COE 561, Term 091

 Digital System Design and Synthesis

HW# 4 Solution

Due date: Tuesday, Jan. 19

# Consider a technology library containing the following cells:

|  |  |
| --- | --- |
| **Cell** | **Area Cost** |
| INV(x1) = x1’ | 1 |
| NAND2(x1, x2) = (x1 x2)’ | 2 |
| NAND3(x1, x2, x3) = (x1 x2 x3)’ | 3 |
| NOR2(x1, x2) = (x1 + x2)’ | 2 |
| AOI21(x1, x2, x3) = ((x1 x2) + x3)’ | 3 |
| OAI21(x1, x2, x3) = ((x1+x2) x3)’ | 3 |
| AOI22(x1, x2, x3, x4) = (x1 x2 + x3 x4)’ | 4 |
| OAI22(x1, x2, x3, x4) = ((x1+x2) (x3+x4))’ | 4 |

## Show the **pattern trees** of the library cells using **NAND2** and **INV** as base functions. Assume that symmetric representations do not need to be stored.

## Using the dynamic programming approach, **map** the circuit given below using the given library into the **minimum area** cost solution. Inputs are *{a, b, c, d, e, f, g, s}* and output is {*t}.*

## Using the given library, use the SIS command ***read\_libray*** **q1.lib** to read the library. Then, map the circuit to the library using the sis command ***map –s –m 0***. Compare your solution to the solution obtained in (iii) and comment on any differences. You can save the mapped circuit using the sis command ***write\_blif –n***.



# Assuming **Boolean matching**, determine the number of ROBDD’s that need to be stored in the cell library for each of the following cells. Justify your answer.

## f = a ⊕ b ⊕ c

## f = a b + a c + b c

## f = a b + a’ b’ + a c + b c

