Course: Digital Signal Processing		Course Number: COEN 212	Sections: EC and W
Examination: Midterm	Date: April 20, 2020	Time: 3 hours	# of pages: 1
Instructor: Dr. M.R. Soleymani			
Books and Material: Open Book			
Special Instructions: Try all questions.			

1) Simplify and implement the circuit $F\ (x, y, z) = [(x + y)(x' + z)]'$ with NOR gates only. Use the minimum number of gates. (10 Marks)
2) A combinational circuit has a has input bits w, x, y, z and an output F. The output is one when the number of one at the input is more than one. Design the circuit using a multiplexer (10 Marks)
3) Using a decoder and minimal external gates design a combinational circuit with inputs bits x, y, z and two outputs
$$F = x'y'z' + xz$$
and
$$G = (x + y)z$$
(10 Marks)
4) A sequential circuit has three D flip-flops with the following input equations:
$$D_A = (AC' + BC)x'$$
$$D_B = (B \oplus C)x'$$
$$D_C = A'C'x'$$
and the output equation $y = AB'C'x'$.
Draw the state transition table (4 Marks), and state diagram (4 Marks). What does the function do? (2 Marks)

5) Using minimum possible of JK flip-flops design a counter that counts: 0, 1, 6, 3, 5, 2, 4, 0, … (repeat).