Chapter 12 solutions

1. TWA does not need to worry about collisions occurring at tags. This is because it only considers the scenario of a single reader and multiple tags. In TWA collisions occur at the reader, when multiple tags answer concurrently. In RCA, multiple readers may transmit simultaneously, thus potentially generating collisions at tags covered by more than one transmitting reader. Then, a lack of answer does not necessarily mean absence of matching tags.

[BT]RCA avoids collisions by each reader randomly choosing the time of its transmission and repeating transmissions that do not generate answers.

2. The optimal tag coverage problem attempts to find the minimum number of readers required to be active in order to monitor all the tags currently in the system. The tag reporting problem attempts to find the optimum manner of reporting tags by requiring each tag to be only reporting by one reader, the one minimizing a certain cost function (e.g. the reader closest to the sink).

3. In RRE, reader R_2 covers 5 tags, more than R_3 and R_4. Then, tag T will be assigned to reader R_2, which then will have to stay active. All the other readers (R_1, R_3 and R_4) cover a set of tags not covered by anyone else, thus have to stay active. The optimum solution would find R_2 to be redundant and turn it off.

4. For part 1 of the problem, replace the tags' size on line 22 with the reader's hop count to the sink. Similarly, for part 2, use the readers' hop count instead of the number of tags covered to greedily select first the readers closest to the sink. Effectively this will resemble a breadth first search algorithm starting with the sink.

5. The constant cannot be larger than 1. It should say that RRE requires r nodes to be active in the worst case. To see why this is true, consider the example from

Figure 12.7, for r = 5. Consider that reader R1 covers another tag T and R2 covers another tag T', neither of them covered by any other reader. Then, in the worst case reader R3 covers tags T3-T5, reader R2 covers tags T1 and T2, R4 covers T7 and T8, R1 covers T and R5 covers T'. This can be easily generalized to any value of r, if there exists an ordering of choosing readers such that when a new reader is picked, it covers a set of tags not covered by any of the already picked readers.