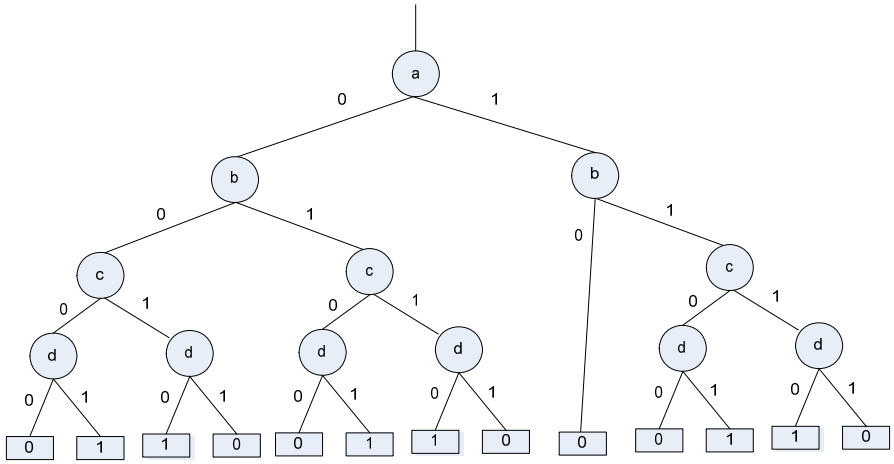
COE 561, Term 081

Digital System Design and Synthesis

HW# 1

Due date: Tuesday, Nov. 11

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



Q.2. Consider the functions f1=ab+ac+bc, f2=a(b⊕c)+bc and f3=a(a⊕b)'+c(a⊕b):

(i) Draw the **ROBDD** for the functions **f1, f2** and **f3** using the variable order {a, b, c}.

(ii) What do you conclude from the results obtained in (i).

Q.3. Consider the two functions f=a⊕b⊕c and g=ab+ac+bc.

(i) Compute the function f⊕g.

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

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

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

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.

Q.5. Consider the function $F(A,B,C) = AB + \overline{A}C + \overline{B}\overline{C}$.

(i) Represent the function using **positional cube notation**.

(ii) Using positional cube notation, compute the **cofactor** F_A.

(iii) Using positional cube notation, compute the **consensus** between the two cubes $\overline{A}C$ and $\overline{B}\overline{C}$.

(iv) Using positional cube notation, based on the **sharp** operation, compute the complement of the function *F*.

(v) Using positional cube notation, determine if the cube BC is **covered** by the function $F = AB + \overline{A}C + \overline{B}\overline{C}$.

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

(i) Compute the **complement** of the function using the recursive complementation procedure outlined in section 7.3.4.

(ii) Compute all the **prime implicants** of the function using the method outlined in section 7.3.4.

Note that you do not need to use the positional cube notation in your solution of this question.