Given Preferences Lists are:
Men:

	I	II	III	IV	V
Victor	A	B	C	D	E
Wyatt	B	C	D	A	E
Xavier	C	D	A	B	E
Yancey	D	A	B	C	E
Zeus	A	B	C	D	E

Women:

	I	II	III	IV	V
Amy	W	X	Y	Z	V
Bertha	X	Y	Z	V	W
Clare	Y	Z	V	W	X
Diane	Z	V	W	X	Y
Erika	V	W	X	Y	Z

GS Algorithm is:
Initialize each person to be free.
while (some man is free and hasn't proposed to every woman) {
    Choose such a man m
    w = 1st woman on m's list to whom m has not yet proposed
    if (w is free)
        assign m and w to be engaged
    else if (w prefers m to her fiancé m')
        assign m and w to be engaged and m' to be free
    else
        w rejects m
}

Algorithm Tracing:

numberOfProposals: 0
Pairs Made: []
Free Men: [V, W, X Y, Z]
Yet to Propose List of Men in Order of Preference:
    {
        V: [A, B, C, D, E],
        W: [B, C, D, A, E],
        X: [C, D, A, B, E],
        Y: [D, A, B, C, E],
        Z: [A, B, C, D, E]
    }

Step-I:

Choose a Man m who is free and hasn't proposed to every woman
m = V
w = 1st woman on m's list to whom m has not yet proposed
w = A

V proposes A, A is free. So, V and A are paired.
Increase numberOfProposals by 1.
Remove V from Free Men List and A from yet to propose list of V.
Output after Step-I:
numberOfProposals: 1
Pairs Made: [V: A]
Free Men: [W, X, Y, Z]
Yet to Propose List of Men in Order of Preference:

{
V: [B, C, D, E],
W: [B, C, D, A, E],
X: [C, D, A, B, E],
Y: [D, A, B, C, E],
Z: [A, B, C, D, E]
}

Step-II:

Choose a Man m who is free and hasn't proposed to every woman
m = W
w = 1st woman on m's list to whom m has not yet proposed
w = B

W proposes B, B is free. So, W and B are paired.
Increase numberOfProposals by 1.
Remove W from Free Men List and B from yet to propose list of W.
Output after Step-II:
numberOfProposals: 2
Pairs Made: [V: A, W: B]
Free Men: [X, Y, Z]
Yet to Propose List of Men in Order of Preference:

{
V: [B, C, D, E],
W: [C, D, A, E],
X: [C, D, A, B, E],
Y: [D, A, B, C, E],
Z: [A, B, C, D, E]
}

Step-III:

Choose a Man m who is free and hasn't proposed to every woman
m = X
w = 1st woman on m's list to whom m has not yet proposed
w = C

X proposes C, C is free. So, X and C are paired.
Increase numberOfProposals by 1.
Remove X from Free Men List and C from yet to propose list of X.
Output after Step-III:
numberOfProposals: 3
Pairs Made: [V: A, W: B, X: C]
Free Men: [Y, Z]
Yet to Propose List of Men in Order of Preference:

{
V: [B, C, D, E],
W: [C, D, A, E],
X: [D, A, B, E],
Y: [D, A, B, C, E],
Z: [A, B, C, D, E]
}

Step-IV:

Choose a Man m who is free and hasn't proposed to every woman
m = Y
w = 1st woman on m's list to whom m has not yet proposed
w = D

Y proposes D, D is free. So, Y and D are paired.
Increase numberOfProposals by 1.
Remove Y from Free Men List and D from yet to propose list of Y.
Output after Step-IV:
numberOfProposals: 4
Pairs Made: [V: A, W: B, X: C, Y: D]
Free Men: [Z]
Yet to Propose List of Men in Order of Preference:

{
V: [B, C, D, E],
W: [C, D, A, E],
X: [D, A, B, E],
Y: [A, B, C, E],
Z: [A, B, C, D, E]
}

Step-V:

Choose a Man m who is free and hasn't proposed to every woman
m = Z
w = 1st woman on m's list to whom m has not yet proposed
w = A

Z proposes A. A is paired with V but she prefers Z over V.
Increase numberOfProposals by 1.
A trades up from V to Z.
Remove Z from Free Men List and A from yet to propose list of Z. Add V to Free Men List
Output after Step-V:
numberOfProposals: 5
Pairs Made: [W: B, X: C, Y: D, Z: A]

Free Men: [V]
Yet to Propose List of Men in Order of Preference:
{
V: [B, C, D, E],
W: [C, D, A, E],
X: [D, A, B, E],
Y: [A, B, C, E],
Z: [B, C, D, E]
}

Step-VI:
Choose a Man m who is free and hasn't proposed to every woman
m = V
w = 1st woman on m's list to whom m has not yet proposed
w = B

V proposes B. B is paired with W but prefers V over W.
Increase numberOfProposals by 1.
B trades up from W to V
Remove V from Free Men List and B from yet to propose list of V. Add W to Free Men List
Output after Step-VI:
numberOfProposals: 6
Pairs Made: [X: C, Y: D, Z: A, V: B]
Free Men: [W]
Yet to Propose List of Men in Order of Preference:
{
V: [C, D, E],
W: [C, D, A, E],
X: [D, A, B, E],
Y: [A, B, C, E],
Z: [B, C, D, E]
}

Step-VII:
Choose a Man m who is free and hasn't proposed to every woman
m = W
w = 1st woman on m's list to whom m has not yet proposed
w = C

W proposes C. C is paired with X but prefers W over X.
Increase numberOfProposals by 1.
C trades up from X to W
Remove W from Free Men List and C from yet to propose list of W. Add X to Free Men List
Output after Step-VII:
numberOfProposals: 7
Pairs Made: [Y: D, Z: A, V: B, W: C]
Free Men: [X]
Yet to Propose List of Men in Order of Preference:
{
V: [C, D, E],
W: [D, A, E],

X: [D, A, B, E],
Y: [A, B, C, E],
Z: [B, C, D, E]
}

Step-VIII:

Choose a Man m who is free and hasn't proposed to every woman
m = X
w = 1st woman on m's list to whom m has not yet proposed
w = D

X proposes D. D is paired with Y but prefers X over Y.
Increase numberOfProposals by 1.
D trades up from Y to X
Remove X from Free Men List and D from yet to propose list of X. Add Y to Free Men List
Output after Step-VIII:
numberOfProposals: 8
Pairs Made: [Z: A, V: B, W: C, X: D]
Free Men: [Y]
Yet to Propose List of Men in Order of Preference:
{
V: [C, D, E],
W: [D, A, E],
X: [A, B, E],
Y: [A, B, C, E],
Z: [B, C, D, E]
}

Step-IX:

Choose a Man m who is free and hasn't proposed to every woman
m = Y
w = 1st woman on m's list to whom m has not yet proposed
w = A

Y proposes A. A is paired with Z but prefers Y over Z.
Increase numberOfProposals by 1.
A trades up from Z to Y
Remove Y from Free Men List and A from yet to propose list of Y. Add Z to Free Men List
Output after Step-IX:
numberOfProposals: 9
Pairs Made: [V: B, W: C, X: D, Y: A]
Free Men: [Z]
Yet to Propose List of Men in Order of Preference:
{
V: [C, D, E],
W: [D, A, E],
X: [A, B, E],
Y: [B, C, E],
Z: [B, C, D, E]
}

Step-X:

Choose a Man m who is free and hasn't proposed to every woman
m = Z
w = 1st woman on m's list to whom m has not yet proposed
w = B

Z proposes B. B is paired with V but prefers Z over V.
Increase numberOfProposals by 1.
B trades up from V to Z
Remove Z from Free Men List and B from yet to propose list of Z. Add V to Free Men List
Output after Step-X:
numberOfProposals: 10
Pairs Made: [W: C, X: D, Y: A, Z: B]
Free Men: [V]
Yet to Propose List of Men in Order of Preference:

{
V: [C, D, E],
W: [D, A, E],
X: [A, B, E],
Y: [B, C, E],
Z: [C, D, E]
}

Step-XI:

Choose a Man m who is free and hasn't proposed to every woman
m = V
w = 1st woman on m's list to whom m has not yet proposed
w = C

V proposes C. C is paired with W but prefers V over W.
Increase numberOfProposals by 1.
C trades up from W to V
Remove V from Free Men List and C from yet to propose list of V. Add W to Free Men List
Output after Step-XI:
numberOfProposals: 11
Pairs Made: [X: D, Y: A, Z: B, V: C]
Free Men: [W]
Yet to Propose List of Men in Order of Preference:

{
V: [D, E],
W: [D, A, E],
X: [A, B, E],
Y: [B, C, E],
Z: [C, D, E]
}

Step-XII:

Choose a Man m who is free and hasn't proposed to every woman
m = W
w = 1st woman on m's list to whom m has not yet proposed

w = D

W proposes D. D is paired with X but prefers W over X.
Increase numberOfProposals by 1.
D trades up from X to W
Remove W from Free Men List and D from yet to propose list of V. Add X to Free Men List
Output after Step-XII:
numberOfProposals: 12
Pairs Made: [Y: A, Z: B, V: C, W: D]
Free Men: [X]
Yet to Propose List of Men in Order of Preference:

```
{
        V: [D, E],
        W: [A, E],
        X: [A, B, E],
        Y: [B, C, E],
        Z: [C, D, E]
}
```

Step-XIII:

Choose a Man m who is free and hasn't proposed to every woman
m = X
w = 1st woman on m's list to whom m has not yet proposed
w = A

X proposes A. A is paired with Y but prefers X over Y.
Increase numberOfProposals by 1.
A trades up from Y to X
Remove X from Free Men List and A from yet to propose list of X. Add Y to Free Men List
Output after Step-XIII:
numberOfProposals: 13
Pairs Made: [Z: B, V: C, W: D, X: A]
Free Men: [Y]
Yet to Propose List of Men in Order of Preference:

```
{
        V: [D, E],
        W: [A, E],
        X: [B, E],
        Y: [B, C, E],
        Z: [C, D, E]
}
```

Step-XIV:

Choose a Man m who is free and hasn't proposed to every woman
m = Y
w = 1st woman on m's list to whom m has not yet proposed
w = B

Y proposes B. B is paired with Z but prefers Y over Z.
Increase numberOfProposals by 1.
B trades up from Z to Y

Remove Y from Free Men List and B from yet to propose list of Y. Add Z to Free Men List
Output after Step-XIV:
numberOfProposals: 14
Pairs Made: [V: C, W: D, X: A, Y: B]
Free Men: [Z]
Yet to Propose List of Men in Order of Preference:
{
V: [D, E],
W: [A, E],
X: [B, E],
Y: [C, E],
Z: [C, D, E]
}

Step-XV:
Choose a Man m who is free and hasn't proposed to every woman
m = Z
w = 1st woman on m's list to whom m has not yet proposed
w = C

Z proposes C. C is paired with V but prefers Z over V.
Increase numberOfProposals by 1.
C trades up from V to Z
Remove Z from Free Men List and C from yet to propose list of Z. Add V to Free Men List
Output after Step-XV:
numberOfProposals: 15
Pairs Made: [W: D, X: A, Y: B, Z: C]
Free Men: [V]
Yet to Propose List of Men in Order of Preference:
{
V: [D, E],
W: [A, E],
X: [B, E],
Y: [C, E],
Z: [D, E]
}

Step-XVI:
Choose a Man m who is free and hasn't proposed to every woman
m = V
w = 1st woman on m's list to whom m has not yet proposed
w = D

V proposes D. D is paired with W but prefers V over W.
Increase numberOfProposals by 1.
D trades up from W to V
Remove V from Free Men List and D from yet to propose list of V. Add W to Free Men List
Output after Step-XVI:
numberOfProposals: 16
Pairs Made: [X: A, Y: B, Z: C, V: D]
Free Men: [W]

Yet to Propose List of Men in Order of Preference:

{

V: [E],
W: [A, E],
X: [B, E],
Y: [C, E],
Z: [D, E]

}

Step-XVII:

Choose a Man m who is free and hasn't proposed to every woman
m = W
w = 1st woman on m's list to whom m has not yet proposed
w = A

W proposes A. A is paired with X but prefers W over X.
Increase numberOfProposals by 1.
A trades up from X to W
Remove W from Free Men List and A from yet to propose list of W. Add X to Free Men List
Output after Step-XVII:
numberOfProposals: 17
Pairs Made: [Y: B, Z: C, V: D, W: A]
Free Men: [X]
Yet to Propose List of Men in Order of Preference:

{

V: [E],
W: [E],
X: [B, E],
Y: [C, E],
Z: [D, E]

}

Step-XVIII:

Choose a Man m who is free and hasn't proposed to every woman
m = X
w = 1st woman on m's list to whom m has not yet proposed
w = B

X proposes B. B is paired with Y but prefers X over Y.
Increase numberOfProposals by 1.
B trades up from Y to X
Remove X from Free Men List and B from yet to propose list of X. Add Y to Free Men List
Output after Step-XVIII:
numberOfProposals: 18
Pairs Made: [Z: C, V: D, W: A, X: B]
Free Men: [Y]
Yet to Propose List of Men in Order of Preference:

{

V: [E],
W: [E],
X: [E],

Y: [C, E],
Z: [D, E]
}

Step-XIX:

Choose a Man m who is free and hasn't proposed to every woman
m = Y
w = 1st woman on m's list to whom m has not yet proposed
w = C

Y proposes C. C is paired with Z but prefers Y over Z.
Increase numberOfProposals by 1.
C trades up from Z to Y
Remove Y from Free Men List and C from yet to propose list of Y. Add Z to Free Men List
Output after Step-XIX:
numberOfProposals: 19
Pairs Made: [V: D, W: A, X: B, Y: C]
Free Men: [Z]
Yet to Propose List of Men in Order of Preference:
{
V: [E],
W: [E],
X: [E],
Y: [E],
Z: [D, E]
}

Step-XX:

Choose a Man m who is free and hasn't proposed to every woman
m = Z
w = 1st woman on m's list to whom m has not yet proposed
w = D

Z proposes D. D is paired with V but prefers Z over V.
Increase numberOfProposals by 1.
D trades up from V to Z
Remove Z from Free Men List and D from yet to propose list of Z. Add V to Free Men List
Output after Step-XX:
numberOfProposals: 20
Pairs Made: [W: A, X: B, Y: C, Z: D]
Free Men: [V]
Yet to Propose List of Men in Order of Preference:
{
V: [E],
W: [E],
X: [E],
Y: [E],
Z: [E]
}

Step-XXI:

Choose a Man m who is free and hasn't proposed to every woman
m = V
w = 1st woman on m's list to whom m has not yet proposed
w = E

V proposes E. E is free. So, V & E are paired.
Increase numberOfProposals by 1.
Remove V from Free Men List and E from yet to propose list of V.
Output after Step-XXI:
numberOfProposals: 21
Pairs Made: [W: A, X: B, Y: C, Z: D, V: E]
Free Men: []
Yet to Propose List of Men in Order of Preference:
{
V: [],
W: [E],
X: [E],
Y: [E],
Z: [E]
}

Algorithm ends because free men list is empty.
The Stable Matching pairs formed by GS Algorithm are [W: A, X: B, Y: C, Z: D, V: E]
The Number of proposal occurred are 21

Algorithm Analysis:

Step	Cost	Number of times it runs
Initialize each person to be free.	C1	1
while(some man is free and hasn't proposed to every woman)	C2	n * (n - 1)
Choose such a man m	C3	n * (n - 1)
w = 1st woman on m's list to whom m has not yet proposed	C4	n * (n - 1)
if (w is free) assign m and w to be engaged	C5	n * (n - 1)
else if (w prefers m to her fiancé m') assign m and w to be engaged and m' to be free	C6	n * (n - 1)
else w rejects m	C7	n * (n - 1)

f(n) = (C2 + C3 + C4 + C5 + C6 + C7) * n^2 - (C2 + C3 + C4 + C5 + C6 + C7) * n + C1

Let g(n) = 3 * (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2
= (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 + (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 + (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2

We can clearly say that

1) (C2 + C3 + C4 + C5 + C6 + C7) * n^2 <= (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 for all n >= 1 since right hand side has C1 which is always >= 1
2) - (C2 + C3 + C4 + C5 + C6 + C7) * n <= (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 for all n >= 1 since left hand side is a negative value whereas right hand side is a positive value
3) C1 <= (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 for all n >= 1 since left hand side is a constant and right hand side varies with n which is >= 1.

If we add all the above 3, the invariant won't change. So,
(C2 + C3 + C4 + C5 + C6 + C7) * n^2 - (C2 + C3 + C4 + C5 + C6 + C7) * n + C1 <= (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 + (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 + (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2
== f(n) <= 3 * (C1 + C2 + C3 + C4 + C5 + C6 + C7) * n^2 for all n >= 1
According to Upper Bound Definition, f(n) = O(g(n)) if there exists a positive constants C, n0 where f(n) <= C * g(n) for all n >= n0
Therefore, f(n) = O(n^2) where C = 3 * (C1 + C2 + C3 + C4 + C5 + C6 + C7) and n0 = 1