7 Mobile and Sensor Systems (CM)

Pelagus Sensing Ltd is consulting you about the design of a system to monitor sea water content along the coasts of Britain.

(*a*) Initially, imagine that fixed sensors need to be installed on buoys in the sea. The system needs to be able to report data on sea water, such as temperature and saline composition, ten times a day for more than a year over a coastal area of one kilometre.

   (*i*)   List the challenges in defining the above defined architecture and suggest a physical architecture of the system. [2 marks]

   (*ii*) Describe the *Low-Energy Adaptive Clustering Hierarchy (LEACH)* approach, presented in the lectures. [2 marks]

   (*iii*) Illustrate how *LEACH* can be employed to design a solution to the request of *Pelagus Sensing Ltd*, indicating advantages and disadvantages. [4 marks]

(*b*) Now imagine that *Pelagus Sensing Ltd* coordinates with zoologists monitoring seals through sensors attached to the animals in the same coastal area. The zoologists offer to put additional water temperature and saline composition sensors on their seal tags to help *Pelagus Sensing Ltd* with sea water monitoring.

   (*i*)   Describe an effective physical architecture (specifying which radio the tags would use and which other hardware devices should be present in the network, if any) which would allow sensing data to be collected through the animal tags and illustrate advantages and limitations. [2 marks]

   (*ii*) Illustrate the MAC and routing protocols that you would use in such an architecture explaining advantages over other protocols described in the lectures. [4 marks]

   (*iii*) Indicate how data aggregation could be used in this setting, highlighting advantages and disadvantages. [3 marks]

   (*iv*) If the mobile sensors attached to the seals were to be eventually reprogrammed, which protocol would you suggest to be installed on them and why? [3 marks]