Homework #3: MACM-300

Reading: Sipser; Chapter 1, Section 1.2 and 1.3
Distributed on Jan 23; due on Jan 30 (in class)
Anoop Sarkar – `anoop@cs.sfu.ca`

Only submit answers for questions marked with †.

(1) † Prove that there is no language L such that $L^* = \{a\}^*\{b\}^*$ (use proof by contradiction).

(2) Sipser, q1.7

(3) Sipser, q1.9

(4) Sipser, q1.10

(5) Sipser, q1.14

   Hint: Assume each state in the DFA has transitions on all symbols in the alphabet. Use proof by contradiction for 1.14.a.

(6) Sipser, q1.15

(7) † Sipser, q1.16

(8) Sipser, q1.17

(9) † Provide a regular expression for the following languages:

   a. All strings of 0's and 1's that represent binary numbers that are equal to the decimal number 6.

   b. All strings of 0's and 1's that represent binary numbers that are powers of 2.

   c. All strings of 0's and 1's that represent Binary Coded Decimal (BCD) numbers. A BCD number is a decimal number where each decimal digit is encoded using a 4-bit representation of its binary value. For example, the BCD number of 2509 is 0010010100001001

(10) Sipser, q1.20

(11) † Sipser, q1.21

(12) † Sipser, q1.38

   Hint: Think about the subset construction for conversion of an NFA to an equivalent DFA.