9   Mobile and Sensor Systems (RKH)

In some hazardous commercial and industrial environments it is a safety risk for employees to work alone. A company wishes to create smartphone apps to support such scenarios. You should assume employees are motivated to carry their personal smartphone running the app at all times for their own safety.

(*a*) For some environments, lone working is permissible if the worker's absolute position is known at all times. On the assumption that WiFi has been deployed for communications, the company proposes to use fingerprint-based positioning. Describe how this works and discuss the practical challenges in deploying such a system.   [8 marks]

(*b*) For other environments, two people must always be present but absolute location is not necessary. The company proposes two different approaches to designing an app that can raise an alarm if an employee is not close enough to another:

   (*i*)   to use the smartphone Bluetooth radios to detect the proximity of employee smartphones;

   (*ii*) to use the smartphone speakers and microphones to estimate the distance between pairs of smartphones using ultrasonic broadcasts.

   Describe how each approach would work and compare and contrast them in the context of the application.   [8 marks]

(*c*) Describe how the company could combine the techniques described in Parts (*a*) and (*b*) to form an improved absolute positioning system. Discuss any disadvantages of this collaborative approach.   [4 marks]