

HOMEWORK II

(27 Pts, due 10/02/2022, 11:59 PM)

The homework must be solved individually. We use software to automatically detect cheating.

Any case of cheating will lead to grade 0 for this homework.

Carefully provide the different steps of your solution for each problem

Problem I (Codes, 6 Pts)

Design a circuit that takes as input an ASCII-coded symbol (7 bits) and generates its parity bit. Consider for this problem the even parity.

Problem II (Codes, 5 Pts)

Consider a heat monitoring system containing an internal temperature sensor that produces different levels of voltage depending on the ambient temperature. The following table summarizes the possible voltage outputs:

Temperature Decreasing  						
2.7 V	3.0 V	3.3 V	3.6 V	3.9 V	4.2 V	4.5 V
Temperature Increasing 						

We wish to represent these voltages in computer for further processing. The conversion is done using an analog-digital-converter.

Provide an optimal binary coding. That is a coding that reflects the behavior of the analog device. Small changes on the analog side cause small movements on the binary side.

Problem III (Arithmetic with BCD, 6 Pts)

Convert the number into BCD representation and perform the following operations.

- a) $312 + 641$ (2pts)
- b) $4567 + 9374$ (2pts)
- c) $759 - 380$ (2pts)

Problem IV (Logic Simplification, 10 Pts)

Simplify the following logic expressions using the theorems seen in class and draw the corresponding circuit

a) $\frac{(A + C)(\bar{A} + B)(B + C)}{(2\text{pts})}$

b) $\frac{(A + \bar{B} + \bar{C})(\bar{A} + B + \bar{C})}{(2\text{pts})}$

c) $\frac{(A + \bar{B} + CD)(\bar{A} + \bar{B} + CD)}{(2\text{pts})}$

- d) Find the equation of the following circuit **(2pts)** and simplify it using the theorems seen in class **(1pt)**, and draw the resulting optimized circuit **(1pt)**.

