

# CDA 3201L – Computer Logic Design Laboratory

## Lab Exercise 4

### Combinational Logic Circuits ( IV )

**Part A:** Design and wire a circuit to implement the Boolean expression  $C(x, y, z) = \sum m(3, 5, 6, 7)$  using an 8-to-1 multiplexer (TTL Part 74LS151). Here, C stands for carry bit. Verify the operation by checking all input combinations in the Boolean function's truth table.

**Part B:** Implement the function  $C(x, y, z)$  from Part A using only a 4-to-1 multiplexer (TTL Part 74LS153). You are not allowed to use any other logic gates.

**Part C:** Design a logic circuit that accepts two 3-bit numbers and generates different 2-bit outputs based on the scenarios below. In your report, include a table indicating which scenario each output value corresponds to.

1. The 3-bit binary number  $a_2a_1a_0$  is greater than the other binary number  $b_2b_1b_0$ .
2. The 3-bit binary number  $a_2a_1a_0$  is less than the other binary number  $b_2b_1b_0$ .
3. The 3-bit binary number  $a_2a_1a_0$  is equal to the other binary number  $b_2b_1b_0$ .

#### 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](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/>