

Computer-Aided Verification

Class Quiz (1)

Due Date: March 29, 2006

(A) Use CTL to express the following properties.

- (1) Suppose a semaphore x_i is used by process p_i for entering its critical section, write a general form of **mutual exclusion** for n processes.
- (2) **Whenever** a system fails (crashes), it will be restarted.
- (3) When an elevator is called at a particular floor, the elevator will **eventually** open at that floor.
- (4) Between the time an elevator is called at a particular floor and the time it opens at that floor, it will have passed the floor **at most** once without opening.
- (5) Signal A will be asserted for exactly 2 clock cycles only if signal B is de-asserted for **at most** 1 clock cycle and signal C is asserted for **at least** 2 clock cycles.
- (6) Death is inevitable.
- (7) Signal X will be asserted for at least one cycle **whenever** signal Y is asserted for at least 2 cycles.
- (8) If you ever fall in love, you will **eventually** marry someone. (Note the spouse can be different from the one you fell in love with.)
- (9) In any state, a read request will be granted only if the request is made **until** granted.
- (10) If you need to pass this course, you will have to **at least** participate in a midterm exam and a final exam, hand in at least 3 labs, make a paper presentation, and do a project.

(B) Express in your own words what the following mean. (Chinese or English both will do)

- (1) $AG\ EF\ (x == 0)$
- (2) $AG\ (p \rightarrow EG\ q)$
- (3) $EF\ ((E\ p\ U\ q) \vee (EG\ p))$
- (4) $E\ (X\ U\ E\ (Y\ U\ Z))$
- (5) $AF\ (m == 1 \rightarrow A\ (m == 0)\ U\ (m == 2))$

(C) Classify the following into safety or liveness properties..

- (1) $AG\ (x \rightarrow y)$
- (2) $EF\ (y \rightarrow z)$
- (3) $A\ (x\ U\ y)$
- (4) $EG\ (p \wedge q)$
- (5) $E\ (m\ U\ n)$