COS 341, November 12, 1997
Handout Number 15

Homework Set 7

Reading Assignments Read Chapter 12.

Written Assignments Do Exercises 5, 13, 18, 19, 30 and 42 in Chapter 12.6.

Remark In your solution to Exercise 5, be sure to give a rigorous justification of your claim.

Special Problem 1 (counted as 2 exercises) An ancient DNA fragment of a dinosaur has just been found. It is known that this critical fragment σ contains some critical information. If the string $ACGAACT$ appears in $\bar{\sigma}$, then it can fly; if the string $CTCACG$ appears in $\bar{\sigma}$, then it is vegetarian; if the string $TGACCT$ appears in $\bar{\sigma}$, then it is a timid dinosaur.

The fragment has length 17, and you have subjected it to the hybridization procedure with $\ell = 4$. The spectrum S you get consists of the strings $ACGA, AACT, ACTC, ACGT, GACT, CTCA, CGAA, CTGA, TGAC,\ GAAC, GACG, ACTG, CACG, TCAC$. What kind of dinosaurs can you infer? What is G_S? What is G'_S? Find all the σ which has S as its spectrum.

Special Problem 2 (counted as 2 exercises) A *bicycle* graph of *order* n is a graph of the form shown in the figure below, with each *wheel* containing n vertices. The *BICYCLE* problem is: Given as input a pair (n, G), where n is an integer and G is a graph on n^2 or less vertices, decide whether G contains (as subgraph) a bicycle graph of order n.

Question: Prove that the Hamiltonian cycle problem is polynomial-time reducible to the BICYCLE problem.