MATH 323 - EXERCISES 1- SOLUTIONS

1. In the standard notation

   (a) $A \cap B' \cap C'$
   (b) $A \cap B \cap C'$
   (c) $A \cap B \cap C$
   (d) $A \cup B \cup C$
   (e) $(A \cap B \cap C') \cup (A \cap B' \cap C) \cup (A' \cap B \cap C) \cup (A \cap B \cap C)$
   (f) $(A \cap B' \cap C') \cup (A' \cap B \cap C') \cup (A' \cap B' \cap C)$
   (g) $(A \cap B \cap C') \cup (A \cap B' \cap C) \cup (A' \cap B \cap C)$
   (h) $A' \cap B' \cap C'$
   (i) $(A \cap B \cap C)' \equiv A' \cup B' \cup C'$

2. Using set theory arguments

   (a) TRUE : distributivity
   (b) TRUE : $(A \cap B') \cup B = (B \cup A) \cap (B \cup B') = (B \cup A) \cap S.$
   (c) TRUE : distributivity
   (d) FALSE : $s \in LHS \Longrightarrow s \in C$, but $s \in RHS \Longrightarrow s \in C'$ (CONTRADICTION).
   (e) TRUE : $s \in LHS \Longrightarrow s \in B$ and $s \in B' \Longrightarrow$ no such s exists.

3. In standard notation

   (a) B'
   (b) $A' \cap B$
   (c) $(A \cap C) \cup (A' \cap B)$

4. In the obvious notation

   (a) $S = \{FF, SFF, SSFF, FSFF, SSSS, SSSF, SSFS, SFSS, FSSS, FSFS, SFSF, FSSF\}$

   (b) $\{SSSS, SSFS, SFSS, FSSS, FSFS\}$

5. (a) $S = \{A_i : i = 1, ..., n - r + 1\}$, where

   $$A_i \equiv \text{“find first defective on } i\text{th inspection”}$$

   (b) $S = \{B_i : i = r, r + 1, ..., n\}$, where

   $$B_i \equiv \text{“find last defective on } i\text{th inspection”}$$

6. (a) $\Big(A_1 \cup (A_1' \cap A_2)\Big) \cap B \cap C \cap D \cap E$

   (b) Replace B in (a) by the DISJOINT UNION

   $$(B_1 \cap B_2 \cap B_3') \cup (B_1 \cap B_2' \cap B_3) \cup (B_1' \cap B_2 \cap B_3) \cup (B_1 \cap B_2 \cap B_3)$$

NOTE: Can use Venn Diagrams as an aid to solving these problems