CMPS 130 – Spring 2016

Homework 6

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**Chapter 3 (p.117):**

Problem 20

A

**Explanation:**

The string generated by the NFA starts with the letter a. So, the regular expression becomes a. Now, there are 2 loops (ab)\* and (baa)\*. 1. If the second letter of the string is a, then (ab)\* loop occurs. 2. If the second letter of the string is b, then (baa)\* loop occurs. So, the regular expression becomes a(ab + baa)\*. The loop is represented by Kleene star. If we move forward to the next state, there is another loop (aba)\*. So, the regular expression becomes a(ab + baa)\*(aba)\*. Also, a union operation is observed between aa and bab. So, the regular expression becomes a(ab + baa)\*((aba)\*(aa + bab)). Proceeding further, the next transition is single a reaching to the final state. So, the regular expression becomes a(ab + baa)\*((aba)\*(aa + bab))a. The lambda transitions in the NFA are null transitions. Thus, the regular expression is a(ab + baa)\*((aba)\*(aa + bab))a.

B

**Explanation:**

The strings generated by the NFA starts with the either a or b.

A union operation is used between (ab\*a) and (baaba). If the first letter of the string is a, then (ab\*a) occurs. If the first letter of the string is b, then (baaba) occurs. So, the regular expression becomes (ab\*a + baaba). There is

C

Problem 24

δ\*(q, a) = ∪{δ(p, a) | p ∈ δ\*(q, Λ)}= ∪{δ(p, a) | p ∈ {q}} = δ(q, a).

Problem 28

A

B We know from the definition of Λ-closure that Λ(S) ⊆ Λ(Λ(S)). To show the opposite inclusion using structural induction, we must show that for every s ∈ Λ(S), and for every t ∈ Λ(S), Λ({t}) ⊆ Λ(S). The first is trivial, and the second is part of the definition of Λ(S).

C The statement Λ(S∪T) ⊂ Λ(S) ⊆ Λ(T) is easily shown by structural induction. The opposite inclusion follows from the two statements Λ(S) ⊆ Λ (S∪T) and Λ(T) ⊆ Λ(S∪T), both of which are true by part (a).

Problem 31

The proof is by structural induction. We first observe that since there are no A-transitions in M1, δ1\*(q, Λ) = {q} and δ1\*(q, xa) = ∪{δ1(p, a) | p ∈ δ1\*(q,x)}, for every q ε Q, every x ε

Problem 37

C

D

Problem 38

A

C

E