Question 1:

In the lecture, we discussed about power management in IEEE 802.11 infrastructure networks as shown in Figure 1. Explain why this mechanism doesn’t work for ad-hoc networks. Propose a power management solution for IEEE 802.11 ad-hoc networks.

![Figure 1: Power management in IEEE 802.11 infrastructure networks](image)

Question 2:

Why do mobile network providers install several thousands of base stations which is quite expensive, throughout a country, and do not use powerful transmitters with huge cells like for example radio stations use?
**Question 3:**

Consider a cellular system in which total available voice channels to handle the traffic are 960. The area of each cell is $6 \text{ km}^2$ and the total coverage area of the system is $2000 \text{ km}^2$.

a) Calculate the system capacity if the cluster size, $N$ (reuse factor), is 4.

b) Calculate the system capacity if the cluster size is 7.

c) How many times would a cluster size 4 have to be replicated to cover the entire cellular area?

d) Does decreasing the reuse factor $N$ increase the system capacity? Explain.

**Question 4:**

How is localization, location update, roaming done in GSM and reflected in the databases? What are the typical roaming scenarios?

**Question 5:**

Looking at the HLR/VLR database approach used in GSM, how does this architecture limit the scalability in terms of users, and especially moving users?

**Hand In Instructions**

This is a paper exercise. Please hand it in during the exercise session on the due date.