CDA 3201L – Computer Logic Design Laboratory

Lab Exercise 6

Sequential Logic Circuits (II)

This lab assignment requires you to design a shift register using D flip-flops and examine the function of a specific shift register TTL part.

Part A: Design a 4-bit synchronous left-shift register using D flip-flops (7474). Your shift register should have an asynchronous parallel load, serial in, serial out, and parallel out bus. You may convert a flip-flop of another type into a D flip-flop, if needed. Answer the following questions in the report:

1. How would you modify this design to provide synchronous parallel load instead of asynchronous parallel load?
2. How would you modify this design to allow a synchronous right-shift along with synchronous parallel load?

Part B: The 74LS194 is a 4-bit bi-directional shift register with parallel and serial operating modes. Design a circuit using only one 74LS194 IC to perform all the following 3 functions. You are required to provide control signals of your choice to select the functions.

1. Parallel load
2. Circular Left shift or rotate left
3. Circular Right shift or rotate right

References:

"Fundamentals of Logic Design", 7th Edition, by Charles H. Roth Jr. and Larry L Kinney, 2014, ISBN-13: 978-1133628477 or ISBN-10: 1133628478, CENGAGE Learning, Stamford, CT, USA

Notes:

1. You can use http://en.wikipedia.org/wiki/List of 7400 series integrated circuits to find the TTL chip you need.
2. Datasheets of some commonly used TTL chips can be found at the following sites:
    - http://www.jameco.com
    - http://www.ti.com/sc/docs/psheets/databook.htm
    - http://www.datasheetcatalog.com/fairchildsemiconductor/1/