PREFACE

The existing Complementary Metal Oxide Semiconductor (CMOS) has many limitations, which are stopping the nanoscale to go further level to design optimized digital circuits. So, many researchers have explored and found an alternate solution to CMOS namely Quantum-dot Cellular Automata (QCA) technology to design high-density digital circuits. Hence, QCA is chosen for designing the nano digital circuits to overcome the existing CMOS limitations and to achieve high density with a higher clock speed.

Then I started to explore the key advantages and disadvantages of QCA and how to design the conventional structures using QCA. At the initial step, I implemented the existing digital circuits in QCA technology. After that, I started to enhance the XOR gate structure and its applications in QCA. Then, I started thinking to explore the high speed and cost efficient structures in an innovative manner like a serial bit stream cascading magnitude comparator, single-digit and multi-digit BCD adders using QCA as part of the Nano arithmetic circuits library. The performance of the proposed circuits is described in detail in this thesis with the various parameters such as the number of cells, area, delay, cost etc.,