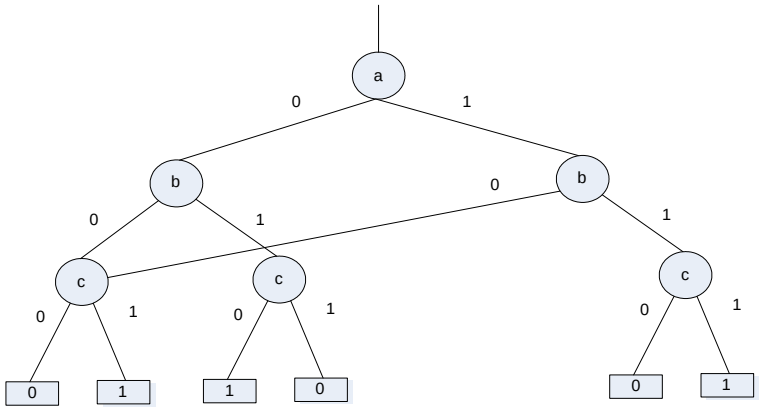
COE 561, Term 101

Digital System Design and Synthesis

HW# 1

Due date: Sunday, Oct. 24

Q.1. Consider the following OBDD with the variable ordering {a, b, c}. Reduce it based on **Reduce** function to obtain the ROBDD. Show the details of your work.



Q.2. Consider the function f=(a+bc)(a'+cd):

(i) Draw the **ROBDD** for the function using the variable order {a, c, b, d}.

(ii) Draw the **ROBDD** for the function using the variable order {d, b, c, a}.

(iii) Comment on the difference between the two obtained ROBDDS and what heuristic do you suggest one should choose in selecting a variable order.

Q.3. Consider the two functions f=(a+bc)(a'+cd) and g=(a+b)(c+d):

(i) Compute the function f⊕g based on orthonormal basis expansion.

(ii) Draw the **ITE DAG** for the function f.g. Show the details of the ITE algorithm step by step. Use the variable order {a, b, c, d}

Q.4. Consider the following given matrix representing a covering problem:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

Find a **minimum cover** using **EXACT_COVER** procedure. Show all the details of the algorithm. Assume the following order in branching selection when needed: C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8.

Q.5. Consider the function $F(A,B,C,D) = \overline{A}\overline{C} + \overline{C}D + A\overline{D} + BC + \overline{A}\overline{B} + AC$. Using recursive paradigm, determine if the function F is **tautology** or not. You need to choose the right variable for expansion to minimize computations.

Q.6. Consider the function $F(A,B,C,D) = \overline{A}\overline{B} + AB + B\overline{C} + AC + CD + B\overline{D}$

(i) Compute the **complement** of the function using the recursive complementation procedure outlined in section 7.3.4. You need to choose the right variable for expansion to minimize computations.

(ii) Compute all the **prime implicants** of the function using the method outlined in section 7.3.4. You need to choose the right variable for expansion to minimize computations.