

CS221: Digital Design

Assignment 4

Full Marks: 50

Submission Deadline: 17th October 2020 in MS Teams

Instructions:

1. Submit a single zip file which contains softcopies of all files. The name of the file would be "RollNo_M4A1.pdf". The TA will run your submission in Linux system to evaluate.
2. Please give me your word that you will not use any unfair means. You can use Kohavi's book and my video lectures and course lecture slides to solve the assignment. You have all the options and had all the time and opportunities communicate answers to one another, or discuss with other, or copy the solution from Internet and from your friend. But, I trust you and your conscience to follow these guidelines. Hope you will repay my trust. Here is an amazing story about this experiment of trust: (<https://journosdiary.com/2017/04/21/exam-without-invigilation-an-experiment-in-trust/>).

Question:

1. Consider the following expression. Represent the expression using (10)

$$F(w, x, y, z) = \Sigma(0, 1, 2, 5, 7, 8, 10, 15)$$

- a. Minimum number of NAND gates
 - b. Minimum number of NMOS and PMOS transistors
2. For the following expression, find all level-0, level-1, and level-2 kernels: (10)

$$vwy' + vwz + x'y' + x'z + wx.$$

3. For the following two expressions: (30)

$$f_1 = uwz + uxz + vwz + vxz + yz + uv,$$

$$f_2 = vw + vx + vyz + uz,$$

- a. Derive all the kernels from their cube-literal incidence matrices,
- b. Derive the kernel-cube incidence matrix and identify all its prime rectangles,
- c. Perform a kernel extraction based on prime rectangle and show the network graph for each extraction.