Due: Fri. Sep. 9, 2016

**Question 1 (10%)**
Let $A$, $B$, and $C$ be propositional wffs. Write a wff whose meaning is “if $A$ then $B$ else $C$.”

**Question 2 (15%)**
Use truth tables to verify the following equivalences:
(2.a) $(P \rightarrow Q) \equiv (\neg P \lor Q)$
(2.b) $(P \land Q) \equiv (\neg P \lor \neg Q)$
(2.c) $A \lor (A \land B) \equiv A$

**Question 3 (10%)**
Show that $\rightarrow$ is not associative. That is, $(A \rightarrow B) \rightarrow C$ is not equivalent to $A \rightarrow (B \rightarrow C)$.

**Question 4 (15%)**
Use Quine’s method to show each wff below is a contingency.
(4.d) $(A \rightarrow B) \land (B \rightarrow \neg A) \rightarrow A$
(4.e) $(A \rightarrow B) \land (B \rightarrow C) \rightarrow (C \rightarrow A)$
(4.f) $(A \lor B) \rightarrow (C \lor A) \land (\neg C \lor B)$

**Question 5 (10%)**
Is the following wff a tautology? Why?
$A \land (A \rightarrow B) \rightarrow B$

**Question 6 (15%)**
Transform each of the following wff into a DNF. SHOW YOUR WORK.
(6.g) $Q \land \neg P \rightarrow P$
(6.h) $(P \lor Q) \land R$
(6.i) $(A \lor B) \rightarrow (C \rightarrow D)$

**Question 7 (10%)**
Transform each of the following wff into a full DNF. SHOW YOUR WORK.
(7.j) $P \rightarrow Q \land R$
(7.k) $(A \lor B) \land (A \lor C)$

**Question 8 (5%)**
Transform each of the following wff into a full CNF. SHOW YOUR WORK.
(8.l) $P \rightarrow Q \land R$

**Question 9 (10%)**
Show that $\{ \text{NAND} \} \text{ is a complete set of connectives.}$