COE 561, Term 091

Digital System Design and Synthesis

HW# 4

Due date: Tuesday, Jan. 19

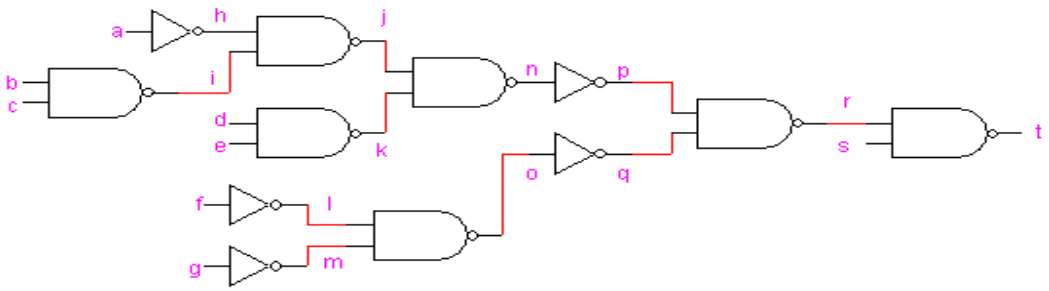
Q.1. Consider a technology library containing the following cells:

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

(i) 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.

(ii) 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}*.

(iii) 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***.



Q.2. 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.

(i) $f = a \oplus b \oplus c$

(ii) $f = a\ b + a\ c + b\ c$

(iii) $f = a\ b + a'\ b' + a\ c + b\ c$