Assignment 1

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Question1:

a) Let $A = \{1\}, B = \{2\}, C = \{1, 2\}$

b) Let $A = \{1\}, B = \{1\}$

c) No such values of A, B, C are possible to satisfy

d) Let $A = \{1\}, B = C = \{2\}$

e) Let $A = B = C = \{1\}$

Question 2:

a) $S_1 = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}, \{a, b, c\}\}$

b) $S_2 = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}\}$

c) $S_3 = \{\{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}\}$

Question 3:

a) $S_1 = \{x | x \subseteq \{a, b, c\} \wedge |x| \leq 1\}$

b) $S_2 = \{x | x \in \mathbb{N} \wedge \ (x \ mod \ 4 = 0)\}$

c) $S_3 = \{(x, y) | (x \in \mathbb{N} \wedge y \in \mathbb{N}) \wedge (y = 2x)\}$

d) $S_4 = \{X | (X \in U) \wedge (X \in X)\}$

e) $S_5 = \{X | (X \in U) \wedge (X \notin X)\}$

Question 4: Bonus Question

Let's consider the situation:

If we assume that $S_5 \in S_5$, then that means that the set of all sets that don't contain themselves, contains itself. But that would mean that S_5 contains itself, so we get a contradiction.

If we assume that $S_5 \notin S_5$, then that means that the set of all sets that don't contain themselves, does not contain itself. So S_5 would have to contain itself, but that leads to the contradiction above.

So we end up with a paradox, which is known as Russel's Paradox.