

Computer-Aided Verification

Class Quiz (2)

Due Date: May 24, 2006

- (1) Choose a variable ordering for the set $\{a, b, c, d\}$ and draw the BDD for the expression

$$(a \wedge b \wedge c) \vee (\neg b \wedge d) \vee (\neg c \wedge d)$$

Try to find an ordering that is optimal for reducing the BDD size.

- (2) Given two dense clock variables x and y , construct a canonical DBM for the following clock zones.

(a) $(x - y \geq 10) \wedge (x \leq 5) \wedge (y \geq 2)$

(b) $(y - x < 5) \wedge (x > 15) \wedge (y < 2)$

(c) $(x < 6) \wedge (y > 12)$

- (3) For the clock zone 2(a) in the above problem, compute the successor clock zone when a transition is taken. The transition has trigger $x = 3$ and clock y is reset.

- (4) Given 2 clocks x and y , such that the maximum constants compared with x and y are, respectively, 2 and 3, compute the number of clock regions.

- (5) Express the following CTL formula using fixpoint notations.

(a) $A(p \cup EF q)$

(b) $E(r \rightarrow AX t)$

(c) $A(p \wedge EGq)$

(d) $EGAG f$

(e) $AGEF f$