Homework 1
Analysis of Software Artifacts (706)
Due Date: October 2, 2002 (Wed)

Question 1 (Review, 10 points): Please give an English description of the path operators (modalities) and path quantifiers given below. Also express each operator/quantifier in terms of X, U, and E (use the duality equations here).
Path operators: X, U, R, F, G.
Path quantifiers: A, E.

Question 2 (Review, 40 points):
Part A: Classify each formula given below as CTL*, CTL, or LTL. Give a short justification for your answer.
A(¬Fp ∨ Gq), AG EF AFp, or A(¬Fp ∨ EGq).
Part B: The path formula fUwg (U_w is called the weak until) is true on a path if f remains true until g becomes true, but we allow g to be false on the entire path. Express weak until U_w as a combination of until U and globally G.

Question 3 (Modeling, 50 points): Express the following English descriptions in CTL*. Also write the negation of the formula and provide English description of that.
Part A: It is not possible to reach a state that is faulty (where the atomic proposition faulty is true).
Part B: If a transaction is started (denoted by truth of the atomic proposition started), it always finishes (denoted by the truth of the atomic proposition finished).

Things to think about: Download NuSMV from the web-site provided on the course home page. Run the semaphore and vending machine example and analyze the result. Start looking at some examples provided with NuSMV distribution.