COMPUTER SCIENCE TRIPOS Part II – 2019 – Paper 8

10 Mobile and Sensor Systems (cm542)

A team of geologists want to set up a system to monitor an area close to a dormant volcano for seismic movements. They have a single basestation which will connect to cellular infrastructure and transmit the data back to their server. They plan to scatter sensor nodes in the area to be monitored.

(a) The team has decided to use SMAC for their Medium Access Control (MAC) layer routing protocol. Explain the advantages and limitations of using SMAC in such a system. [5 marks]

(b) Illustrate a multihop routing solution. Describe in detail the protocol you would use for this system indicating advantages and limitations. [4 marks]

(c) Describe a single hop solution using an IoT protocol and explain its strengths and weaknesses (include details of the protocol). Discuss whether this solution is better or worse than the solution in Part (b). [5 marks]

(d) Now assume that the sensor nodes are mobile (e.g., deployed on autonomous mobile ground platforms).

(i) Explain the benefits of using autonomous mobile sensor nodes in this application. [2 marks]

(ii) Describe a mechanism by which the mobile sensor nodes can collaborate to improve the monitoring information obtained. Include details of your estimation framework, and explain how it would be used to inform the motion planning of your mobile sensor nodes. [4 marks]