

(The Stable Marriage Problem . SMP)

”



”

(matching algorithm)

- (, internet sites)
- ()
- (internet - load balancing)

(Matching Problem)

“

“

“

:

“

(matching):

. G , V, , E

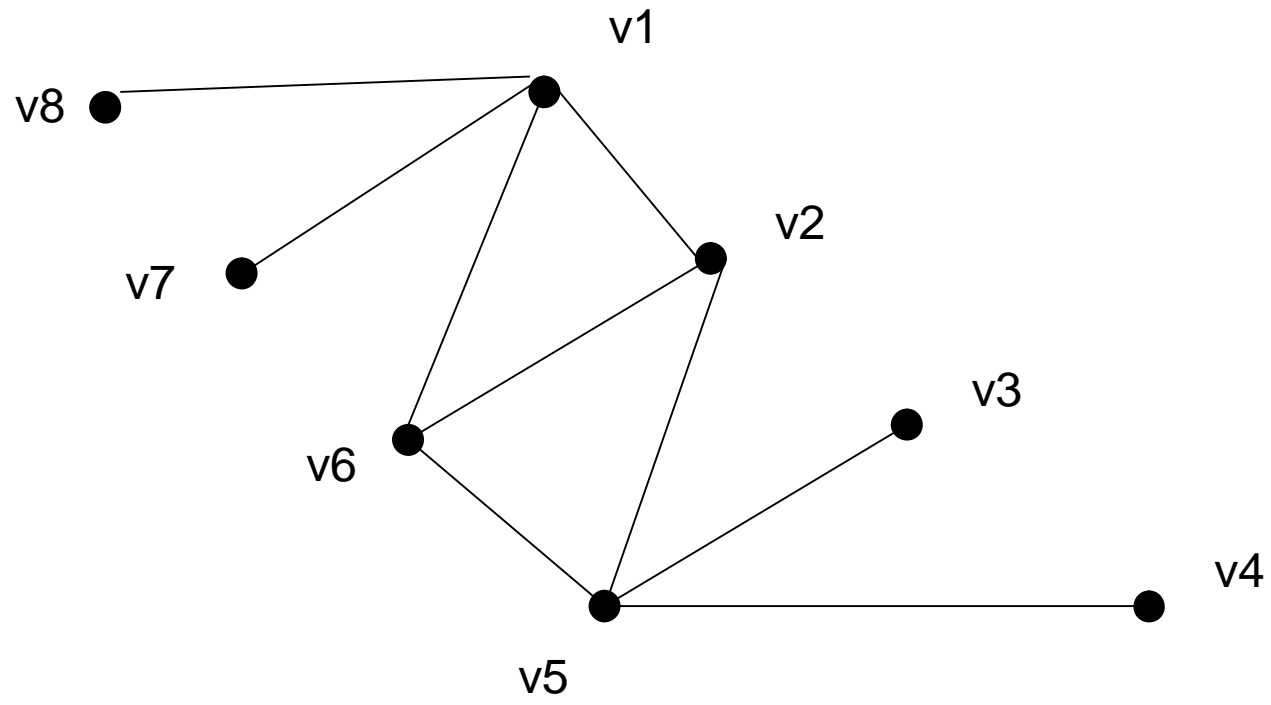
. (matching):

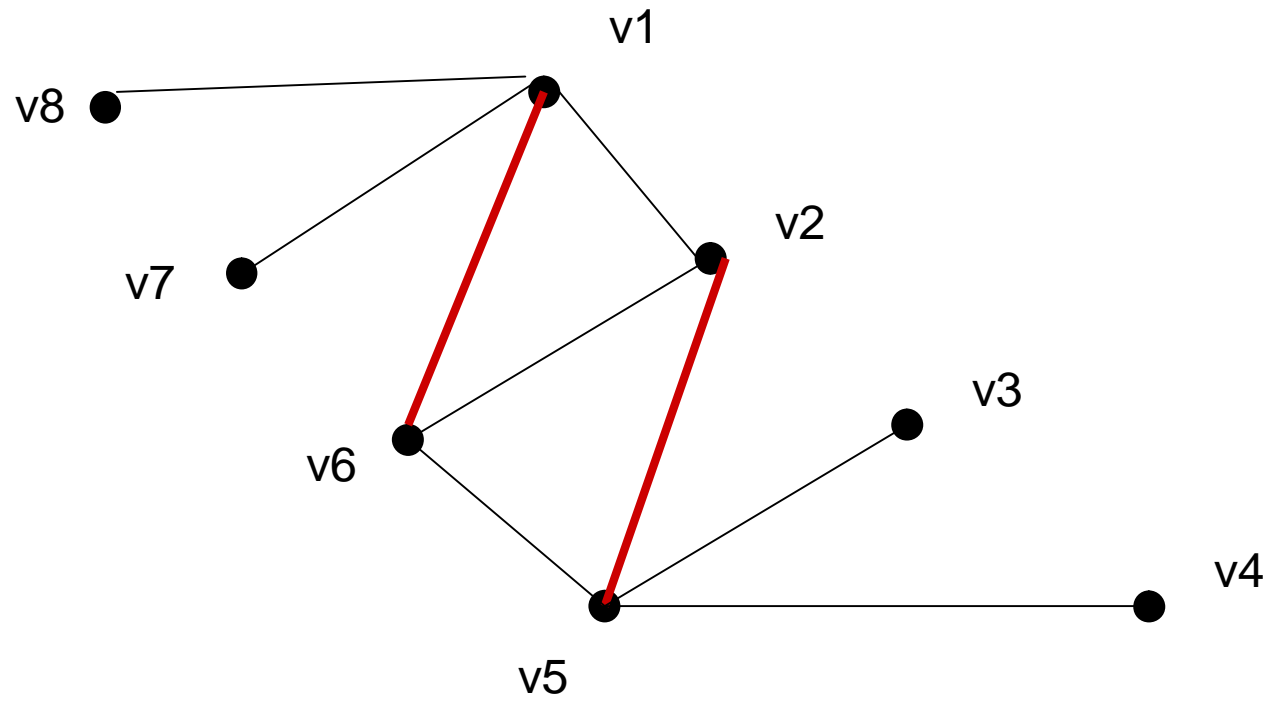
\Leftrightarrow

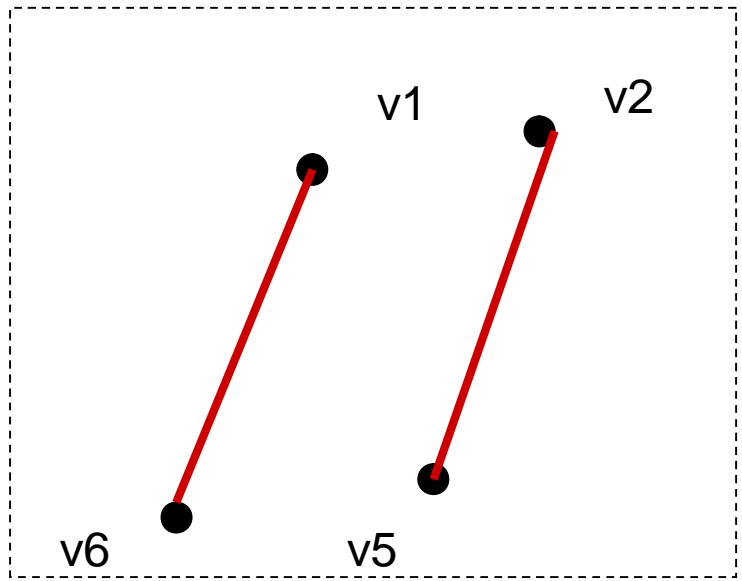
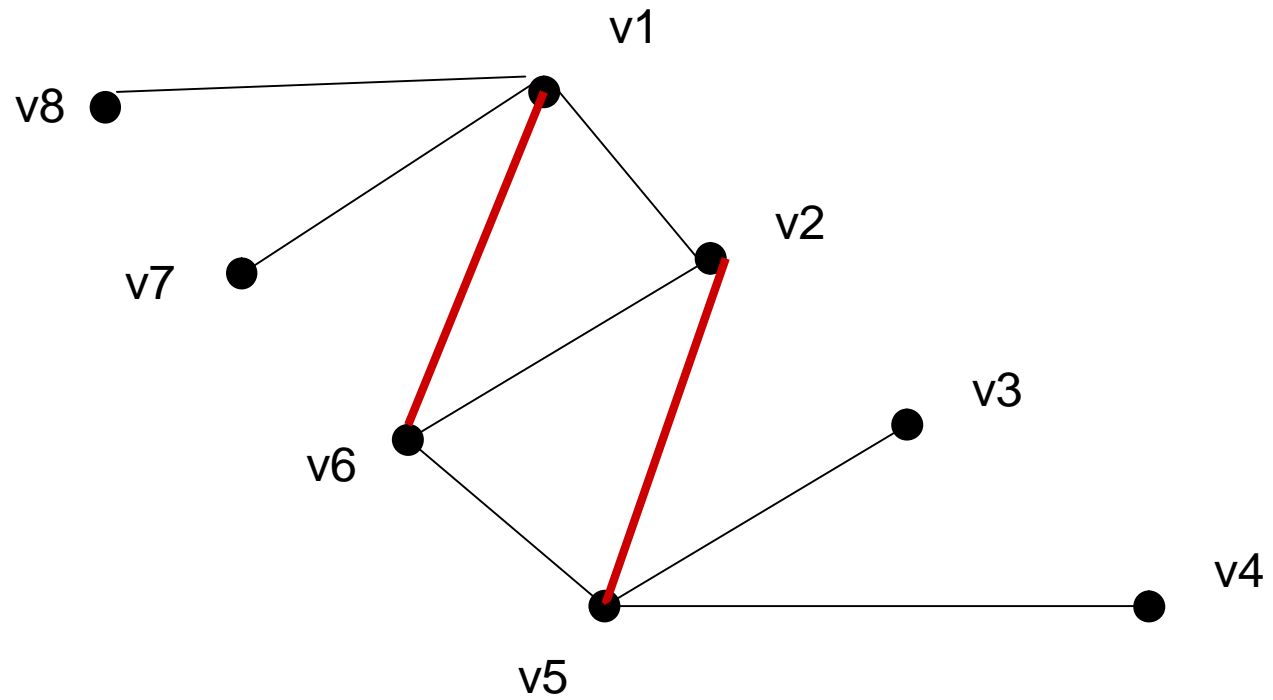
G

1

. \Rightarrow



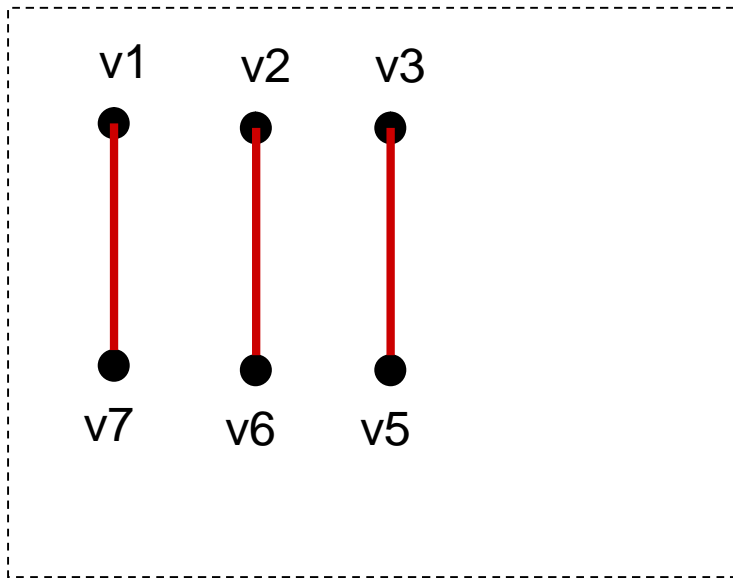
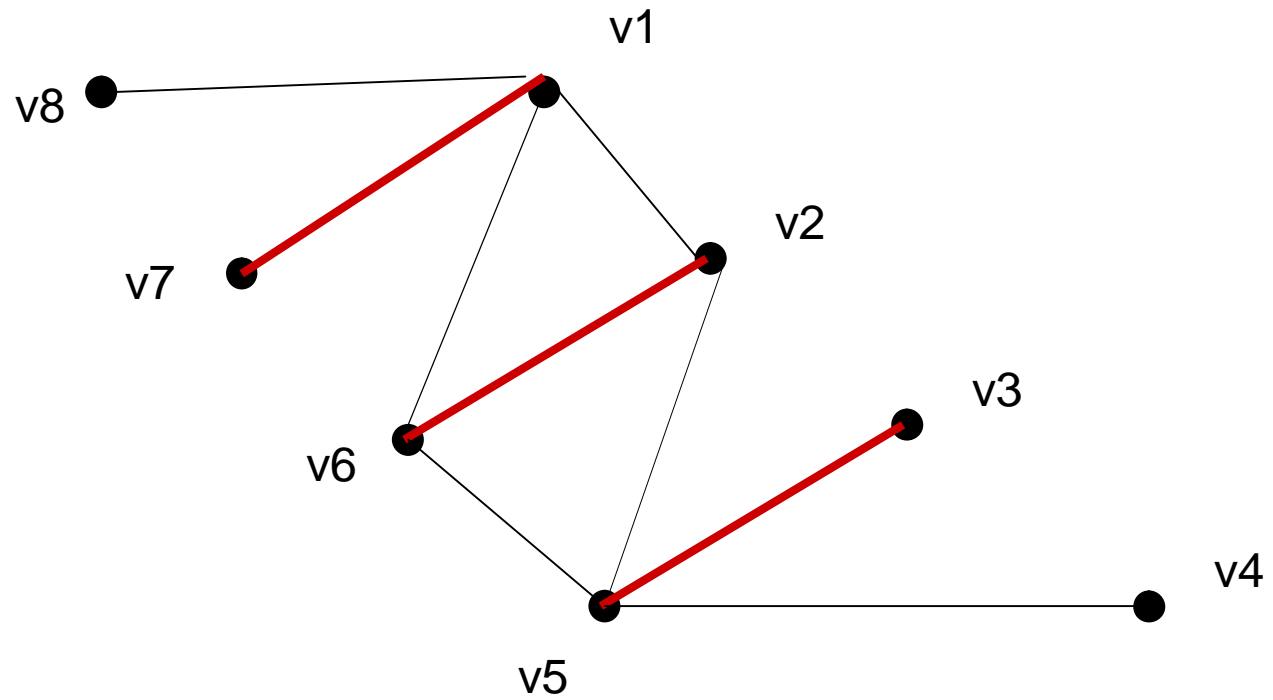




$\Leftrightarrow 2$

2

∴

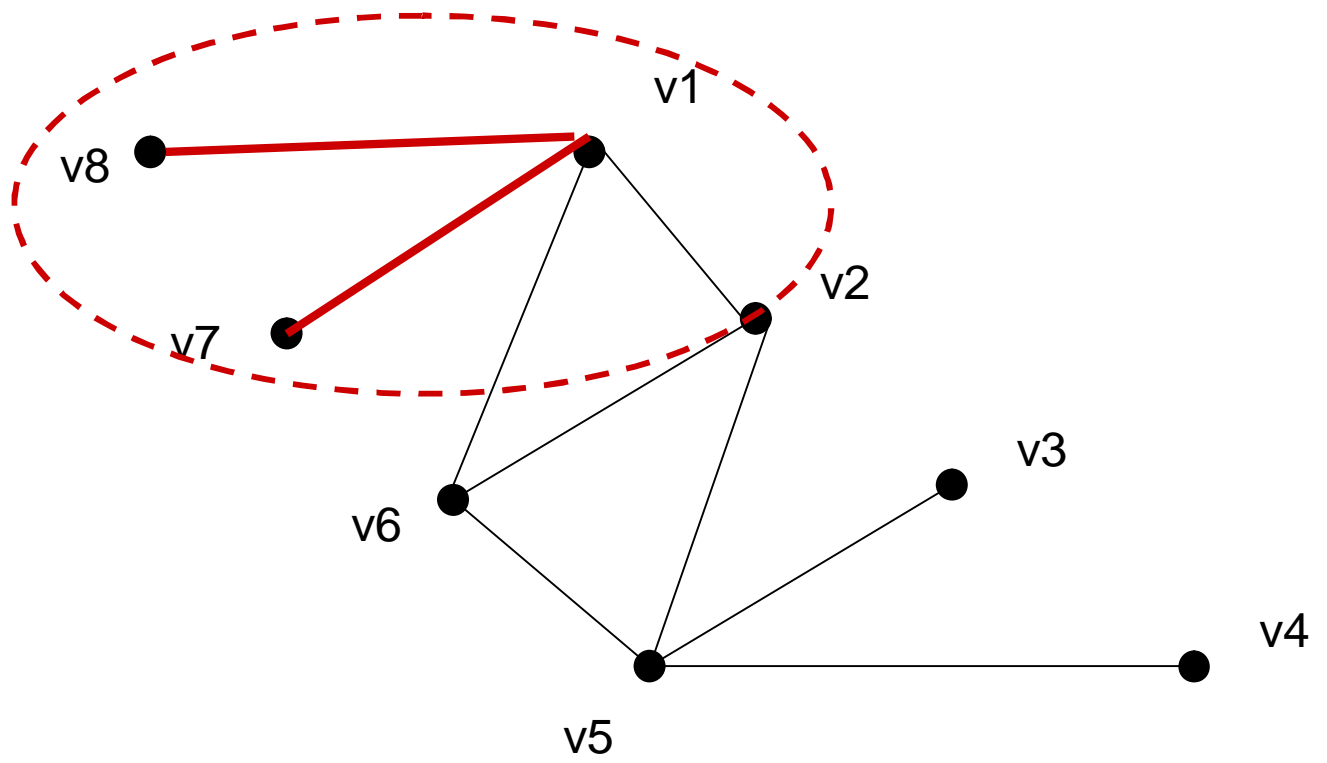


$\Leftrightarrow 3$

\Leftrightarrow

3

4 (4) ; ; ;



3

45

!

(perfect matching)

”

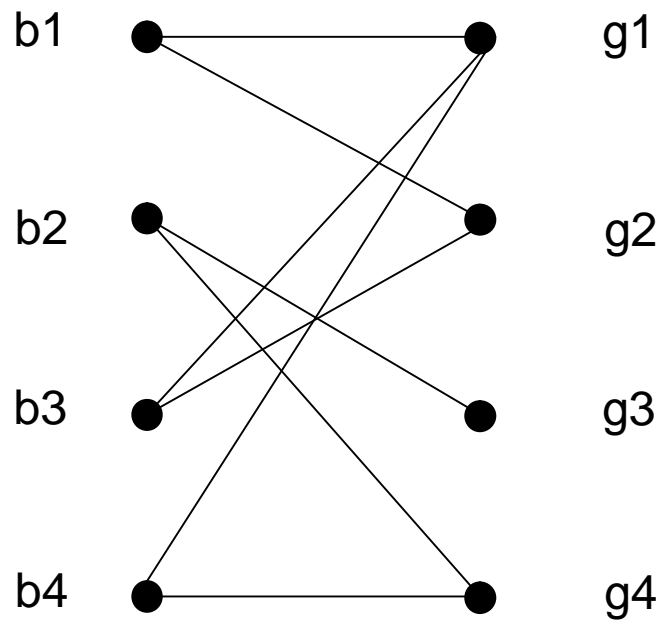
(perfect matching)

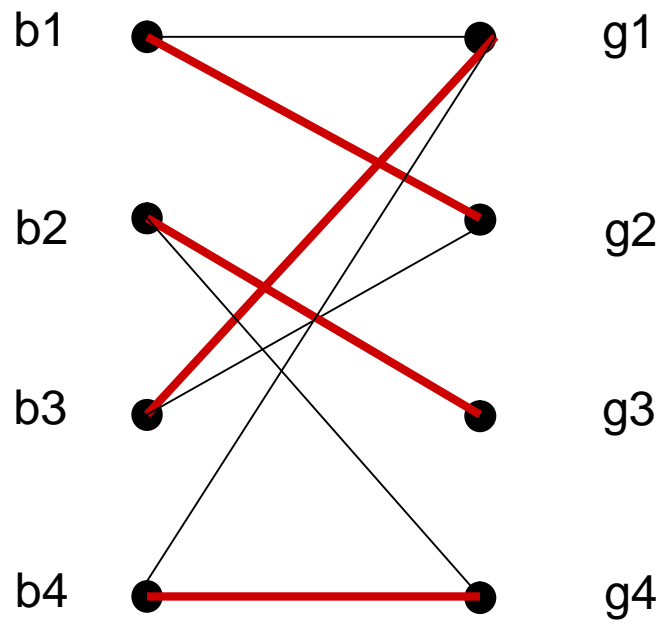
”

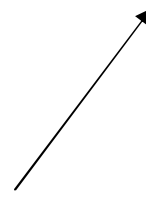
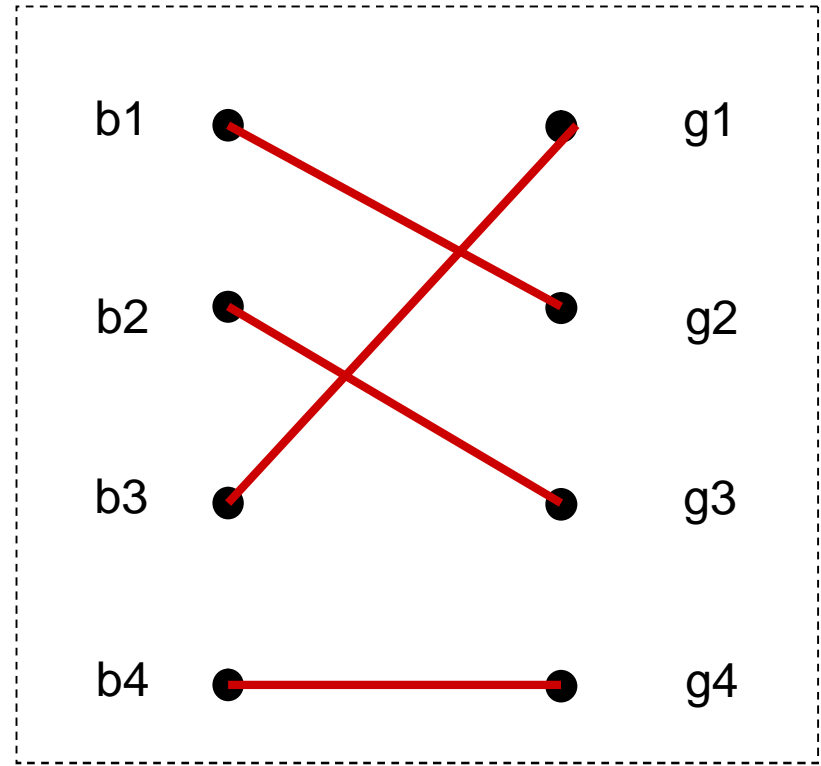
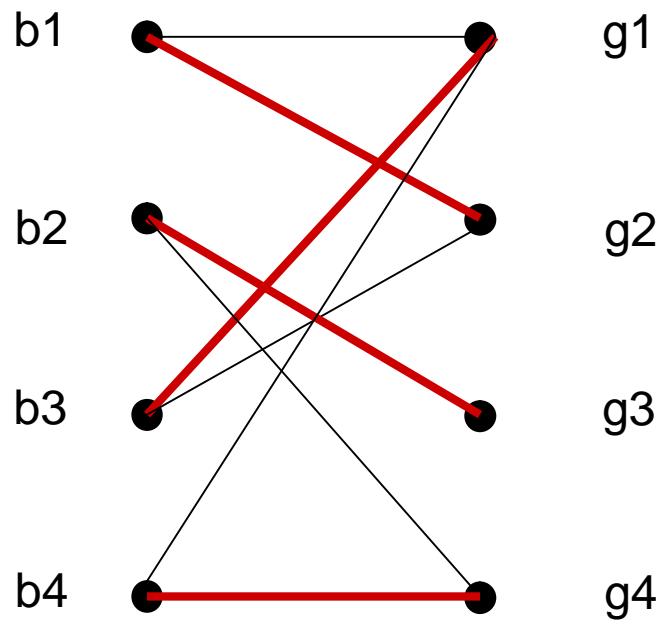
” \Leftrightarrow

”

$|V|/2 \Rightarrow$







!!

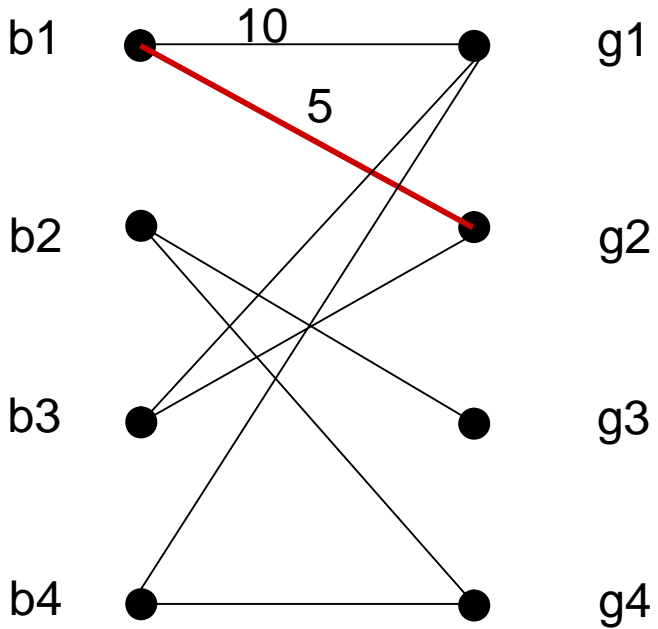
()

“

,

“ ⇒

“ ⇒



⇔

()

“

,

“

⇒

“

⇒

“

:

“

, :

M

”

·

,

·

,

0

“

:

”

G

, G,

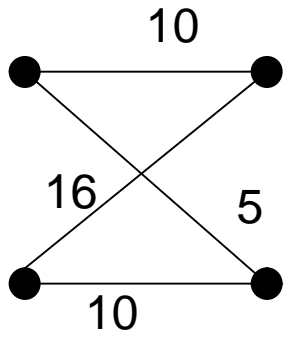
“

”

:

, G,

G



;

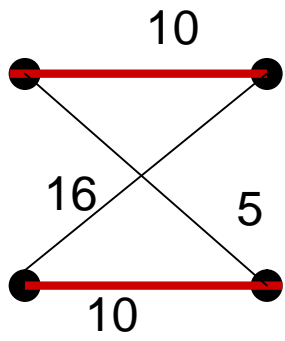
“

”

:

, G,

G



20

;

\tilde{O} ;

“

.

“

“

2

“

(NP-complete)

“

”

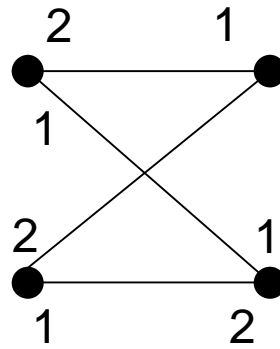
,

.

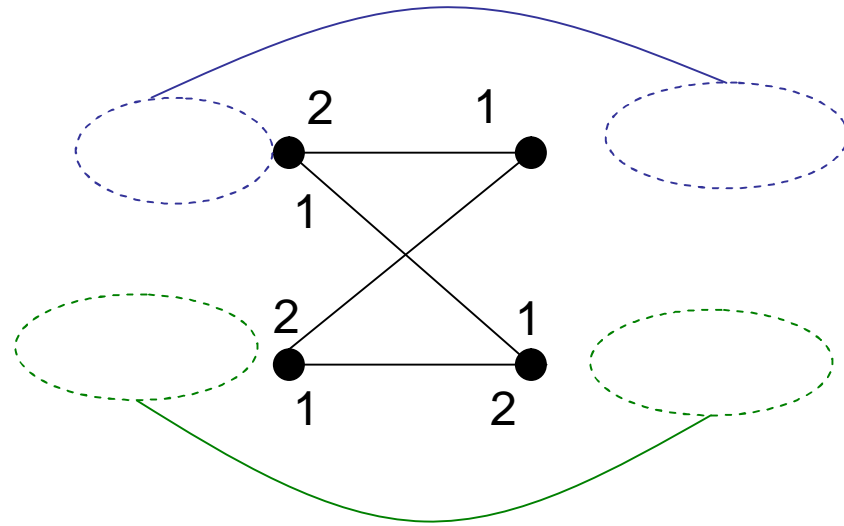
.

.

q

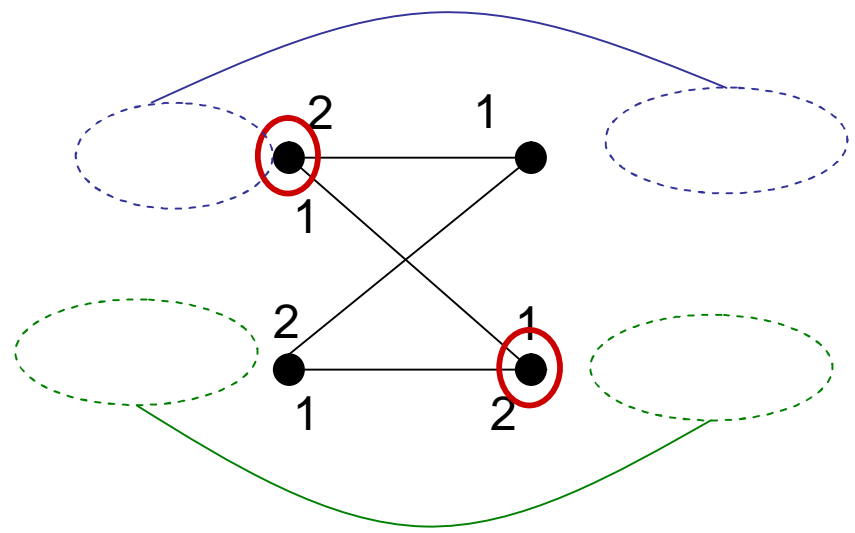


;



;

$\tilde{0}$



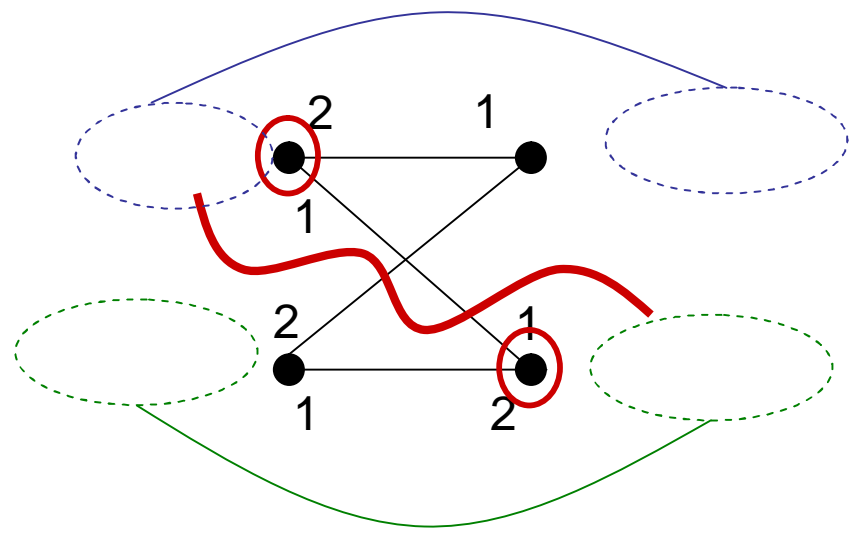
;

$\tilde{0}$

\Rightarrow

«

» (rogue couple)



«

»

(rogue couples)

”

couple) y,

(matching) «

x » (rogue

”

«

»

”

.
⇒
«

»

(stable)

«

»

(rogue couples)

“

.

«

»

”

:

.

;

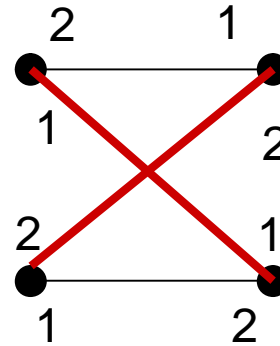
.

“

:

”

!



▪
;

“

;

“

,

;

“

○

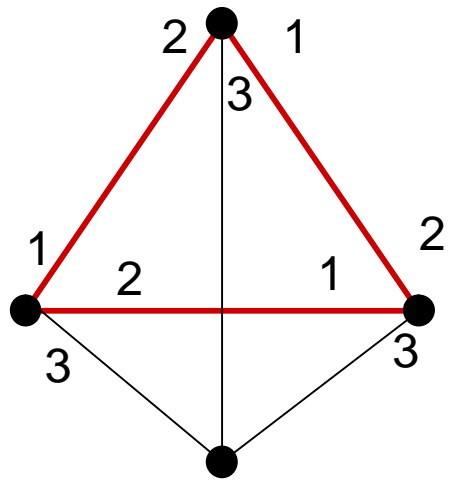
▪ ▪ ▪,

“

«

»

▪



“

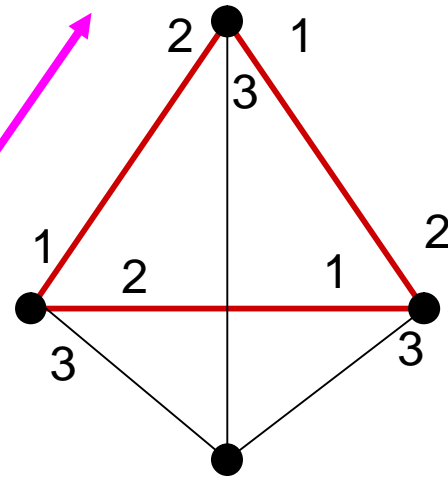
“ ()

· ,
· « »
· ,

“ $W \log ()$

· \Rightarrow ,
“ «
“ \Rightarrow !!

»;



▪
;

“

;

“

,

;

“

○

▪ ▪ ▪,

“

«

»

▪

(The Stable Marriage Problem . SMP)

“ N N
.
“ . ,
.
“
“
“
“
“ :
« »

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

::

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

:

(greedy algorithm)

(The Stable Marriage Problem . SMP)

1: **C**, B, E, A, D

2: **A**, B, E, C, D

3: **D**, C, B, A, E

4: ~~A, C, D~~, **B**, E

5: ~~A, B, D~~, **E**, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

:

(greedy algorithm)

(The Stable Marriage Problem . SMP)

1: **C**, B, E, A, D

2: **A**, B, E, C, D

3: **D**, C, B, A, E

4: ~~A, C, D~~, **B**, E

5: ~~A, B, D~~, **E**, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

:

(greedy algorithm)

(The Stable Marriage Problem . SMP)

1: **C**, B, E, A, D

2: **A**, B, E, C, D

3: **D**, C, B, A, E

4: ~~A, C, D~~, **B**, E

5: ~~A, B, D~~, **E**, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5



:

(greedy algorithm)

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

A: 3, 5, 2, 1, 4

2: A, B, E, C, D

B: 5, 2, 1, 4, 3

3: D, C, B, A, E

C: 4, 3, 5, 1, 2

4: A, C, D, B, E

D: 1, 2, 3, 4, 5

5: A, B, D, E, C

E: 2, 3, 4, 1, 5

:

3

:

“

“

“

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

:

3

:

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

:

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

:

3

:

”

1

,

«

,

»

«

»

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

:

3

:

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

”

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

5: A, B, D, E, C

A: 3, 5, 2, 1, 4

B: 5, 2, 1, 4, 3

C: 4, 3, 5, 1, 2

D: 1, 2, 3, 4, 5

E: 2, 3, 4, 1, 5

1
« , »!

:

:

2

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D	2,4,5	A: 3, 5, 2, 1, 4
2: A, B, E, C, D	--	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1	C: 4, 3, 5, 1, 2
4: A, C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D	2,4, 5	A: 3, 5, 2, 1, 4
2: A, B, E, C, D	--	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1	C: 4, 3, 5, 1, 2
4: A, C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D	2,4, 5	A: 3, 5, 2, 1, 4
2: A , B, E, C, D	--	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1	C: 4, 3, 5, 1, 2
4: A , C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1,4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: C, B, E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1,4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: C , B, E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	1, 4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: B, E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	1,2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: B, E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	1,2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: B , E, A, D	5	A: 3, 5, 2, 1, 4
2: B, E, C, D	1, 2	B: 5, 2, 1, 4, 3
3: D, C, B, A, E	4	C: 4, 3, 5, 1, 2
4: C, D, B, E	3	D: 1, 2, 3, 4, 5
5: A, B, D, E, C	--	E: 2, 3, 4, 1, 5

(The Stable Marriage Problem . SMP)

1: E, A, D

5

A: 3, 5, 2, 1, 4

2: B, E, C, D

2

B: 5, 2, 1, 4, 3

3: D, C, B, A, E

4

C: 4, 3, 5, 1, 2

4: C, D, B, E

3

D: 1, 2, 3, 4, 5

5: A, B, D, E, C

1

E: 2, 3, 4, 1, 5

4

1

(The Stable Marriage Problem . SMP)

1: E, A, D

5

A: 3, 5, 2, 1, 4

2: B, E, C, D

2

B: 5, 2, 1, 4, 3

3: D, C, B, A, E

4

C: 4, 3, 5, 1, 2

4: C, D, B, E

3

D: 1, 2, 3, 4, 5

5: A, B, D, E, C

1

E: 2, 3, 4, 1, 5

«

»;

!!

⇒

!!

1: C, B, E, A, D

2: A, B, E, C, D

3: D, C, B, A, E

4: A, C, D, B, E

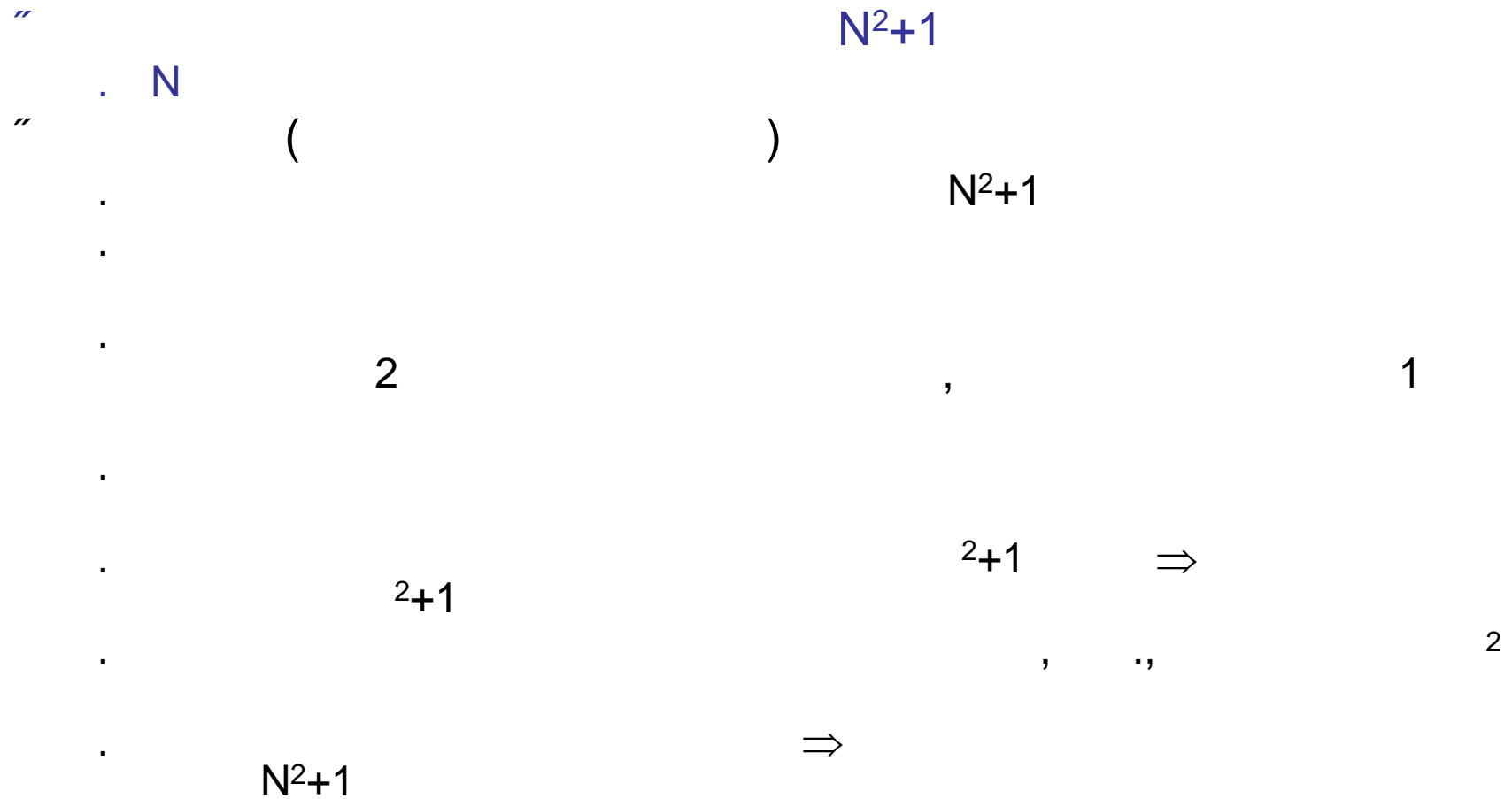
5: A, B, D, E, C

(The Stable Marriage Problem . SMP)

“

· :
· ,
· « »
· :
· ;

(The Stable Marriage Problem . SMP)



(The Stable Marriage Problem . SMP)

“

,

”

“

,

”

,

«

»

”

:

.

,

.

,

(The Stable Marriage Problem . SMP)

```

" P:      , G,      , B,      , G,
          ,
          B
"      (      )
      .
" (      )
" (      )
" (      )
      .
      » HG
      ⇒      P      B      d+1      d+1      ;;      !!
      » HG
      d ⇒ HG      B      d+1,      d      P
      d+1      B
    
```

(The Stable Marriage Problem . SMP)

“

“ (, B,)

· “ , B,

“

·

“ ;

“ ,

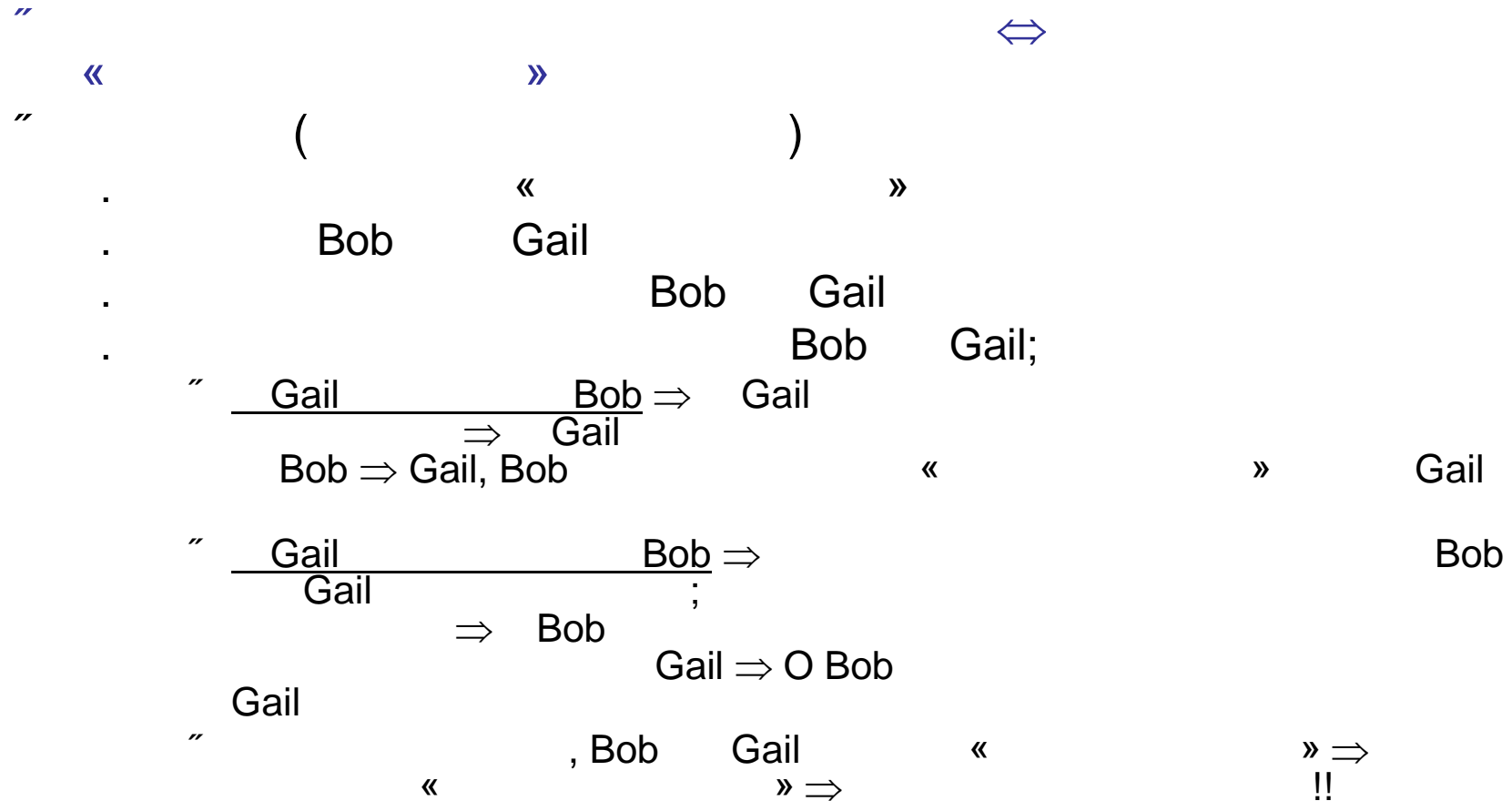
“ ⇒

“ ⇒

“

,

(The Stable Marriage Problem . SMP)



(The Stable Marriage Problem . SMP)

“ : ;
“ . ã
“ ã ã
“ , : ;
“ . ;

(The Stable Marriage Problem . SMP)

" , S

" $S \neq \emptyset$;

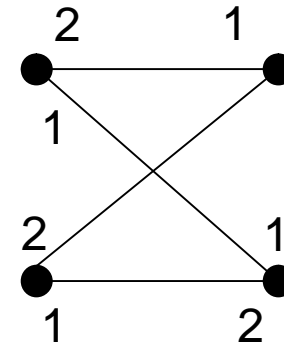
· \Rightarrow S q

" P (realm of possibility)

$$\{Q \mid \exists M \in S \{P, Q\} \in M\}$$

$\Rightarrow 0$

« »



(The Stable Marriage Problem . SMP)

“

(optimal mate):

.

”

(pessimal mate):

“

.

(optimal mate)

.

(pessimal mate)

”

:

.

.

(The Stable Marriage Problem . SMP)

“

mate)

“

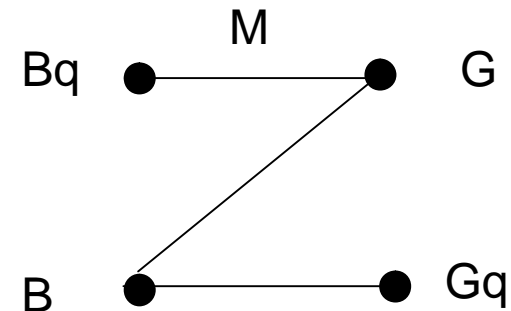
(pessimal mate)

(optimal

.

q

To
 \Rightarrow G (. « »)
 \Rightarrow B G ;
 !!



(The Stable Marriage Problem . SMP)

“

:

!!

“

.

“

«

»;

õ !!!!!

. Online dating

(load balancing)

Web

.

“

web servers

“

servers

(The Stable Marriage Problem . SMP)

“

:

.

group
visibility

.

groups

.

groups

.

;;