Switching Circuits Laboratory (CS29002)

Assignment 3 (28-01-2026)

a) Design a combinational circuit C that takes a 4-bit binary number $B = (b_3, b_2, b_1, b_0)$ as input, and converts it to a 2-digit BCD number (T, U) as output (T – tens digit, U – units digit). For example, the input binary number '1100' will get converted to 12 ('0001 0010' in BCD).

Write the truth table for the eight bits in T and U as functions of the four bits of B. Minimize these functions using Karnaugh maps. Realize the minimized functions using NAND, NOR and NOT gates only.

Display the digits T and U on two 7-segment display units.

b) Design an astable multivibrator M using the 555 timer IC, which generates a rectangular pulse train (clock) of: (i) frequency 50 KHz and duty cycle 90%, (ii) frequency 2 Hz and duty cycle 75%.

c) Feed the 2 Hz clock signal as designed in (Part-b) to a 4-bit binary counter (use TTL IC 7493), and connect the outputs of the counter to the inputs of the combinational circuit C designed in (Part-a). Verify that the count values are displayed in the correct sequence.

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. There will be a penalty for late demonstration beyond the lab hours.*

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.*