## Switching Algebra: Problems

- 1. Do as a homework the following exercises:
  - (a) Prove theorems T1'-T3' and T5' using perfect induction
  - (b) Prove theorems T6-T9 using perfect induction
  - (c) Prove theorems T8'-T11' using switching algebra theorems
  - (d) Prove theorems T13 and T13' (DeMorgan) using induction
- 2. Use switching algebra theorems to simplify each of the following logic functions:
  - (a)  $F = W \cdot X \cdot Y \cdot Z \cdot (W \cdot X \cdot Y \cdot Z' + W \cdot X \cdot Y' \cdot Z + W \cdot X' \cdot Y \cdot Z + W' \cdot X \cdot Y \cdot Z)$
  - (b)  $F = A \cdot B + A \cdot B \cdot C' \cdot D + A \cdot B \cdot D \cdot E' + A' \cdot B' \cdot C' \cdot E$
  - (c)  $F = M \cdot R \cdot P + Q \cdot O' \cdot R' + O \cdot N \cdot M + M \cdot N + Q \cdot P \cdot M \cdot O'$
  - (d)  $F = A \cdot B' + B' \cdot C + C \cdot D' + C \cdot A'$
  - (e)  $F = (A \cdot B' + B' \cdot C + C \cdot D' + C \cdot A')'$
  - (f)  $F = (A \cdot B' + B' \cdot C)' + (C \cdot D' + C \cdot A')'$
  - (g)  $(W \cdot Z)' \cdot (X' + Y')'$
  - (h) F = (((A + B')' + C)' + D)'
- 3. Implement with gates (in a HDL) one of the expressions (b), (c), or (d) from problem 2 in both the initial and the simplified form, then compare the results by simulation.
- 4. Implement with gates in a HDL at least one of the expressions (e), (f), (g), or (h) from problem 2 in the initial form and in the simplified form and compare the results by simulation.