**Digital Systems Preliminary Examination for Fall 2016**

1. Given the following function, f = ABC’D + AB + A’C’D, simplify using a K-map.
2. Design a counter using D or T flip that goes through the sequence: 0, 1, 2, 3, 5, 7, 0. Illustrate the state table, state diagram, and sequential circuit.
3. Implement the following functions using: (a) Programmable Logic Array (PLA) and (b) Programmable Array Logic (PAL). Illustrate the Programming Tables.

F1 = A’C’D’ + ABC + A’B’D’

F2 = C’D’ + ABCD

1. Design an encoder with 8 inputs and 3 outputs.
2. Design an 8 to 1 multiplexer to implement the function:

f (w, x, y, z) = (0,1,2,3,6,7,12,15)

1. Convert the following hexadecimal number to its binary, Octal and Decimal equivalents: Show all work.

AB73

1. Decimal
2. Binary
3. Octal
4. Design a combinational logic circuit using ROM. The circuit accepts a three-bit number and outputs a binary number equal to the square of the input number. Illustrate truth table(s) and circuit/system diagram.