

# B.tech. IV Sem (C) (CSE), 2019-20

## Theory of Computation, Assignment # 2

February 23, 2020

1. Show that regular languages are closed on :
  - (a) union, and
  - (b) *complementation*.
2. Explain the principle of *Pumping lemma*. What are its applications.
3. What are the important properties of Regular languages?
4. Explain the process of checking whether a language is **not** regular, making use of pumping lemma.
5. Explain the Arden's theorem. What are its applications?
6. Answer in brief.
  - (a) What is complements automaton?
  - (b) How do you convert regular expression into automaton?
  - (c) How do you convert automaton into regular expression?
  - (d) Pumping Lemma can be applied to only the languages that are infinite languages (True/False).
  - (e) Pumping-lemma is only sufficient for testing non-regularity of all languages (True/False).
7. Are the regular languages closed under these operations?
  - (a) Infinite union
  - (b) Infinite concatenation
  - (c) Difference
  - (d) Symmetric difference
  - (e) Complementation
8. Justify whether, following statements are true or false.
  - (a) If  $L$  is regular, then  $\{xy\}$  is regular, where  $x, y \in L$ .
  - (b) If  $L$  is regular, then  $\{y\}$  is regular, where  $y = x^R$  and  $x \in L$ .
  - (c) If  $L$  is regular, then  $L_1$  is also regular for  $L_1 \subseteq L$ .
9. Use pumping lemma to show that following languages are not regular:
  - (a)  $\{ww^R \mid w \in (a+b)^*\}$
  - (b)  $\{ww \mid w \in (0+1)^*\}$
  - (c)  $\{w \mid w \text{ is a Palindrome String}\}$

10. Find out the regular expressions using Arden's rule, for the transition diagram shown in Fig. 1 (a), and (b).

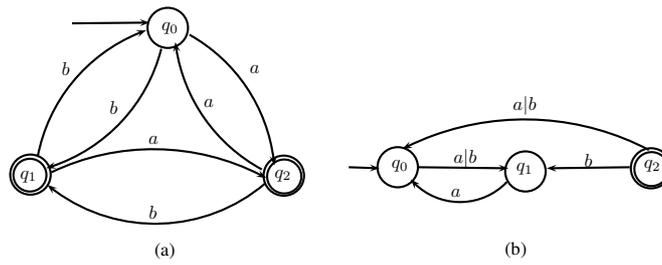


Figure 1: DFAs

11. Find the regular expression for the automaton shown in the Fig. 2.

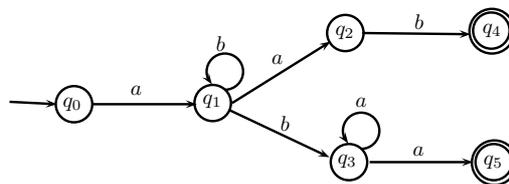


Figure 2: Finite automaton

**Submission deadline: 04-03-2020. The assignment must be done in a register and be submitted in the class. The same will be returned after checking, in next class.**