

## CS275 GRADED HOMEWORK 6

GIVE BACK ON THURSDAY NOVEMBER 4TH 2004 AT BEGINNING OF CLASS

For each question, read **each word** with the greatest care and **without hurrying**. If you have doubts about what is asked, **go back** to the wording of the question until the meaning of the question is clear. Then try to find an answer. If you get stuck, don't hesitate to **contact** your T.A. or me.

Please write your section number on your homework as well as a rough estimate of the time you spent solving it.

**Exercise 1.** Solve Exercise 6 p. 718 of [1]. Construct circuits from inverters, AND gates, and OR gates to produce these outputs.

- a)  $\bar{x} + y.$
- b)  $\overline{(x + y)}x$
- c)  $xyz + \bar{x}\bar{y}\bar{z}.$
- d)  $\overline{(\bar{x} + z)(y + \bar{z})}$

**Exercise 2.** Solve Exercise 8 p. 718 of [1]. Design a circuit for a light fixture controlled by four switches where flipping one of the switches turns the light on when it is off and turns it off when it is on.

**Exercise 3.** Solve Exercise 16 p. 718 of [1]. Use NOR gates<sup>1</sup> to construct circuits with these outputs.

- a)  $\bar{x}$
- b)  $x + y$
- c)  $xy$
- d)  $x \oplus y$

**Exercise 4.** Solve Exercise 4 p. 409 of [1]. Show that the sequence  $\{a_n\}$  is a solution of the recurrence relation  $a_n = -3a_{n-1} + 4a_{n-2}$  if

- a)  $a_n = 0.$
- b)  $a_n = 1.$
- c)  $a_n = (-4)^n.$
- d)  $a_n = 2(-4)^n + 3.$

**Exercise 5.** Solve Exercise 12 p. 409 of [1]. Assume that the population of the world in 2002 is 6.2 billion and is growing at the rate of 1.3% a year.

- a) Set up the recurrence relation for the population of the world  $n$  years after 2002.
- b) Find an explicit formula for the population of the world  $n$  years after 2002.
- c) What will the population of the world be in 2022?<sup>2</sup>

**Exercise 6.** Solve Exercise 28 p. 410 of [1].

- a) Find a recurrence relation for the number of ways to climb  $n$  stairs if the person climbing the stairs can take one, two or three stairs at a time.
- b) What are the initial conditions?
- c) How many ways can this person climb a flight of eight stairs?

### REFERENCES

[1] K. H. Rosen. *Discrete Mathematics and Its Applications*. Mc Graw Hill, 5 edition, 2003.

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<sup>1</sup>Ndlr: Use NOR gates **only**.

<sup>2</sup>Ndlr: Assuming the author's model is correct.