CECS 228 Writing Assignment 7

Due December 6th, 2021

Instructions

Submitting your work

Submit a single file with your handwritten solutions to the drop box by Monday, December 6th, 8:00 am. Make sure you provide your name and SID in the upper-right corner of your solution. Show all necessary steps in your solutions. Points will be lost otherwise.

Late submissions

Should you submit after the dropbox deadline, solutions received no later than 30 minutes after the deadline will lose 20% of the earned points. Solutions received after 30 minutes but before 60 minutes shall lose lose 50% of the earned points. All other late submissions will not be graded.

Problems

A. For a social gathering you must purchase eleven soft drinks of which there are four different flavors (a,b,c,d).

1. How many different 11-multisets of drinks can you possibly purchase so that the multiset has at least one of each flavor? For example,

$$\{a, a, a, b, b, b, b, c, c, d, d\}$$

is one such multiset. Explain your reasoning. (10 pts)

2. Write the multiset

$$\{a, a, a, b, b, b, b, c, c, d, d\}$$

as a non-multiset with the help of repeaters $r_2, r_3, \ldots, r_{11}$. (5 pts)

B. Consider the following set of binary disjunctions.

$$\mathcal{C} = \{(\overline{x}_2, x_3), (\overline{x}_1, \overline{x}_3), (\overline{x}_3, x_5), (\overline{x}_1, \overline{x}_4), (\overline{x}_1, x_5), (x_1, \overline{x}_4), (\overline{x}_1, \overline{x}_5), (\overline{x}_1, x_3), (x_3, x_4), (x_2, \overline{x}_5)\}.$$

1. Draw the implication graph $G_{\mathcal{C}}$ associated with $\mathcal{C}$. (10 points)
2. Suppose there is a variable assignment that satisfies all the disjunctions of $\mathcal{C}$. One way to find this assignment is to find a vertex v in $G_{\mathcal{C}}$ that has the following two properties. i) There is no path from v to its negation. For example, if $v = \overline{x}_3$, then there is no path from v to x_3. ii) For every variable w, there is either a path from v to w, or a path from v to $\overline{w}$. Find such a vertex in $G_{\mathcal{C}}$ and verify that is satisfies both properties. (5 pts)
3. Using the vertex you found from part 2, by assigning this vertex the value 1, and using the fact that an edge represents a logical implication, provide truth values for the other variables, and verify that all disjunctions have been satisfied. (10 pts)