

# CS2200 Languages Machines and Computations

## Assignment-1

Department of Computer Science and Engineering, Indian Institute of Technology Madras.

1. Give CSG for  $\{a^{2^n} \mid n \geq 0\}$ . (5 marks)
2. Give CSG for  $\{ww \mid w \in \{a, b\}^*\}$  (5 marks)
3. Page 53, Question: 9a (5 marks)
4. Page 53, Question:9b (5 marks)
5. Page 53, Question:10 (10 marks)
6. Construct a DFSA to accept strings over  $\{a, b\}^*$  satisfying all of the following three properties.
  - String begins with  $a$  and ends with  $b$
  - $aaa$  is not a subword
  - length of string is divisible by 3
7. Let  $R$  be a regular set over  $\Sigma^*$ . Define  $\frac{1}{2}R = \{x \mid xy \in R, |x| = |y|\}$ . Show that  $\frac{1}{2}R$  is regular. (5 marks)
8. Let  $R$  be a regular set over  $\Sigma^*$ . Define  $\frac{1}{3}R = \{x \mid xyz \in R, |x| = |y| = |z|\}$ . Show that  $\frac{1}{3}R$  is regular. Is  $\{z \mid xyz \in R, |x| = |y| = |z|\}$  regular. Is  $\{xz \mid xyz \in R, |x| = |y| = |z|\}$  regular. (10 marks)