CS 4730 Algorithmic Game Theory

Homework #2

Student: Barak Barclay

Answers to homework problems:

1. Left Preference Structure:
   (A, C) and (B, D) Here, C would rather be with D and vice versa.
   1 2 3 3
   (A, B) and (C, D) Here, A would rather be with D and vice versa.
   3 2 1 2
   (A, D) and (B, C) Here, A would rather be with C and vice versa.
   2 1 1 3
   No stable matching system exists.

   Right Preference Structure:
   (A, D) and (B, C) Here, neither B or C want to switch.
   2 2 1 1
   There is a stable division into pairs.

2. (a) Giving women capital letter and men lowercase:
   1st Proposal:

a1	b1	c1	d1
|	|	|	|
A3		B4	D4

   2nd Proposal:

a1	b2	c1	d1
|	|	|	|
A3	D2	B4	

   3rd Proposal:

a1	b2	c1	d2
|	|	|	|
A3	D2		B2

   3rd Proposal:

a1	b2	c2	d2
|	|	|	|
	D2	A2	B2

   4th and Final Proposal:

a3	b2	c2	d2
|	|	|	|
C2	D2	A2	B2

Bob would only rather have Ann, Ann would only rather have Dan, Dan would only rather have Dot, Dot would only rather have Cal, Cal would only rather have Beth, Beth would only rather have Bob, Bob would only rather have Ann, and Ann would only rather have Dan. Since this goes full cycle including everyone besides Al, this proposal is stable.

(b) Giving women capital letter and men lowercase:

1st Proposal:

A1	B1	C1	D1
|	|	|	|
	b4	d3	c4

2nd Proposal:

A2	B1	C1	D1
|	|	|	|
C2	b4	d3	

3rd Proposal:

A2	B1	C1	D2
|	|	|	|
C2		d3	b2

4th Proposal:

A2	B2	C1	D2
|	|	|	|
C2	d2		b2

5th and Final Proposal:

A2	B2	C2	D2
|	|	|	|
C2	d2	a3	b2

This is the same matchup as the men proposing, so this proposal is stable.

3. Men proposing:

1st Proposal:

a1	b1	c1	d1	e1
|	|	|	|	|
		B1	A2	C2

2nd Proposal:

a2	b2	c1	d1	e1
|	|	|	|	|
	C4	B1	A2	C2

3rd and Final Proposal:

a3	b2	c1	d1	e1
|	|	|	|	|
E5	C4	B1	A2	C2

Women proposing:

1st Proposal:

A1	B1	C1	D1	E1
|	|	|	|	|
	c1	d3		

2nd Proposal:

A2	B1	C1	D2	E2
|	|	|	|	|
d1	c1		e3	

3rd Proposal:

A2	B1	C2	D2	E3
|	|	|	|	|
d1	c1	e1		b3

4th and Final Proposal:

A2	B1	C2	D4	E3
|	|	|	|	|
d1	c1	e1	a4	b3

Both the men and women proposing give different stable matchings, so <u>there is not a unique stable matching</u>.

4.

(a) Women proposing:

1st Proposal:

A1	B1	C1	D1	E1
|	|	|	|	|
	a1	b2		c5

2nd and Final Proposal:

A2	B1	C1	D2	E1
|	|	|	|	|
	a1	b2	c2	

(b) <u>A and E do not have mates</u>.

Men proposing:

1st Proposal:

a1	b1	c1
|	|	|
B1		

2nd Proposal:

a1	b2	c2
|	|	|
B1	C1	D2

The men proposing gives the same stable matching as the women proposing, so <u>there is no other stable matching</u>.