ECE 245: Microcontroller Applications with IoT – Fall 2022: Midterm Exam

Instructor: Dr. Shayan (Sean) Taheri

Note – Cheating and Plagiarism: Cheating and plagiarism are not permitted in any form and cause certain penalties. The instructor reserves the right to fail culprits.

Deliverable: All your responses to the assignment questions should be included in a single compressed file to be uploaded in the Gannon University (GU) – Blackboard Learn environment.

Question 1-A. Determine the types of digital circuits and explain their similarities and differences.

Question 1-B. Provide the truth table and the circuit for: F = (A'.C + B'.D).(B.C + A.E) + B'.D'.E

Question 1-C. Provide the truth table, the circuit, and the Boolean function for a four-to-one multiplexer.

Question 1-D. Explain the differences between latches and flip-flips, specify their types, and draw the circuit for a flip-flip along with its truth table.

Question 2-A. Specify the definition of CMOS and explain its types.

Question 2-B. Show the transistor-level schematic of an inverter and two-input AND gate with the specifying the names of transistors and their terminals. Mention the parameters that affect the operation of a CMOS transistor.

Question 2-C. Comprehensively explain why and how to improve the strength of a digital signal.

Question 2-D. Explain the meaning of "**X**" and "**Z**" in logical states.

Question 3-A. Provide the meanings of "RAM", "ROM", "EPROM", "ADC", "DAC", "I/O", "DRAM", "SRAM", "ISA", "GPIO", "UART", "SSI", "USB", "JTAG", "I2C", "CAN", "PWM", and "NVIC".

Question 3-B. Specify the differences between microprocessors and microcontrollers.

Question 3-C. Specify the differences between memory-mapping and IO-mapping.

Question 3-D. Provide the definitions of CISC and RISC, and explain their similarities and differences.