

Problem Set 8

Due dates: Electronic submission of .tex and .pdf files of this homework is due on **11/08/2013 before 10:00am** on csnet.cs.tamu.edu, a signed paper copy of the pdf file is due on **11/08/2013** at the beginning of class.

Name: (put your name here)

Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework.

Signature: _____

Problem 1 (10 points). Exercise C.2-2 on page 1195.

Solution.

Problem 2 (10 points). Exercise C.2-4 on page 1195.

Solution.

Problem 3 (10 points). Exercise C.2-5 on page 1195.

Solution.

Problem 4 (15 points). Exercise C.2-6 on page 1195.

[Hint: First, try to understand the hint.]

Solution.

Problem 5 (10 points). Consider the set $S = \{1, 2, \dots, n\}$. We generate a subset X of S as follows: a fair coin is flipped independently for each element in S ; if the coin lands on heads, then the element is added to X , and otherwise it is not added. Show that X is equally likely to be any of the 2^n possible subsets.

Solution.

Problem 6 (15 points). Suppose that two sets X and Y are chosen independently and uniformly at random from all the 2^n subsets of $S = \{1, 2, \dots, n\}$. Determine $\Pr[X \subseteq Y]$.

Solution.

Problem 7 (15 points). There may be several different min-cut sets in a graph with n vertices. Show that there can be at most $n(n-1)/2$ distinct min-cut sets. [Hint: The analysis of the min-cut algorithm can help.]

Solution.

Problem 8 (15 points). Consider running the minimum cut algorithm seen in class twice (recall that the algorithm proceeds by repeatedly choosing a random edge to contract). Determine the total number of edge contractions and bound the probability of finding a min-cut.

Solution.

Discussions on piazza are always encouraged, especially to clarify concepts that were introduced in the lecture. However, discussions of homework problems on piazza should not contain spoilers. It is okay to ask for clarifications concerning homework questions if needed.

Checklist:

- Did you add your name?
- Did you disclose all resources that you have used?
(This includes all people, books, websites, etc. that you have consulted)
- Did you sign that you followed the Aggie honor code?
- Did you solve all problems?
- Did you submit (a) your latex source file and (b) the resulting pdf file of your homework?
- Did you submit (c) a hardcopy of the pdf file in class?