CS:1010 DISCRETE STRUCTURES

PRACTICE QUESTIONS
LECTURE 1

Instructions

- Try these questions before class. Do not submit!

(1) Let p and q be the propositions
p: It is below freezing.
q:It is snowing.

Write these propositions using p and q and logical connectives.
(a) It is below freezing and snowing.
(b) It is below freezing but not snowing.
(c) If it is below freezing it is also snowing.
(d) Either it is below freezing or it is snowing, but it is not snowing if it is below freezing.
(e) That it is below freezing is necessary and sufficient for it to be snowing.

(2) Write each of these statements in the form "if p, then q" in English.
(a) It is necessary to wash the boss's car to get promoted.
(b) Winds from the south imply a spring thaw.

(3) How many rows appear in a truth table for each of these compound propositions?
(a) $p \rightarrow \neg p$
(b) $p \vee \neg r) \wedge (q \vee \neg s)$
(c) $q \vee p \vee \neg s \vee \neg r \vee \neg t \vee u$

(4) S.T. $(p \vee q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$ is a tautology.

(5) S.T. $(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$ is not logically equivalent.

(6) The dual of a compound proposition that contains only logical operators $\wedge, \vee, \neg$ is the compound proposition obtained by replacing each $\vee$ by $\wedge$, $\wedge$ by $\vee$, T by F and F by T. The dual of s is denoted as s^*.
(a) Find the dual of $p \wedge \neg q \wedge \neg r$.
(b) S.T. $(s^*)^* = s$.

(c) When is $s^* = s$?

(7) Determine whether this compound proposition is satisfiable.
$(p \rightarrow q) \wedge (p \rightarrow \neg q) \wedge (\neg p \rightarrow q) \wedge (\neg p \rightarrow \neg q)$