Hunter Bresler

COT 4420 Hw 1

1. $S_1 = \{2, 3, 5, 7\}$ $\overline{S_1} = \{1, 4, 6, 8, 9, 10\}$
$S_2 = \{2, 4, 5, 8, 9\}$
$S_1 \cup S_2 = \{2, 3, 4, 5, 7, 8, 9\}$ $\overline{S_1 \cup S_2} = \{1, 2, 4, 5, 6, 8, 9, 10\}$

I wasn't sure if the line above was a negation or artifact, so I wrote both. I'm also not sure if $U = \{1:10\}$ includes 10.

2. $S_1 = \{2, 3, 5, 7\}$ $S_2 = \{2, 4, 5, 8, 9\}$

$S_1 \times S_2 = \{(2,2), (2,4), (2,5), (2,8), (2,9),$
$(3,2), (3,4), (3,5), (3,8), (3,9),$
$(5,2), (5,4), (5,5), (5,8), (5,9),$
$(7,2), (7,4), (7,5), (7,8), (7,9)\}$

3. If $S_1 = S_2$ then $S_1 \cup S_2 = S_1 \cap S_2$

$X \subseteq S_1 = S_2$
$X \subseteq S_1 \cup S_2$
$X \subseteq S_1 \cap S_2$
$\therefore X = X \rightarrow \overline{S_1 \cup S_2} = S_1 \cap S_2$

4. a.) $w = aabbab$ $w^R ww = \underline{aab}bab\underline{aa}bb\underline{a}bab$
b.) 3

NOTE, the homework PDF writes the w^R as a superscript, therefore R is a length and not denoting a reversal of the string w.

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5. a) {ab, aa, baa} A = abaabaaab aa = ab + aa + baa + ab + aa ✓
B = aaaabaaaa = aa + aa + baa + aa ✓
C = baaaaaabaaaaab = baa + aa + ab + aa + aa + (b)^x ✗
D = baaaaaabaa = baa + aa + ab + aa ✓
The 1st, 2nd, and 4th substrings are in L^*

b) L^4 = {abababab, abbabaa, ababbaa ...
The 2nd and 4th substrings are in L^4 because they can be made using 4 "characters" of L, or more accurately, is made of a number of "characters" divisible by 4. That's why the first substring can't be made.

6. a) S → AaAaA A → Ab | λ
b.) S → AaAaA A → Aa | Ab | λ
c.) S → A | AaA | AaAaA | AaAaAaA A → Ab | λ
d.) S → AaAaAaA A → aA | bA | λ
e.) S → aAb A → aA | bA | λ
f.) S → A A → aA | λ | AbAbA