Problem Set 8

Due dates: Electronic submission of this homework is due on **4/18/2019 before 12:30pm** on ecampus, a signed paper copy of the pdf file is due on **4/18/2019** 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: _____

Read Chapter 34 in our textbook.

Problem 1. (20 points) A boolean formula is said to be in disjunctive normal form if and only if it is the disjunction of clauses, where each clause is the conjunction of literals (e.g. $(x \wedge \neg y \wedge \neg z) \vee (\neg x \wedge \neg y \wedge z)$ is in disjunctive normal form). Show that there exists a polynomial-time algorithm to determine whether a boolean formula in disjunctive normal form is satisfiable.

Solution.

Problem 2. (20 Point) Dr. S.M. Art Aleck thinks he deserves the Turing award as he gave the following compelling argument that SAT can be solved in polynomial time. Given a boolean formula f in conjuctive normal form, simply convert f to disjunctive normal form and use the poly-time algorithm from the previous problem to determine whether f is satisfiable. Explain why Dr. Aleck is mistaken.

Solution.

Problem 3. (20 points) Consider the language

GRAPH-ISOMORPHISM $= \{(G_1, G_2) : G_1 \text{ and } G_2 \text{ are isomorphic graphs}\}$.

Prove that GRAPH-ISOMORPHISM is in NP by describing a polynomial-time algorithm to verify the language.

Solution.

Problem 4. (20 points) Exercise 34.2-10 on page 1066. [Hint: Read Chapter 34.2 and make sure you understand the definition of co-NP.]

Problem 5. (20 points) Exercise 34.5-5 on page 1101 [Hint: Reduce SUBSET SUM to SET PARTITION.]

Make sure that you write the solutions in your own words!

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 the pdf file resulting from your latex file of your homework?
☐ Did you submit a hardcopy of the pdf file in class?