

MID TERM EXAM

Open book, open notes, open desktop/laptop without searching online for answers

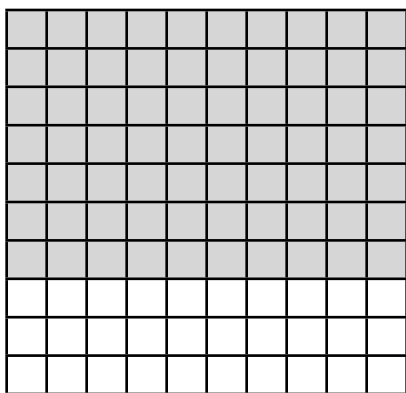
The answer complexity will determine grades for graduate and undergraduate students.

Keep your solutions simple. All questions carry equal weight (roughly 15 minutes question)

1. Suppose you are the lead designer for the volcano monitoring system. Your science team expresses an interest in viewing the seismic sensor readings in real-time in order to visually detect interesting events. Discuss your scientific response to this request with justification.

2. Suppose you are the lead designer for the Zebranet project. A group of scientists who study snails listen to your presentation and are really impressed by your work. They would like for you to design a sensor to study the behavior of snails in the wild. Being a super-genius hardware engineer, you shrink the Zebranet hardware to fit into a snails shell; the sensor is the size of a pin head, and supports the exact same functionality as the Zebranet sensors (including Solar charging capabilities, radio communication range etc.). What aspects of Zebranet experience do you expect to carry over to the Snailnet scenario? What aspects do you expect to be completely different?

3. Scalability is considered an important goal of sensor networks design. Frequently, systems are designed to operate with millions of nodes. Consider the mobile aquatic sensor scenario with the Aquafleck and Amour devices). Suppose we use these hardware devices for surveillance. Each Aquafleck is fitted with a magnetometer that has a range of one sq. Km. In a single day, assume that amours can travel and collect data from Aquaflecks to cover 10 sq. Km. (i.e. amour can collect information from 10 Aquaflecks in a single day). For our surveillance system, we require information to be available to the external user within seven days of the actual event that triggered a magnetometer. At the end of the seventh day, the Amours surface and make a satellite connection to upload their collected data. Consider the matrix illustration: assume that amour covers a row of 10 width in a single day and covers 7 columns in 7 days. Question: How would you use this system to cover a area of 700 sq. Kms. How would you scale this system to cover the entire Pacific ocean (170 million sq. Kms)



4. Suppose you are the designer of the Volcano monitoring system. NASA wants to use your system for a future manned trip to Mars to study its seismic activity. NASA astronauts will experience the same hard-ship as in earth (it is hard for humans to manually perform operations on the field). Describe the scientific questions that you will ask the NASA engineers in order to change your sensors to work on Martian terrain (The goal of this question is to not test your knowledge of Mars but to understand the important components that was used in the design of the Volacano sensor on Earth).

5. Assume that Vigilnet uses greedy geographic routing where messages are sent to nodes that are geographically closer to the destination. Describes some challenges that will be encountered by this approach. Outline one solution that can help solve this problem.