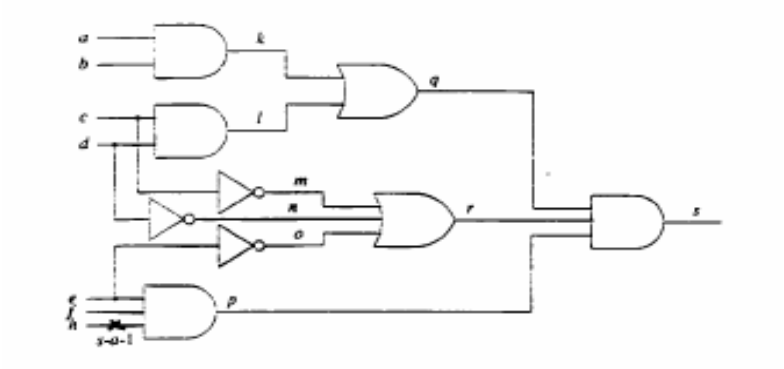
COE 561, Term 061

Digital System Design and Synthesis

HW# 1

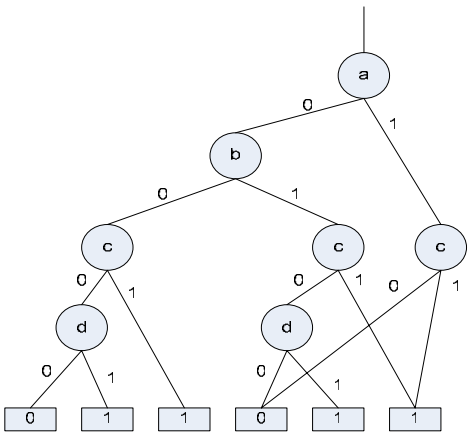
Due date: Sunday, Oct. 29

Q.1. Consider the following circuit shown below:



Find the set of all test vectors that detect the fault **h stuck-at-1**.

Q.2. 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.3. Consider the function $f=a_3b_3' + (a_3' \oplus b_3)\, a_2b_2' + (a_3' \oplus b_3)(a_2' \oplus b_2)a_1b_1'$

(i) Implement the function f using **2x1 Multiplexers**. Minimize the number of multiplexers used.

(ii) Implement the function f using **4x1 Multiplexers**. Minimize the number of multiplexers used.

(iii) Draw the **ROBDD** for the function f using the variable order $\{a_1, b_1, a_2, b_2, a_3, b_3\}$. Is this the best ordering used? If not suggest a better ordering and show its ROBDD.

Q.4. Consider the two functions f=a⊕b⊕c and g=ac+a'b'+bc'.

(i) Compute the following functions: f . g, f + g, and f ⊕g.

(ii) Draw the **ITE DAG** for the function f ⊕g. Show the details of the ITE algorithm step by step.

Q.5. Consider the following given matrix representing a covering problem:

$$A = \begin{bmatrix} 1001100 \\ 1010010 \\ 1100000 \\ 0011100 \\ 0101000 \\ 1001101 \\ 1000011 \\ 1101110 \\ 1011100 \\ 0000001 \end{bmatrix}$$

Find a minimum cover using **EXACT_COVER** procedure. Show the details of the algorithm.