

**COMP 681 Formal Methods****Spring 2008****Assignment 1**

1. Encode the following into the language of propositional logic. Use the indicated schematic letters for the indicated prime propositions.

- a. *COMP 618 meets Mondays, Wednesdays, and Fridays except when all classes are cancelled or Prof. Smith, who teaches this class, is out of town.*

$p$  = COMP 618 meets Mondays.

$q$  = COMP 618 meets Wednesdays.

$m$  = COMP 618 meets Fridays. (**Corrected**, was  $p$  = COMP 618 meets Mondays.)

$r$  = All classes are cancelled.

$s$  = Prof. Smith is out of town.

$t$  = Prof. Smith teaches COMP 618.

- b. *Besides manufacturing paper, Acme, Inc. is a supplier of cellulose, which is used in the production of cellophane and rayon, as well as (given there's a demand) garden mulch.*

$p$  = Acme, Inc. manufactures paper.

$q$  = Acme, Inc. supplies cellulose.

$r$  = Cellulose is used in the production of cellophane.

$s$  = Cellulose is used in the production of rayon.

$t$  = There is a demand for garden mulch.

$u$  = Acme, Inc. is a supplier of garden mulch.

2. Encode the following into the language of propositional logic. You must identify prime propositions and associate schematic letters with them.

- a. *The shipping department will increase rates if sales increase while costs hold steady even though, when sales increase, wages do as well, and increased wages lead to decreased profits.*

- b. *Unlike Fred, Bill passed COMP 618, but he, like Bill, will take COMP 619 only if he also takes COMP 620, and that requires that he took COMP 520.*

3. Consider the following propositional logic wff.

$$\neg p \wedge q \vee r \Rightarrow (q \Rightarrow \neg r) \wedge s \Rightarrow \neg r \vee \neg (s \vee t)$$

- a. Give the fully parenthesized version of this wff.  
b. Draw the parse tree for it.

4. For each of the following, draw the parse tree for the following formula then give the truth table for it.

a.  $(p \vee \neg q) \wedge r \Leftrightarrow p \wedge q \Rightarrow q \wedge r$

b.  $(p \vee q) \wedge (r \vee s) \Rightarrow \neg p \wedge r \vee \neg (q \wedge s)$