Cogs 502 – Prog. & Log.
Spring 2017 Quiz 1 March 10

Name of the Student: _____

There are 3 questions in the exam. You have 30 minutes to finish the exam.

Question 1 (20%)

State true or false:

(a) ___For any sets A and B, if $A \subseteq B$, then $A \subset B$.

(b) ___For any sets A, B and C, if $A \subseteq B$ and $B \subset C$, then $A \subseteq C$.

(c) ___For any sets A, B and C, if $A \subseteq B$ and $C \subseteq B$, then $A \cap C \neq \emptyset$.

(d) ___$\{x \in \mathbb{N} \,|\, x < 2 \text{ and } x > 2\} = \{x \in \mathbb{Z} x^2 + 5 = 0 \,|\,\}$,
where $\mathbb{N}$ is the set of natural numbers (=zero and all the positive whole numbers), and $\mathbb{Z}$ is the set of integers (=natural numbers and all the negative whole numbers).

Question 2 (30%)

Remember that for a set of sets A,

$$\bigcup A = \{a \,|\, a \in B \text{ for some } B \in A\}$$
$$\bigcap A = \{a \,|\, a \in B \text{ for each } B \in A\}$$

State whether true or false:

(a) ___Given any set K, $\bigcup\{X \,|\, X \subseteq K\} \subseteq K$

(b) ___Given any set K, $\bigcap\{X \,|\, X \subseteq K \text{ and } |X| < 3\} = \emptyset$

Question 3 (50%)

Given a set A and a relation $R \subseteq A \times A$. We say that R is *connected* if and only if for every *distinct* x and y in A, (x,y) or (y,x) or both are in R.

Given $A = \{1,2,3,4\}$, what is the smallest number of elements a connected relation R on A can have. Give an example for such a relation.