \left[1 - (1-\delta)^n\right]$ ⑥

In interference limited system, $\delta \to 0$, then equation ③ becomes, $P_B = \sum_{n=0}^{N} \alpha_n P_n = \Sigma \alpha_n \left[1 - (1-\mu)^n\right]$ — ①