Practical Connection Assignment

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Throughout the MSCS 532 Algorithms and Data Structures course, I have gained a deeper understanding of the computational foundations that directly support the systems I work with every day. Although algorithms are sometimes viewed as abstract concepts reserved for theoretical computer science, this course has shown how essential they are to designing efficient, reliable, and scalable solutions in real-world environments. As a Firmware Test Engineer at Boston Scientific, I work on medical devices where performance, accuracy, and reliability are critical. The knowledge and skills gained in this course have enhanced my ability to analyze system behavior, optimize testing approaches, and better understand the underlying structures that influence device performance.

One of the most direct applications of this course in my current role involves the use of data structures to improve test automation and firmware analysis. In testing embedded systems, I frequently work with buffers, queues, stacks, and linked data structures that store sensor outputs and event logs. Understanding how memory is allocated and how these structures behave under different conditions has allowed me to identify performance bottlenecks and potential failure points more effectively. For example, recognizing when a circular buffer is appropriate versus when a dynamically resizing vector is necessary can prevent inefficiencies or overflow scenarios in memory-constrained embedded environments.

Sorting and searching algorithms were another core part of the course that proved relevant to my work. In firmware validation, large datasets are often collected from device logs, system telemetry, or simulation outputs. Efficient data retrieval is essential when diagnosing issues or verifying system performance under stress. Before taking this course, I would often default to using built-in library methods without considering the underlying complexity. Now, I am more intentional about choosing algorithms based on input size, frequency of access, and memory usage. Understanding the time complexity differences between algorithms like merge sort, quicksort, and binary search allows me to analyze data more efficiently and provide faster turnarounds in testing cycles.

Additionally, the course emphasized algorithmic problem-solving and optimization—skills that are central to both software development and engineering decision-making. In the medical device field, optimization is not just about efficiency; it is often tied to safety and regulatory compliance. The ability to break down a technical problem into smaller logical components, evaluate solution paths, and select the most reliable approach aligns with Boston Scientific’s commitment to quality and patient well-being. This aligns closely with UC’s emphasis on servant leadership, where knowledge is applied ethically and responsibly to benefit others. In my case, improved algorithms contribute to the reliability of life-saving devices, making the work both meaningful and impactful.

In summary, MSCS 532 has significantly reinforced my technical foundation in algorithms and data structures, while also enhancing my practical effectiveness as a firmware test engineer. The knowledge gained supports not only better system performance analysis and test design, but also aligns with the ethical responsibility of ensuring reliable medical devices for patient safety.