CSE303 Q3 PRACTICE SOLUTIONS

YES/NO questions Circle the correct answer Write SHORT justification.

1. Any regular language is finite.
   Justify: $L = a^*$ is infinite **n**
2. For any language L there is a deterministic automata M, such that $L = L(M)$.
   Justify: language must be regular **n**
3. Given L_1, L_2 regular languages over Σ, then $(L_1 \cap (\Sigma^* - L_1))L_2$ is not regular.
   Justify: Regular languages are closed under intersection and complement **n**
4. There is an algorithm that for any finite automata M computes a regular expression r, such that $L(M) = r$.
   Justify: defined in the proof of Main Theorem **y**
5. For any M, $L(M) = \bigcup\{R(1, j, n) : \ q_j \in F\}$, where $R(1, j, n)$ is the set of all strings in Σ^* that may drive M from state initial state to state q_j without passing through any intermediate state numbered $n + 1$ or greater, where n is the number of states of M.
   Justify: only when M is a finite automaton **n**
6. Pumping Lemma says that we can always prove that a language is regular.
   Justify: it gives certain characterization of infinite regular languages and can be used for proving that a language is not regular.
   n
7. $L = \{a^{2n} : n \geq 0\}$ is regular.
   Justify: $L = (aa)^*$ **y**
8. $L = \{a^n : n \geq 0\}$ is not regular.
   Justify: $L = a^*$ **n**
9. $L = \{b^n a^n : n \geq 0\}$ is not regular.
   Justify: proved using Pumping Lemma **y**
10. Let L be a regular language. The language $L^R = \{w^R : \ w \in L\}$ is regular.
    Justify: L^R is accepted by a finite automata $M^R = (K \cup s', \Sigma, \Delta', s', F = \{s\})$, where K is the set of states of M accepting L, $s' \notin K$, s the initial state of M, F is the set of final states of M and
    $$\Delta' = \{(r, \sigma, p) : (p, \sigma, r) \in \Delta\} \cup \{(s', e, q) : q \in F\},$$
    where Δ is the set of transitions of M. **y**
11. Any subset of a regular language is a regular language.
    Justify: $L_1 = \{b^n a^n : n \geq 0\} \subseteq L = b^* a^*$ and L is regular, and L_1 is not regular **n**

QUESTION 1 Use the constructions defined in the proof of theorem

A language is regular iff it is accepted by a finite automata

construct a finite automata M such that $L(M) = a(ab \cup aab)^*b$ and

$$M = M_a(M_{ab} \cup M_{aab})^* M_b$$

Solution - follow DIRECTLY book definitions!