Study Guide- Algorithmic Game Theory

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Problem 1) Consider the following instance of the House Allocation Problem:

- Player 1: h_3, h_2, h_1, h_4, h_5
- Player 2: h_4, h_1, h_5, h_3, h_2.
- Player 3: h_1, h_5, h_2, h_4, h_3
- Player 4: h_4, h_3, h_1, h_2, h_5.
- Player 5: h_1, h_4, h_3, h_2, h_5

Allocate the houses using the Top-Trading Cycle Procedure. **Clearly indicate the allocations made at each iteration.**

Problem 2) Consider the following instance of the House Allocation Problem:

- Player 1: h_5, h_4, h_3, h_2, h_1
- Player 2: h_1, h_5, h_4, h_3, h_2.
- Player 3: h_2, h_1, h_5, h_4, h_3
- Player 4: h_3, h_2, h_1, h_5, h_4.
- Player 5: h_4, h_3, h_2, h_1, h_5

Allocate the houses using the Top-Trading Cycle Procedure. **Clearly indicate the allocations made at each iteration.**

Problem 3) Consider the following instance of the Stable Marriage Problem. [**Note:** On the Exam, a correct answer with no work will receive full credit. An incorrect answer with some correct work will receive partial credit. One way to show work is to clearly indicate any matchings made at a given iteration, and then to cross out the pairing if the couple breaks up.]

Firms				Workers			
F_1	F_2	F_3	F_4	W_1	W_2	W_3	W_4
W_3	W_1	W_1	W_3	F_1	F_1	F_3	F_4
W_1	W_3	W_3	W_1	F_3	F_4	F_1	F_1
	W_4		W_4		F_2	F_4	F_3
	W_2		W_2		F_3		

(a) What is the stable matching produced by the Gale-Shapley algorithm, when the Firms propose?

(b) What is the stable matching produced by the Gale-Shapley algorithm, when the Workers propose?