MATH 323 - EXERCISES 1- SOLUTIONS

1 In the standard notation

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

2 Using set theory arguments

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

3 In standard notation

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

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) $\big(A_1 \cup (A_1^c \cap A_2)\big) \cap B \cap C \cap D \cap E$

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

$$(B_1 \cap B_2 \cap B_3^c) \cup (B_1 \cap B_2^c \cap B_3) \cup (B_1^c \cap B_2 \cap B_3) \cup (B_1 \cap B_2 \cap B_3)$$

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