Cogs 502 – Prog. & Log.
Fall 2017 Quiz 1 Oct 31

Name of the Student: _____

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

Question 1 (30%)

State true or false:

(a) ___ $A \subseteq B$ if and only if there exists no a such that $a \in A$ and $a \notin B$.

(b) ___ Let $\mathscr{P}(A)$ be the set of all subsets of A; $\bigcup \mathscr{P}(A) \in \mathscr{P}(A)$.

(c) ___ There are as many b's in *trick* as in *crick*.

(d) ___ $\emptyset \subset \{\emptyset\}$

(e) ___ For any sets A, B, C, if $A \subseteq B$ and $B \not\subseteq C$, then $A \not\subseteq C$.

(f) ___ If $a, b \in A$, then $\{\{a\},\{a,b\}\} \in \mathscr{P}(\mathscr{P}(A))$.

Question 2 (40%)

Remember the definitions of reflexivity, symmetry and transitivity:

A relation $R \subseteq A \times A$ is **reflexive** if and only if for each $x \in A$, $(x,x) \in R$.

A relation $R \subseteq A \times A$ is **symmetric** if and only if for each $(x,y) \in R$, (y,x) is also in R.

A relation $R \subseteq A \times A$ is **transitive** if and only if whenever (x,y) and (y,z) are in R, then (x,z) is also in R.

Given two relations R_1 and R_2 in $A \times A$ for some set A, state true or false:

(a) ___ if both R_1 and R_2 are reflexive, then $R_1 \cap R_2$ is also reflexive.

(b) ___ if both R_1 and R_2 are symmetric, then $R_1 \cup R_2$ is also symmetric.

(c) ___ if both R_1 and R_2 are symmetric, then $R_1 \cap R_2$ is also symmetric.

(d) ___ if both R_1 and R_2 are transitive, then $R_1 \cap R_2$ is also transitive.

(e) ___ if both R_1 and R_2 are transitive, then $R_1 \cup R_2$ is also transitive.

Question 3 (30%)

Let $A = \{1,2,3,4\}$; give a relation R in $A \times A$, that is:

(a) reflexive, symmetric, but not transitive;

(b) reflexive, transitive, but not symmetric;

(c) transitive, symmetric, but not reflexive.