Switching Circuits Laboratory (CS29002)

Assignment 2 (21-01-2026)

a) Design a combinational circuit that takes a 4-bit binary number $N = (A, B, C, D)$ as input, where A is the MSB and D is the LSB. The circuit produces an output F of 1 if N is a prime, and 0 otherwise. Draw the truth table of the circuit, obtain the minimized logic expression for F, and realize the circuit using basic gates.

Connect an external LED to display the value of F. *Do not use any on-board LED*. Ensure that when the LED glows, a current of about 5 mA flows through it.

b) Design a combinational circuit that takes a BCD digit $A = (A_3, A_2, A_1, A_0)$ as input, and produces a BCD digit $B = (B_3, B_2, B_1, B_0)$ as output, where $B = (A + 4) \% 10$. Draw the truth table of the circuit, obtain logic expressions for B_3, B_2, B_1, B_0, and realize the circuit using 2-input NAND gates only.

Display both the input and the output digits A and B on two 7-segment LED display units.

Instructions:

1) *For each design, draw the circuit diagram on paper, following the suggested conventions. Following this, you can issue the components and start with the realization on the breadboard.*
2) *After you finish each part of the experiment, show it to your assigned TA, who will be doing the evaluation.*
3) *Prepare a laboratory report in PDF format and upload it to Moodle by the specified deadline. A single report has to be uploaded per group.*