Topical Issues Examples Sheet 2011/12

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──────── **Tracking and Fingerprinting** ────────

1. Compare and contrast location systems that position a mobile transmitter (e.g. the Bat system, U-TDOA) with those that position a mobile receiver (e.g. GPS, EOTD).

2. A transmitter located at (15,20) is surrounded by receivers: A at (0,50), B at (5,0), C at (30,30). For this setup, give the equations of the vectors, circles or hyperbolae associated with the i) AoA ii) ToA and iii) TDoA location techniques. Assume all measurements have no noise (and are therefore perfect). You should identify any system elements that require synchronisation.

3. The Bat system is a ToA system where the tag acts as a transmitter.

    (a) Explain how sync is obtained
    (b) Describe how to invert the system so that the tag is a receiver
    (c) Discuss the advantages and disadvantages of this new approach.

4. Imagine that you are tasked with designing an iPhone-like device that must be able to position itself at all times. Discuss the solutions you would use and the accuracies you might expect indoors and out.

──────── **RFID** ────────

5. Discuss the merits and demerits of using long-range passive RFID tags to track people wherever they go.

6.

    (a) Show in detail the steps taken by the BTWA and the QTA to identify the tags 10101, 10001, 00001 and 11111
    (b) Discuss what an eavesdropper who is out of range of the tag signal but in range of the redaer can detect from these schemes.

7. Discuss the potential uses of UHF RFID by a supermarket. Include practical and legal considerations in your answer.

8. Describe how the hash-lock and randomised hash-lock schemes work. Discuss their strengths and weaknesses for RFID.