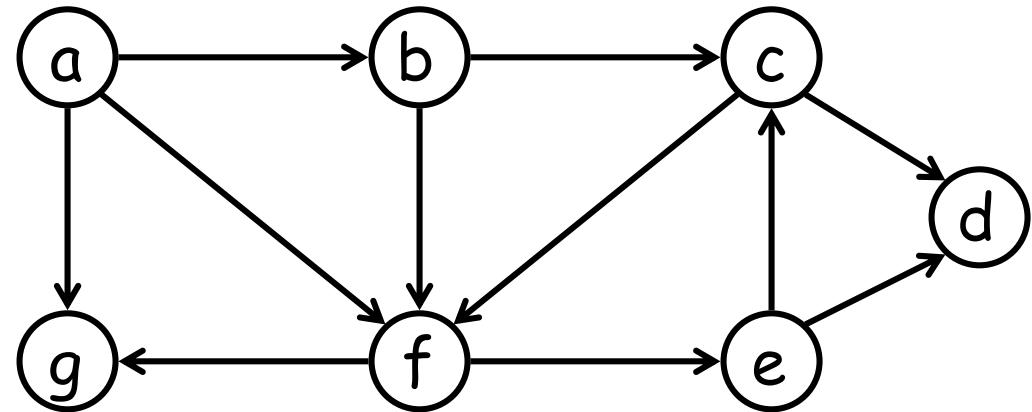


סרייקת גרף

$$G=(V,E)$$

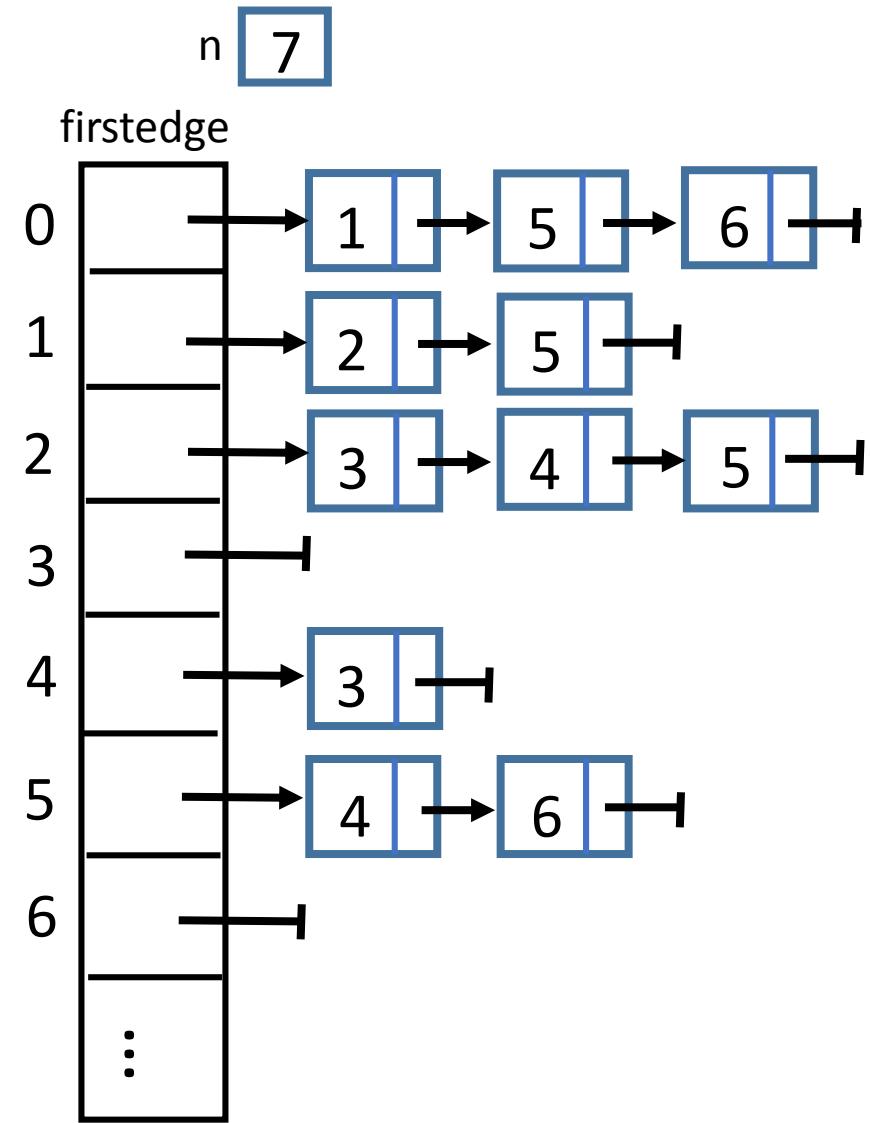
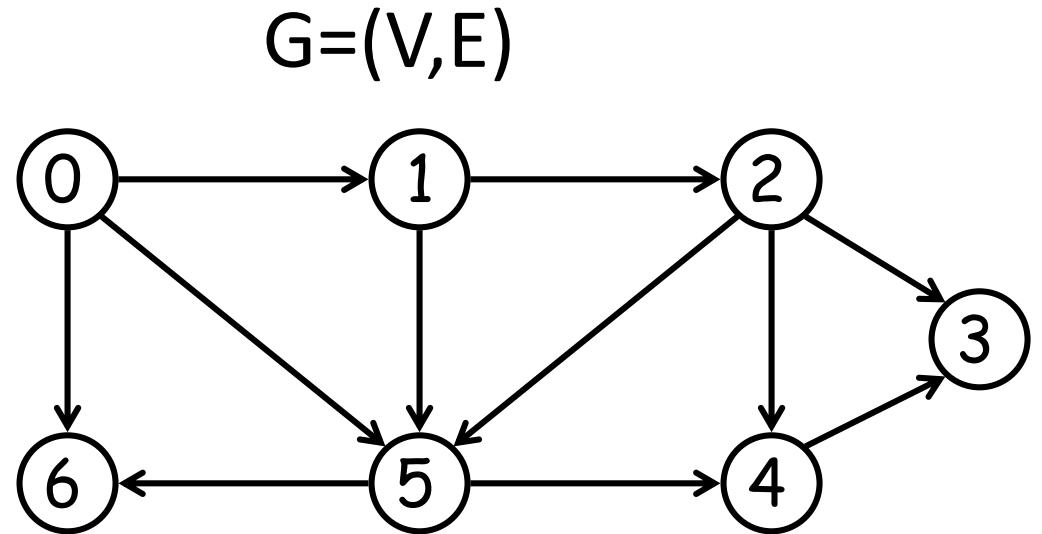


מטרה:

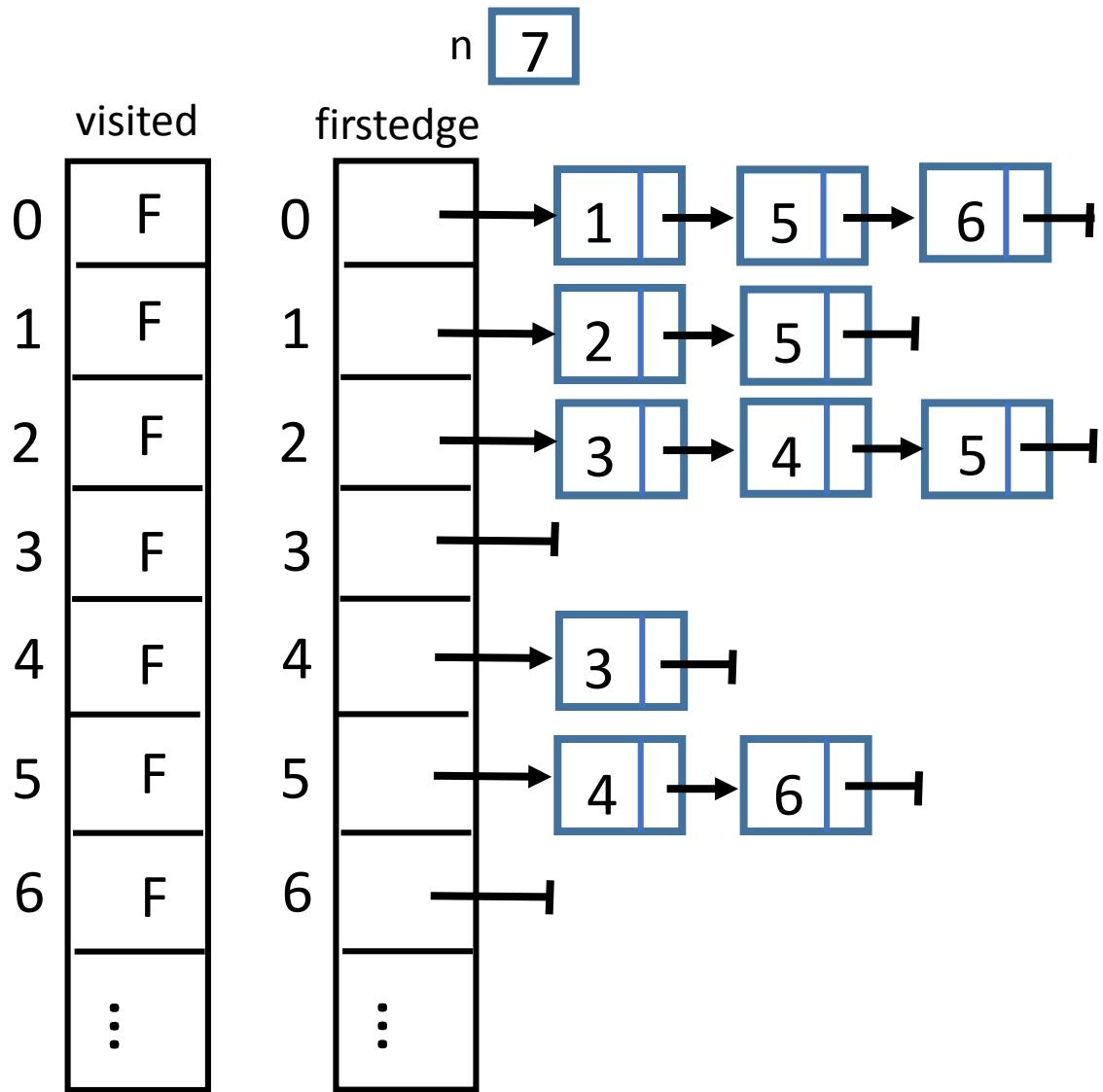
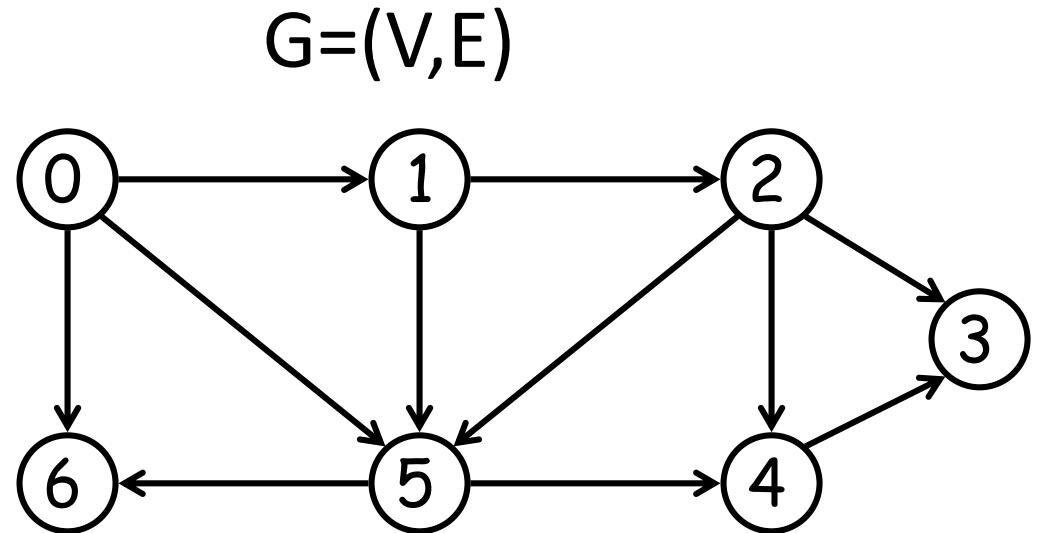
בහינתן גרף $G = (V, E)$ רוצים לעבור על המידע שהגרף מייצג בהתאם למבנה הגרף.

מהו המידע שהגרף
מייצג?

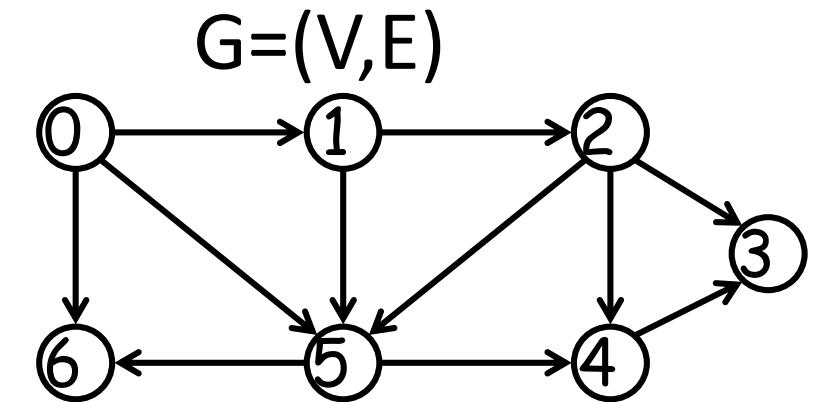
סריקת גרף בחיפוש לעומק (DFS)



סריקת גרף בחיפוש לעומק (DFS)

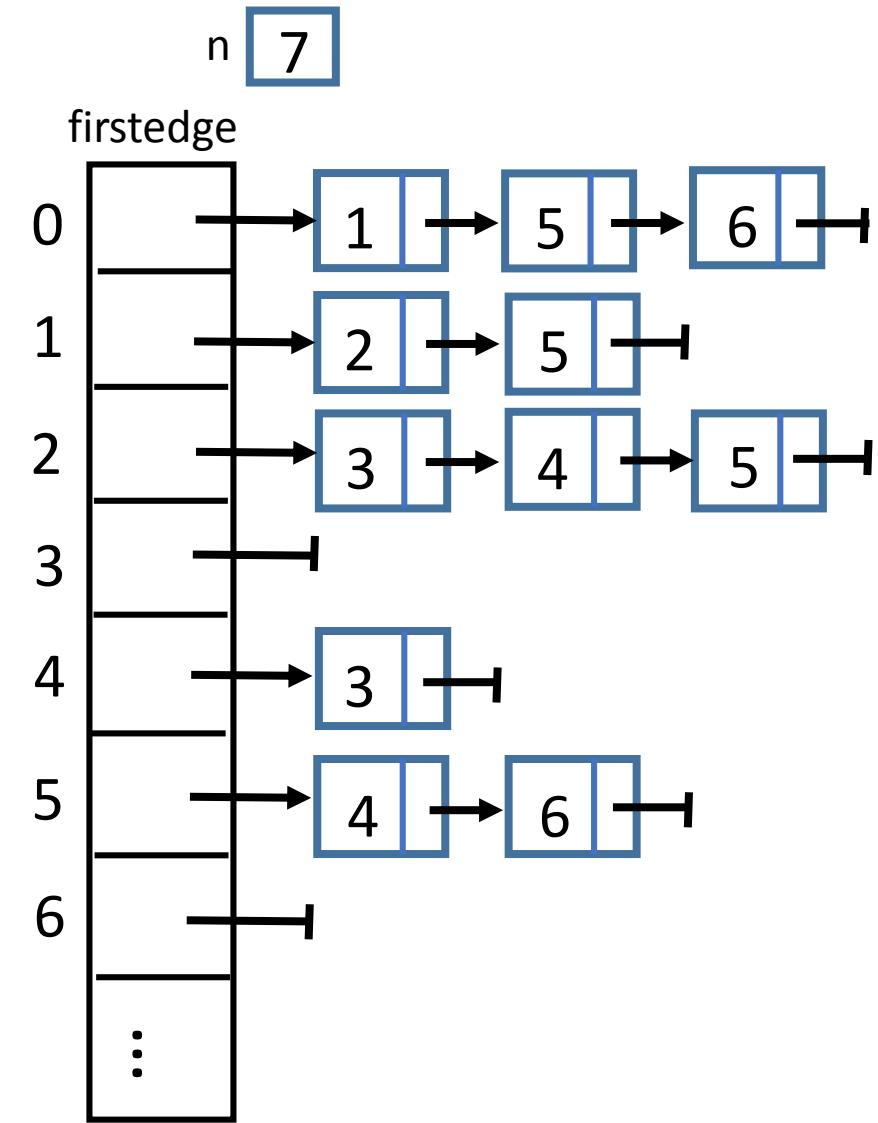


סריקת גרף בהיפוך לעומק (DFS)

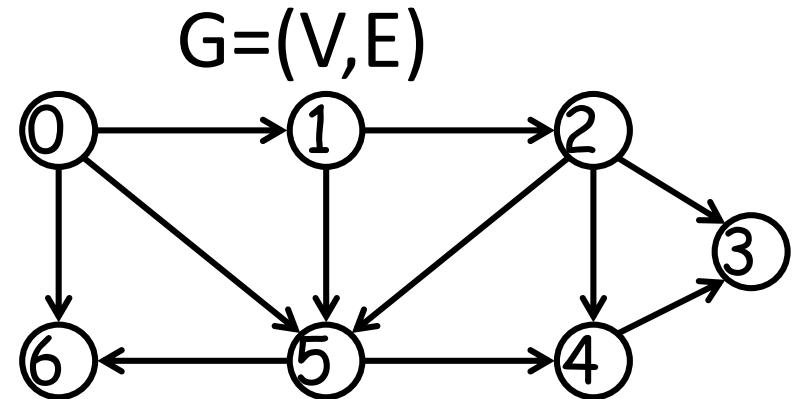


DFS(G)
DFS-Visit(0)

	visited
0	F
1	F
2	F
3	F
4	F
5	F
6	F
⋮	



סריקת גרף בהיפוך לעומק (DFS)

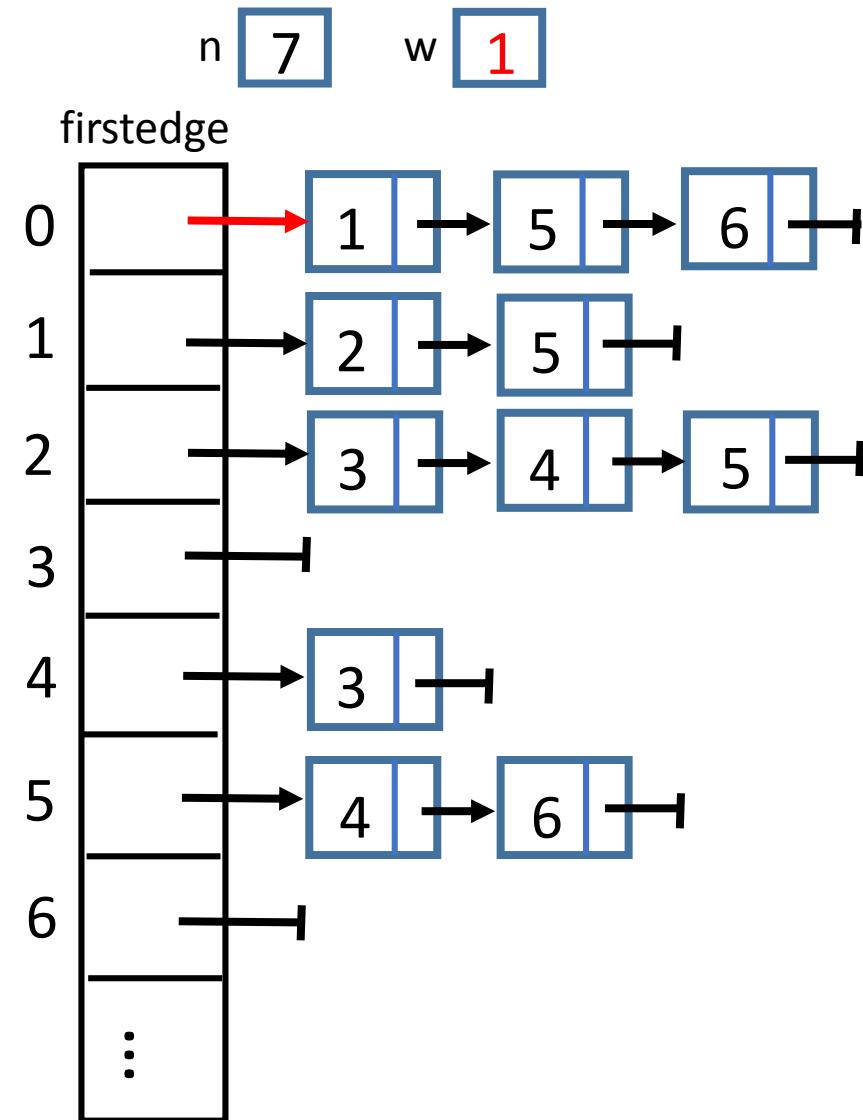


DFS ה

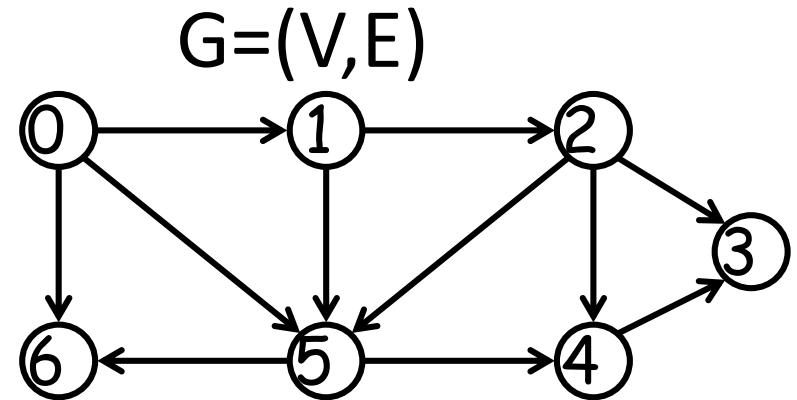
0

DFS(G)
DFS-Visit(0)
DFS-Visit(1)

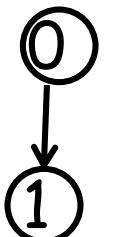
	visited
0	T
1	F
2	F
3	F
4	F
5	F
6	F
:	



סריקת גרף בהיפוך לעומק (DFS)



יער ה DFS



DFS(G)
DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)

visited

0	T
1	T
2	F
3	F
4	F
5	F
6	F
:	

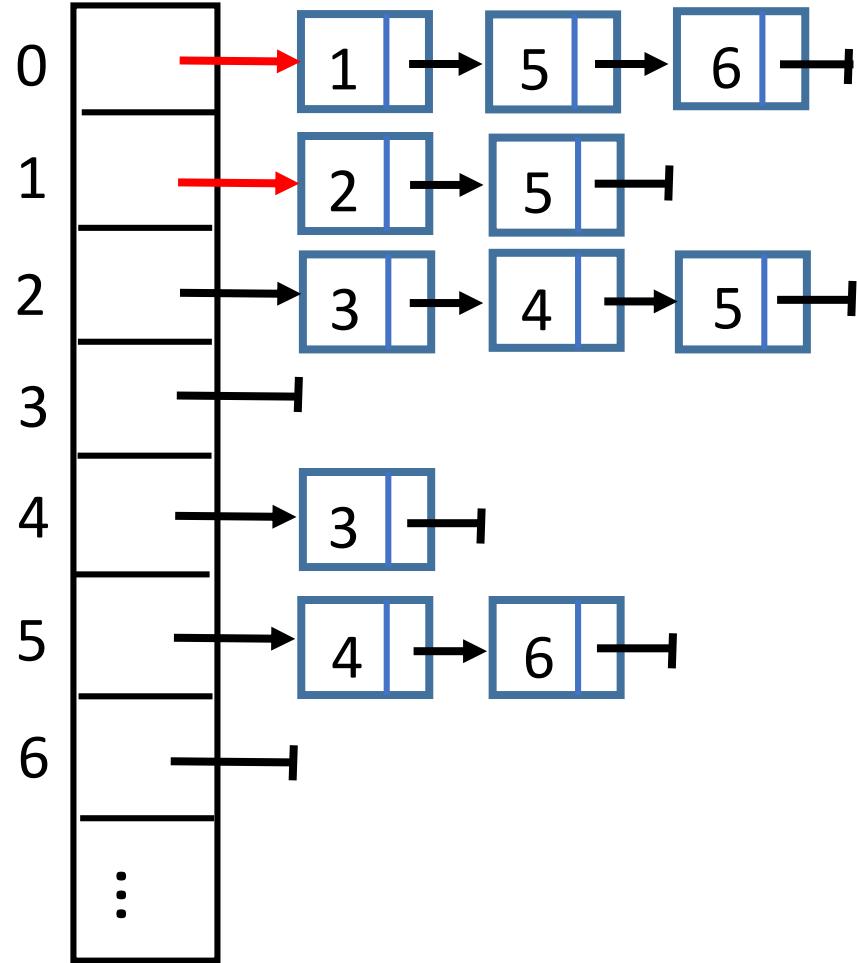
n

7

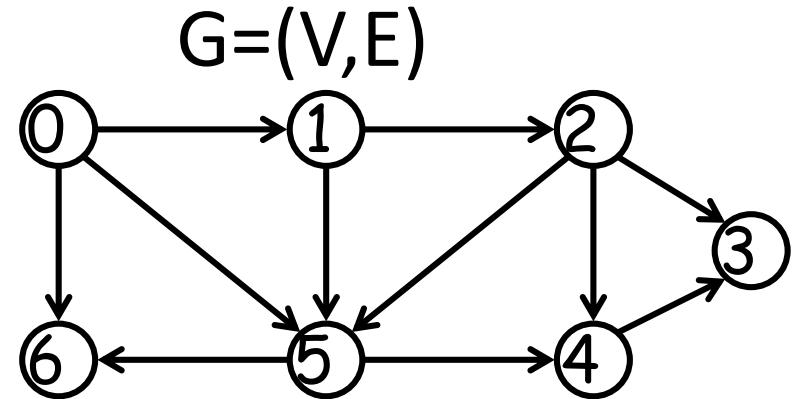
w

2

firstedge

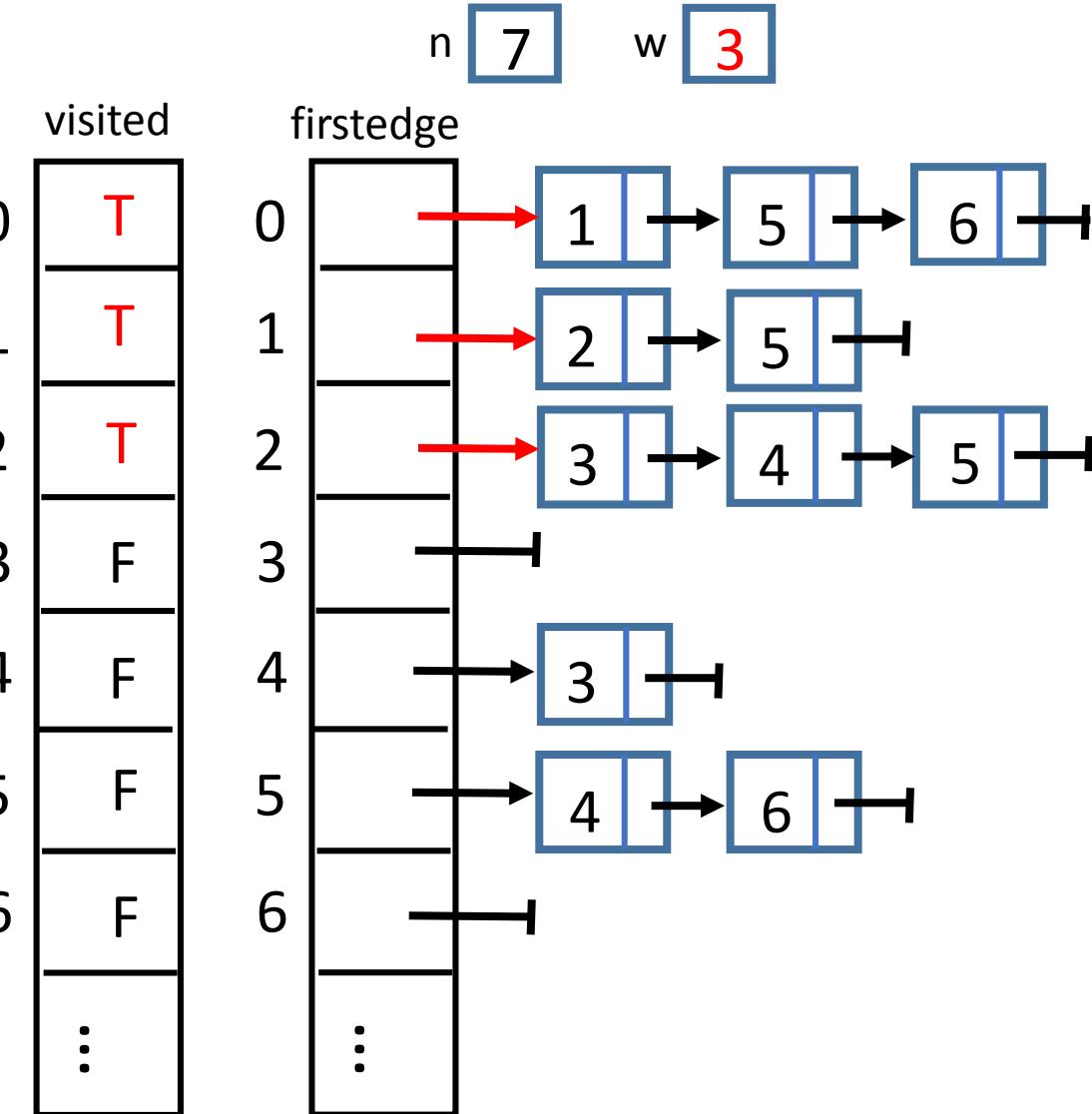
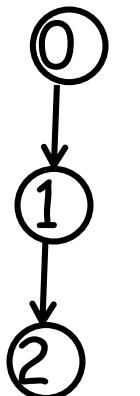


סריקת גרף בהיפוך לעומק (DFS)

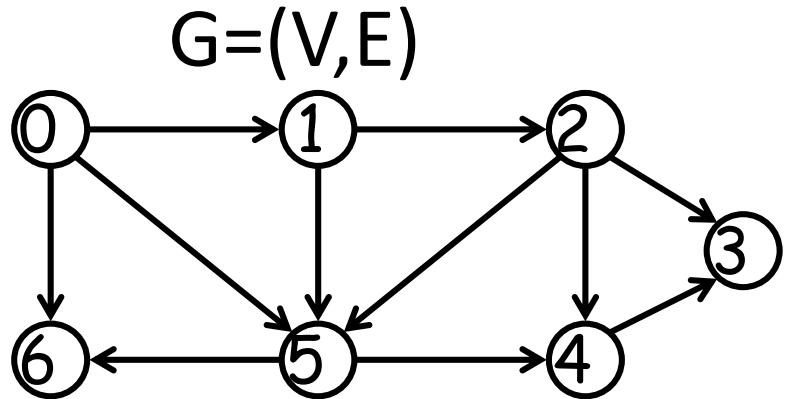


$\text{DFS}(G)$
 $\text{DFS-Visit}(0)$
 $\text{DFS-Visit}(1)$
 $\text{DFS-Visit}(2)$
 $\text{DFS-Visit}(3)$

יער ה

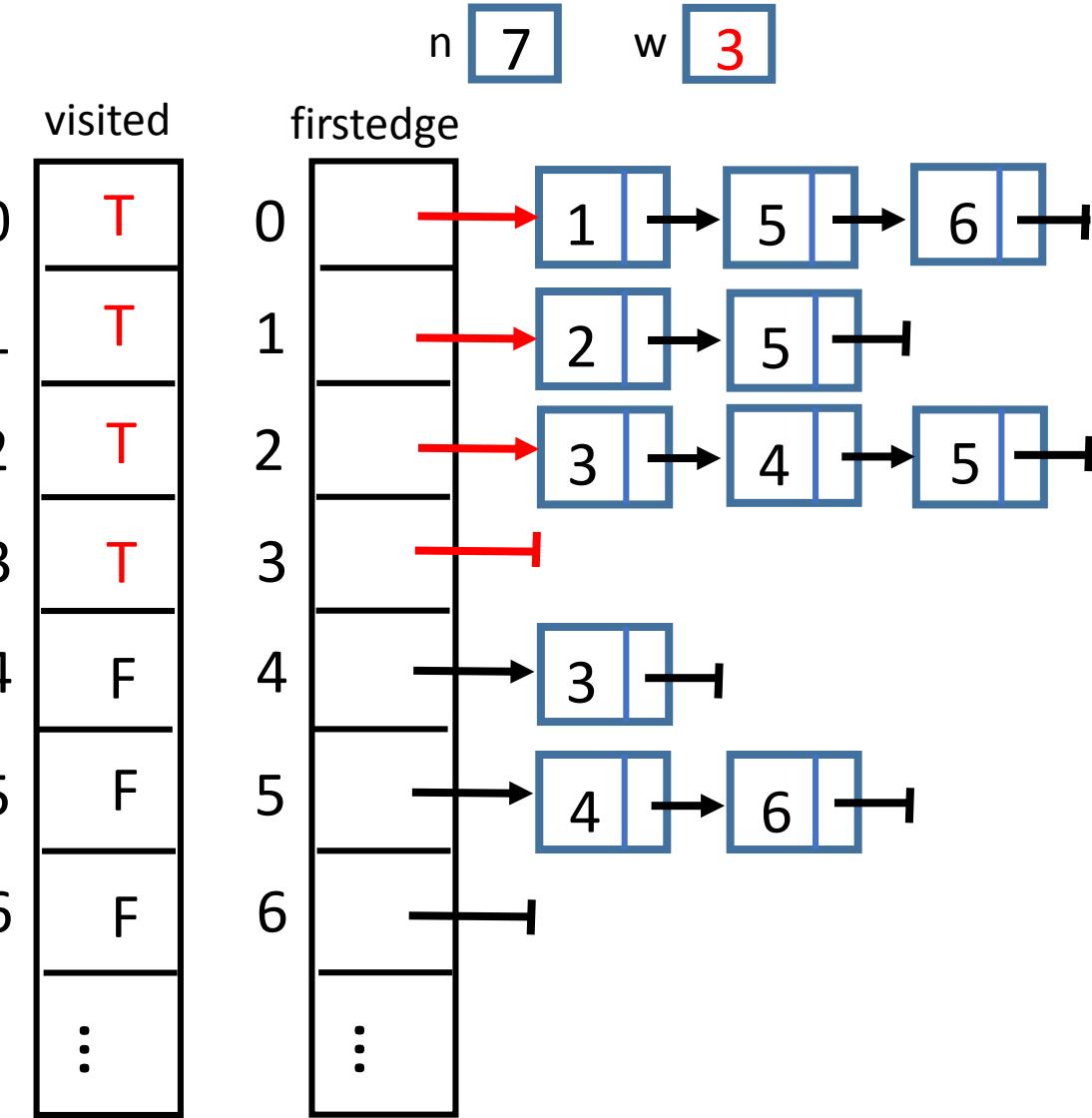
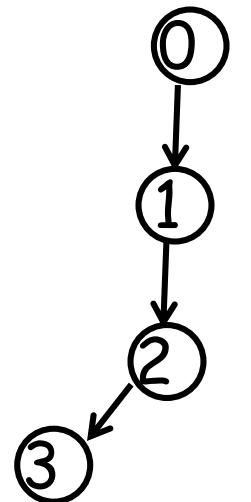


סריקת גרף בהיפוך לעומק (DFS)

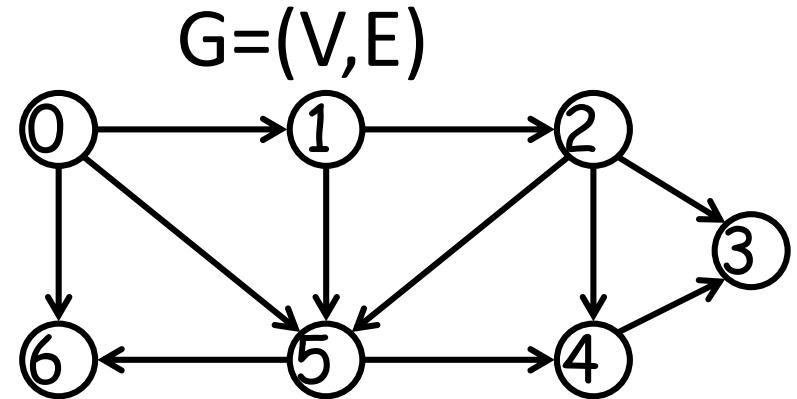


$\text{DFS}(G)$
 $\text{DFS-Visit}(0)$
 $\text{DFS-Visit}(1)$
 $\text{DFS-Visit}(2)$
 $\text{DFS-Visit}(3)$

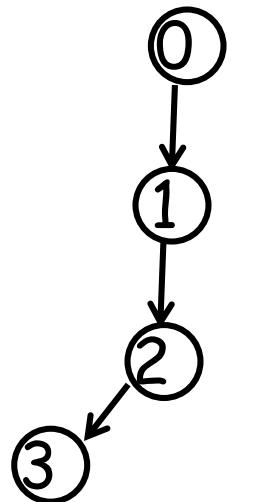
יער ה



סריקת גרף בהיפוך לעומק (DFS)

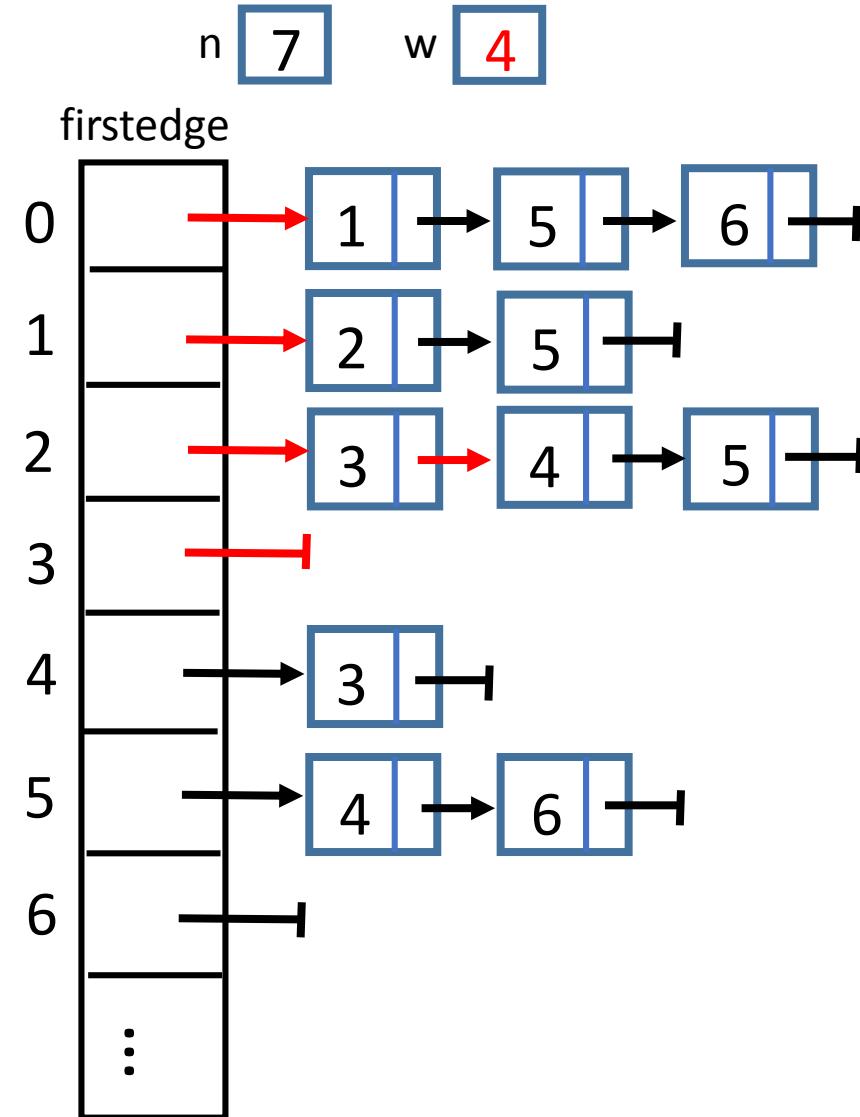


DFS ה

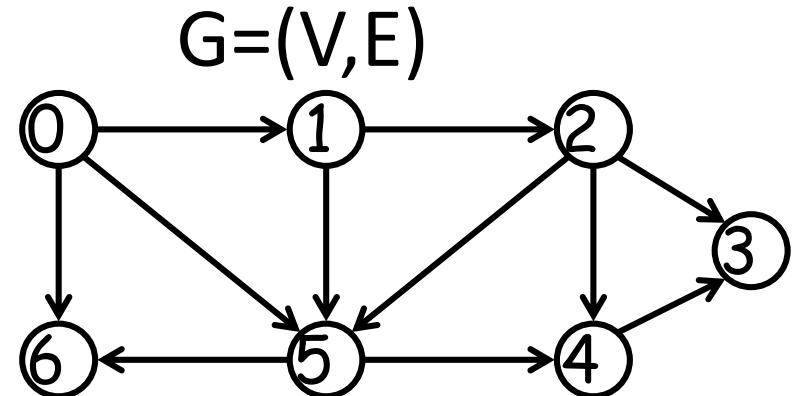


$\text{DFS}(G)$
 $\text{DFS-VISIT}(0)$
 $\text{DFS-VISIT}(1)$
 $\text{DFS-VISIT}(2)$
 $\text{DFS-VISIT}(3)$
 $\text{DFS-VISIT}(4)$

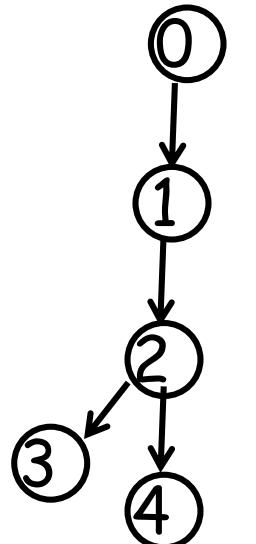
	visited
0	T
1	T
2	T
3	T
4	F
5	F
6	F
:	



סריקת גרף בהיפוך לעומק (DFS)

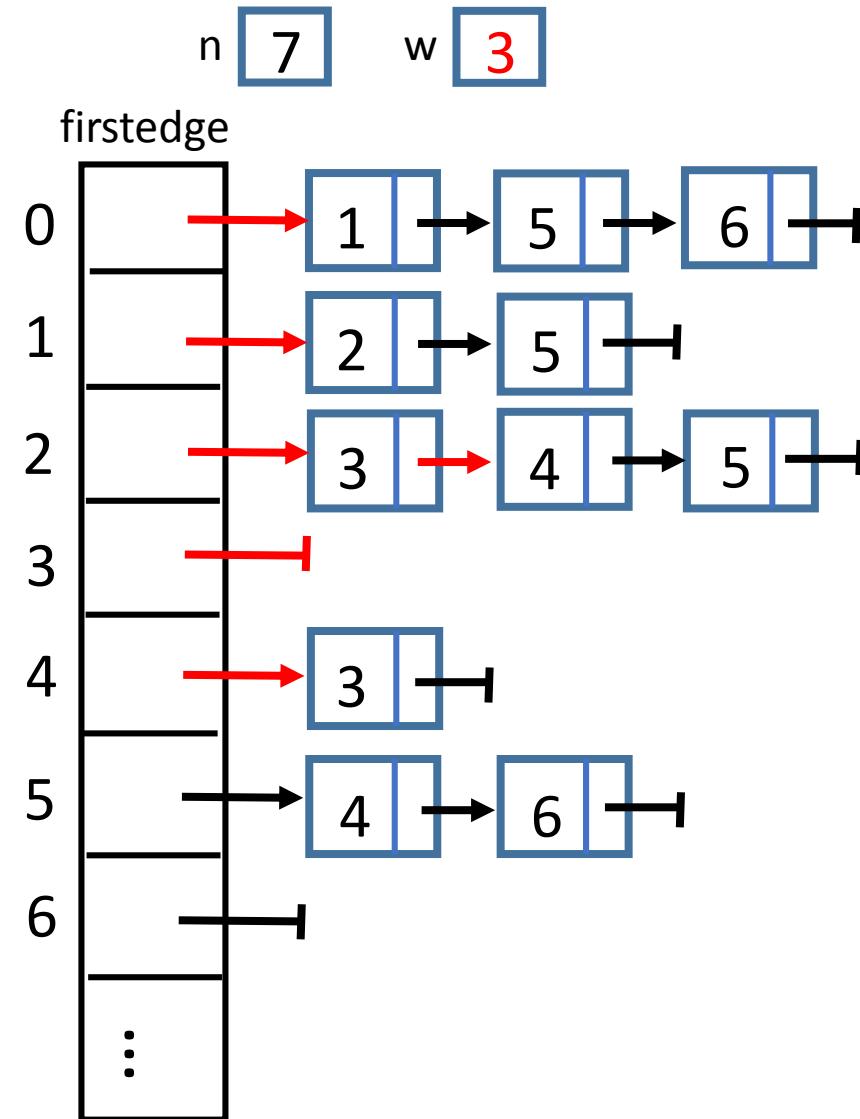


DFS ה

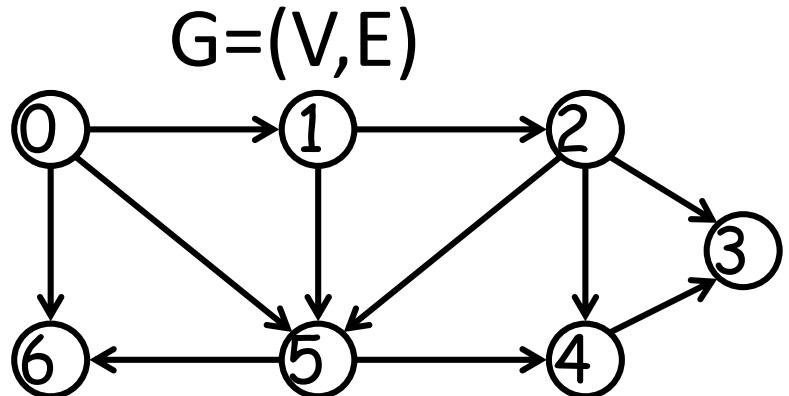


$\text{DFS}(G)$
 $\text{DFS-VISIT}(0)$
 $\text{DFS-VISIT}(1)$
 $\text{DFS-VISIT}(2)$
 $\text{DFS-VISIT}(3)$
 $\text{DFS-VISIT}(4)$

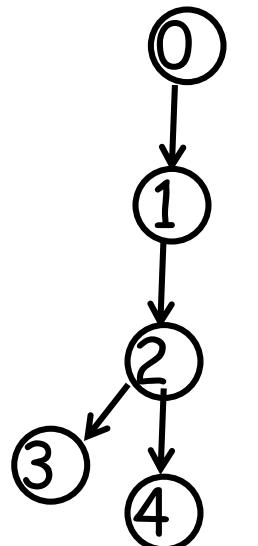
	visited
0	T
1	T
2	T
3	T
4	T
5	F
6	F
⋮	



סריקת גרף בהיפוך לעומק (DFS)

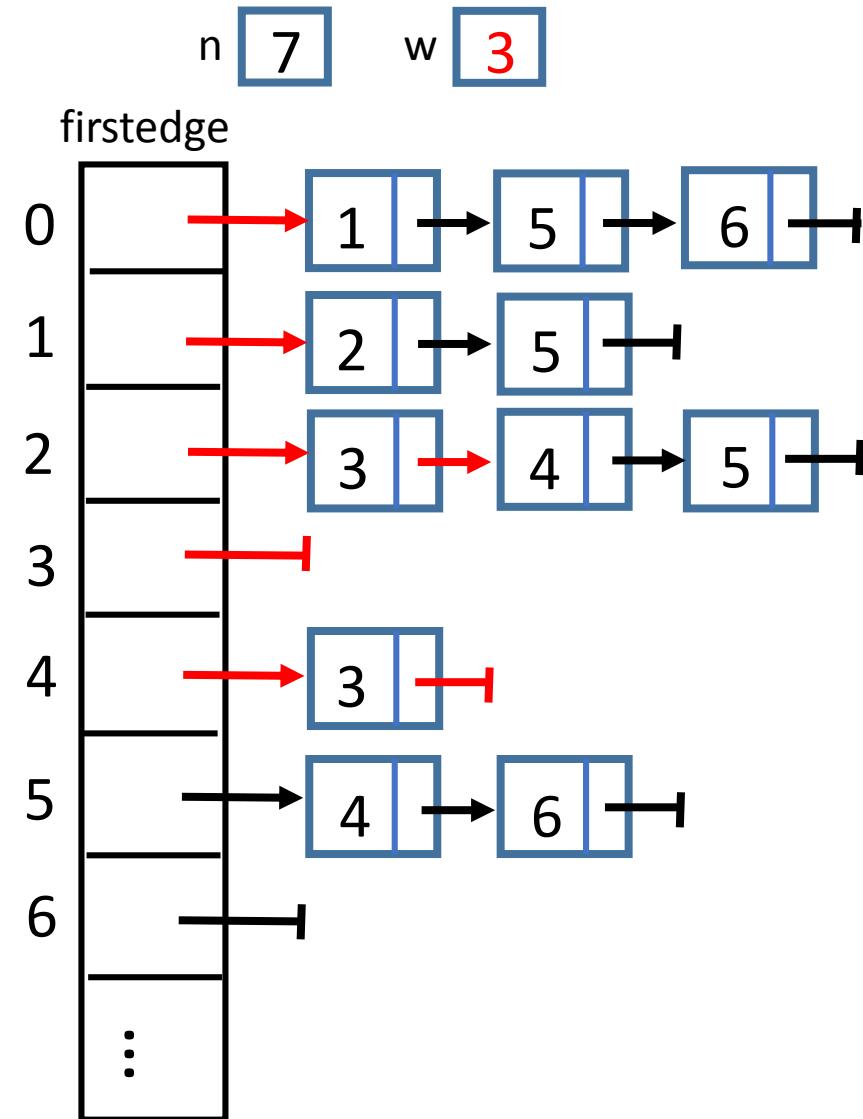


DFS ה

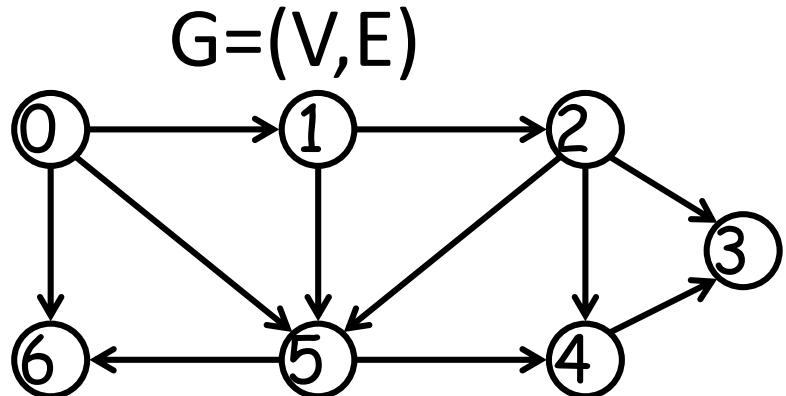


$\text{DFS}(G)$
 $\text{DFS-VISIT}(0)$
 $\text{DFS-VISIT}(1)$
 $\text{DFS-VISIT}(2)$
 $\text{DFS-VISIT}(3)$
 $\text{DFS-VISIT}(4)$

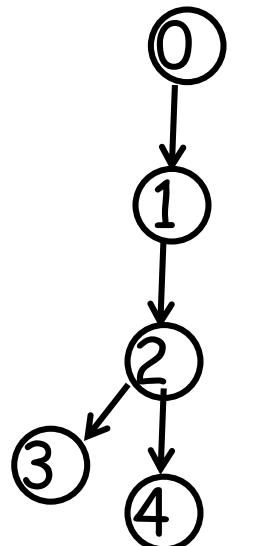
	visited
0	T
1	T
2	T
3	T
4	T
5	F
6	F
⋮	



סריקת גרף בהיפוך לעומק (DFS)

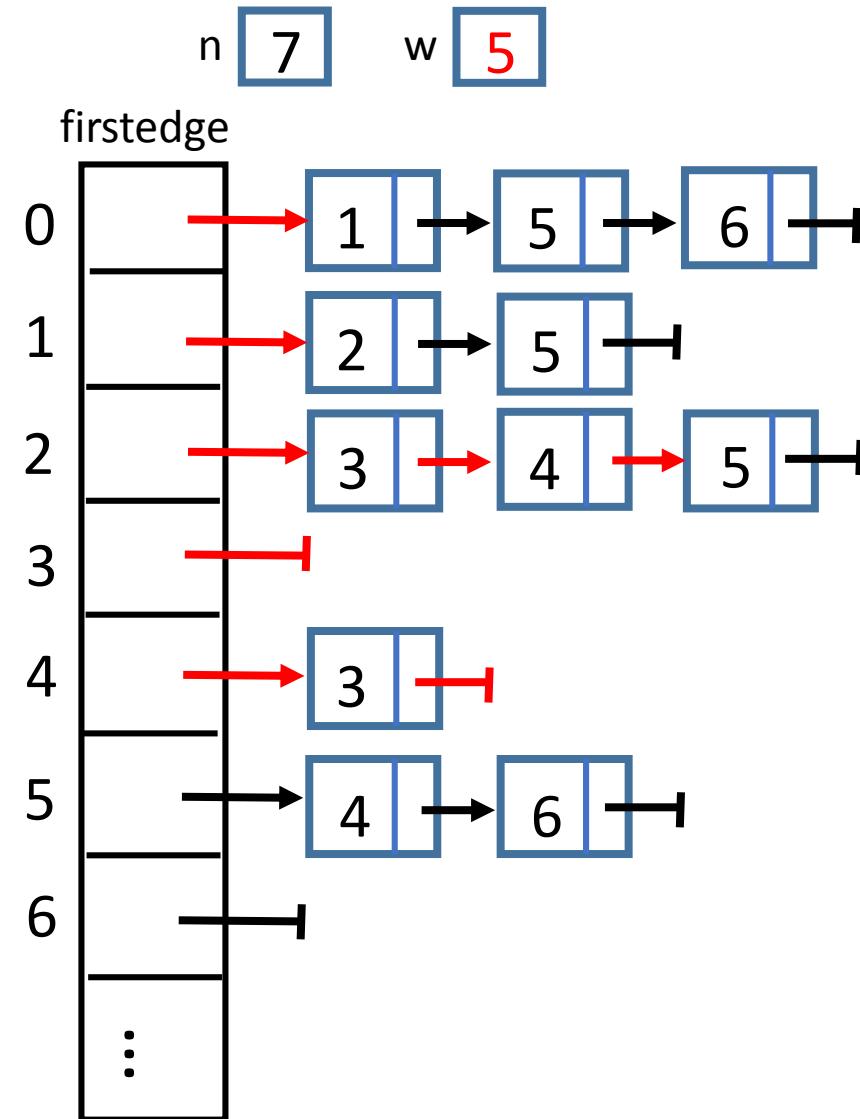


DFS ה



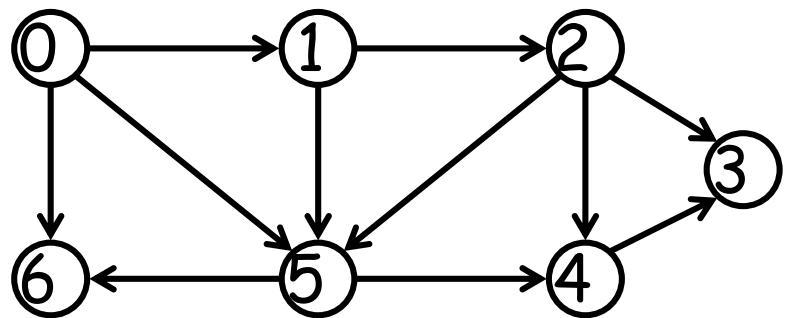
$\text{DFS}(G)$
 $\text{DFS-VISIT}(0)$
 $\text{DFS-VISIT}(1)$
 $\text{DFS-VISIT}(2)$
 $\text{DFS-VISIT}(3)$
 $\text{DFS-VISIT}(4)$
 $\text{DFS-VISIT}(5)$

	visited
0	T
1	T
2	T
3	T
4	T
5	F
6	F
⋮	

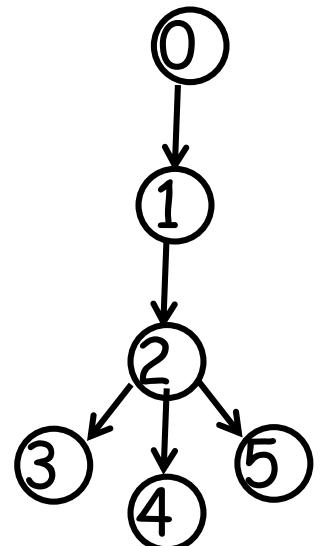


סרייקת גרף בחיפוש לעומק (DFS)

$$G = (V, E)$$



יְהוָה עָרֵךְ



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)

	visited
0	T
1	T
2	T
3	T
4	T
5	T
6	F
	⋮

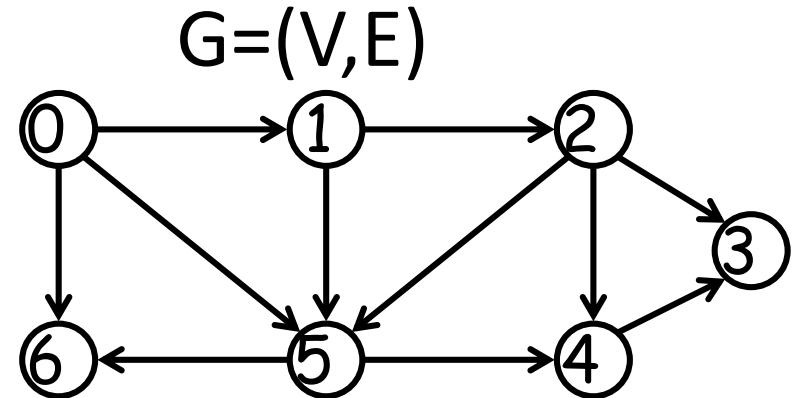
n 7 w 4

firstedge

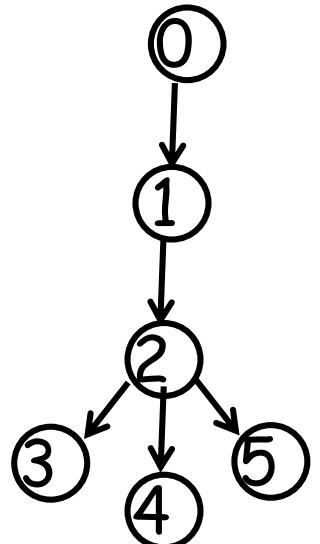
```

graph LR
    Root[1] --> N1_1[2]
    Root --> N1_2[3]
    N1_1 --> N2_1[5]
    N1_2 --> N2_2[4]
    N2_2 --> N3_1[5]
    N2_1 --> N3_2[4]
    N3_2 --> N4_1[5]
    N3_1 --> N4_2[6]
    N4_2 --> N5_1[6]
  
```

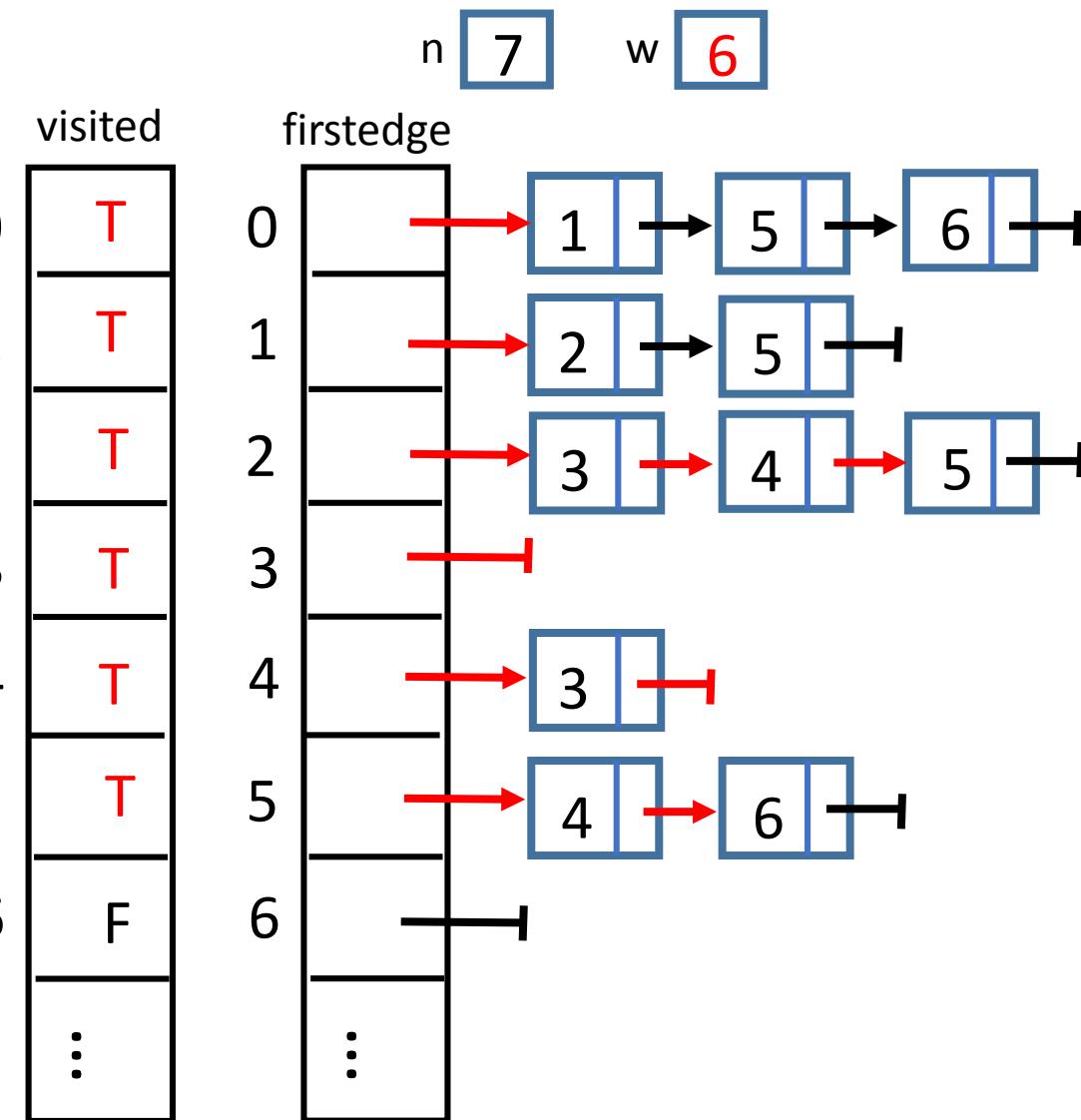
סריקת גרף בהיפוך לעומק (DFS)



DFS ה

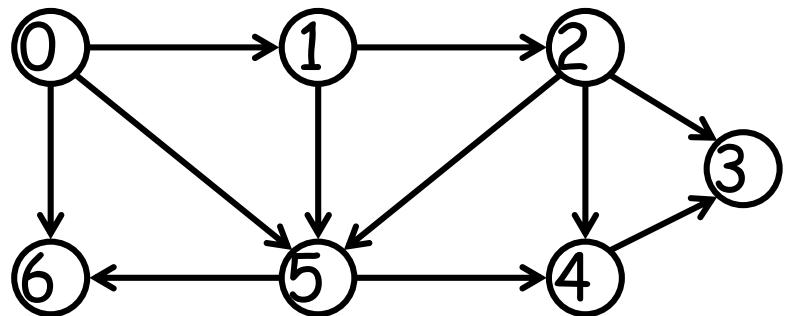


DFS(G)
DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

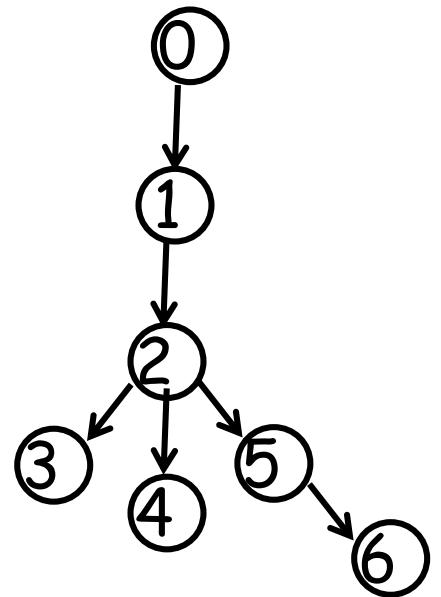


סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
:	

n
7

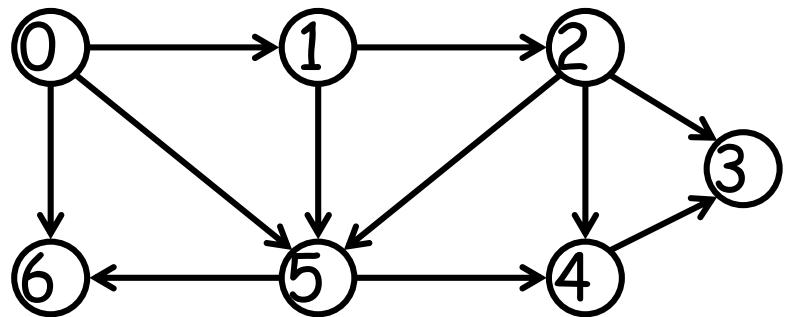
w
6

firstedge

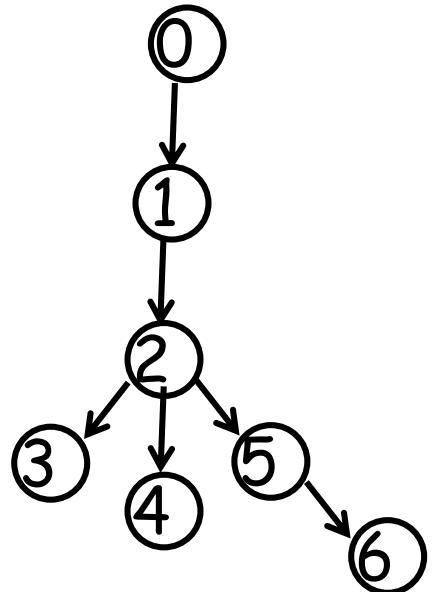
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
:			

סריקת גרף בהיפוך לעומק (DFS)

$$G=(V,E)$$



DFS היררכיה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
:	

n
7

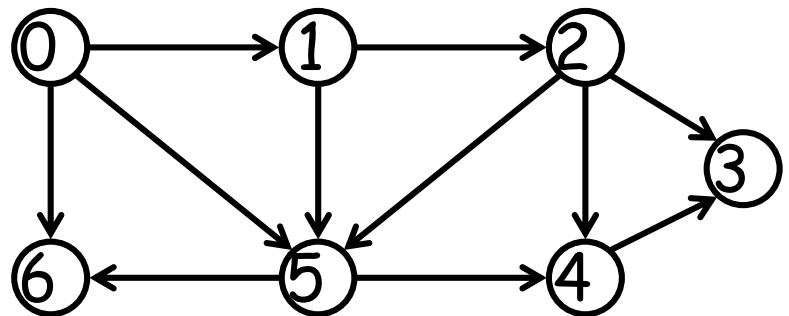
w
6

firstedge

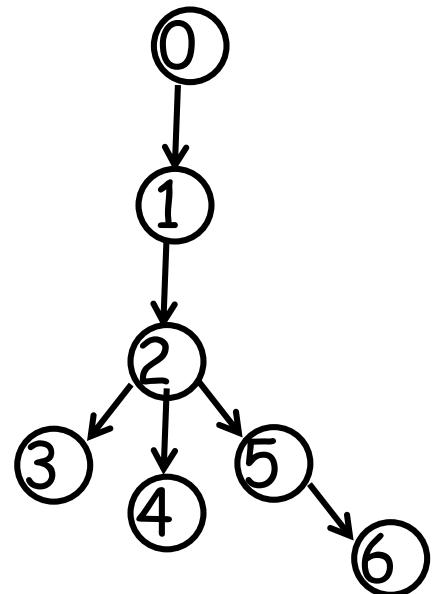
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
:			

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
:	

n
7

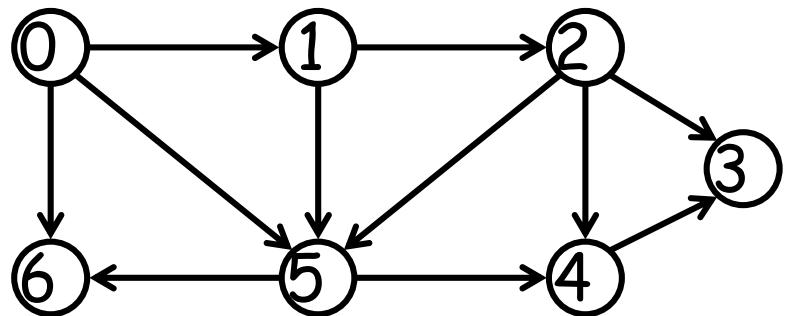
w
5

firstedge

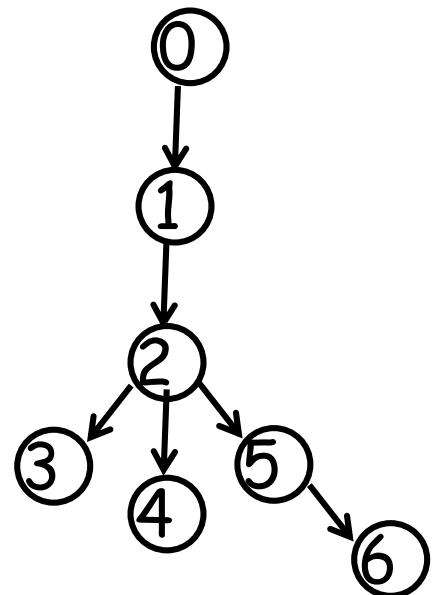
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
:			

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
⋮	

n

7

w

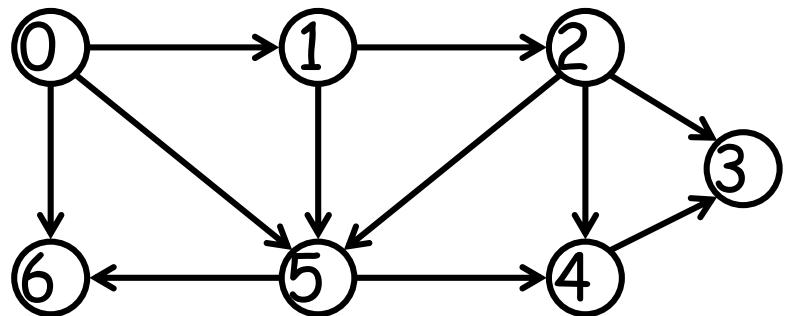
5

firstedge

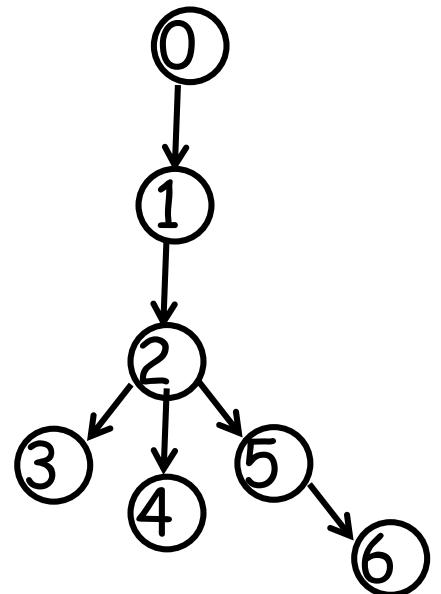
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
⋮			

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
⋮	

n
7

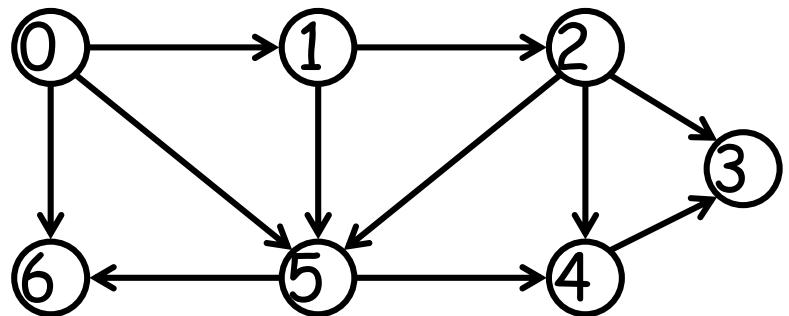
w
5

firstedge

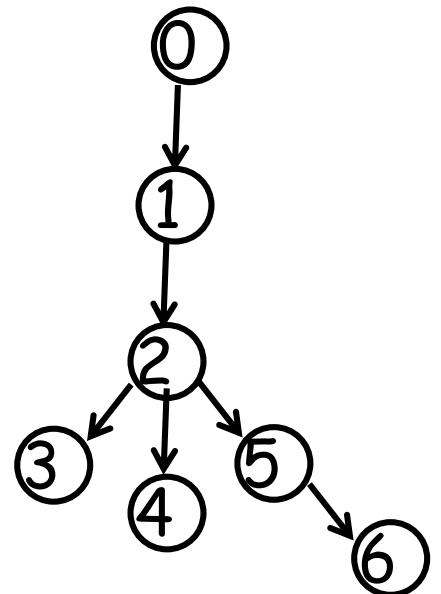
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
⋮			

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
⋮	

n
7

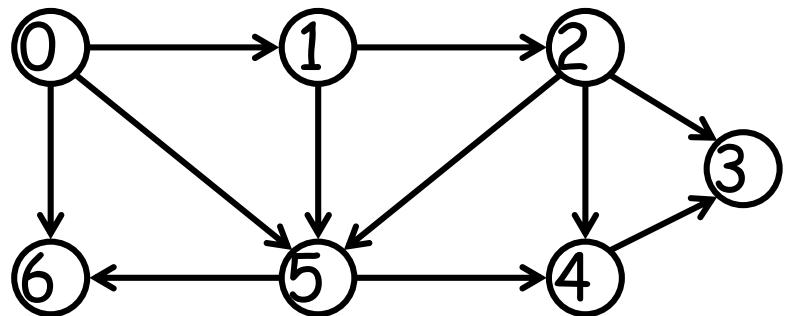
w
5

firstedge

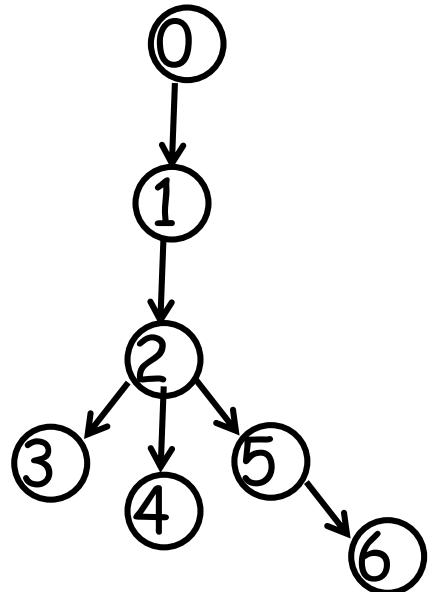
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
⋮			

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
DFS-Visit(1)
DFS-Visit(2)
DFS-Visit(3)
DFS-Visit(4)
DFS-Visit(5)
DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T
:	

n
7

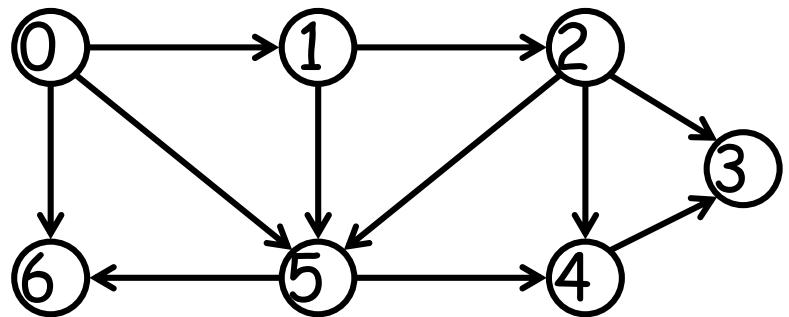
w
6

firstedge

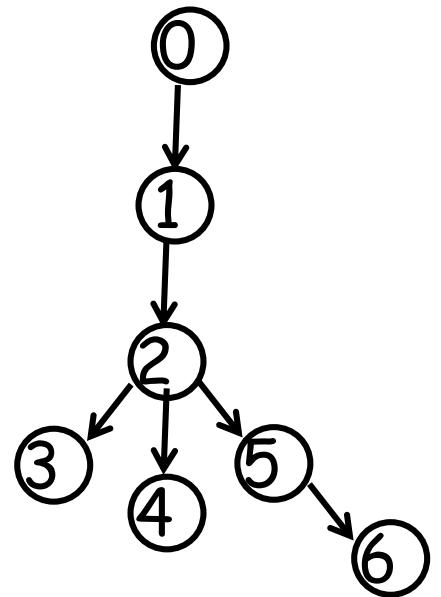
0	1	5	6	1
1	2	5	5	2
2	3	4	5	3
3				4
4	3			
5	4	6		
6				5
:				

סריקת גרף בהיפוך לעומק (DFS)

$G=(V,E)$



DFS ה



DFS(G)

DFS-Visit(0)
 DFS-Visit(1)
 DFS-Visit(2)
 DFS-Visit(3)
 DFS-Visit(4)
 DFS-Visit(5)
 DFS-Visit(6)

visited

0	T
1	T
2	T
3	T
4	T
5	T
6	T

n

7

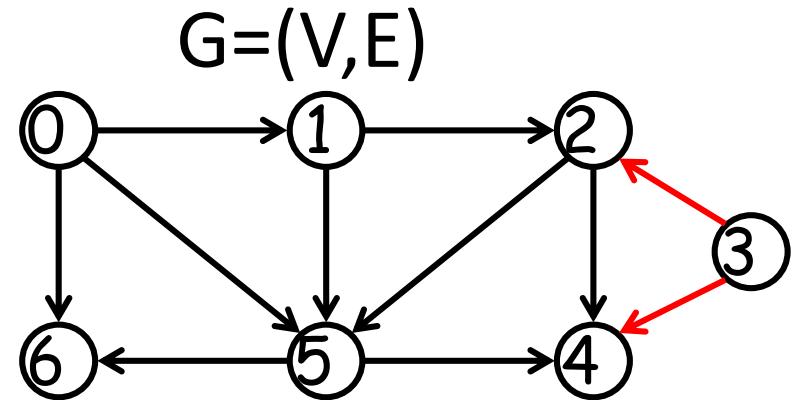
w

6

firstedge

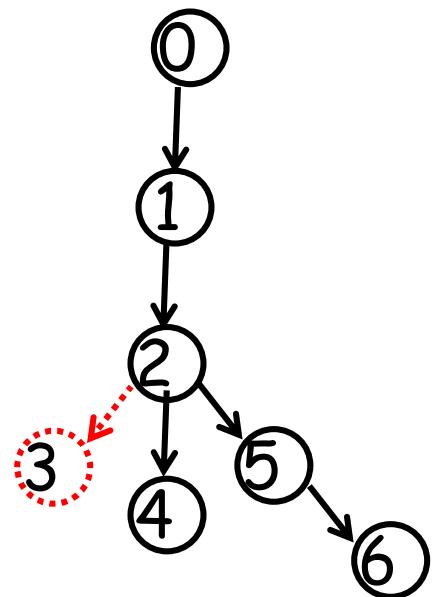
0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5		4	6
6			

סריקת גרף בהיפוך לעומק (DFS)



DFS(G)

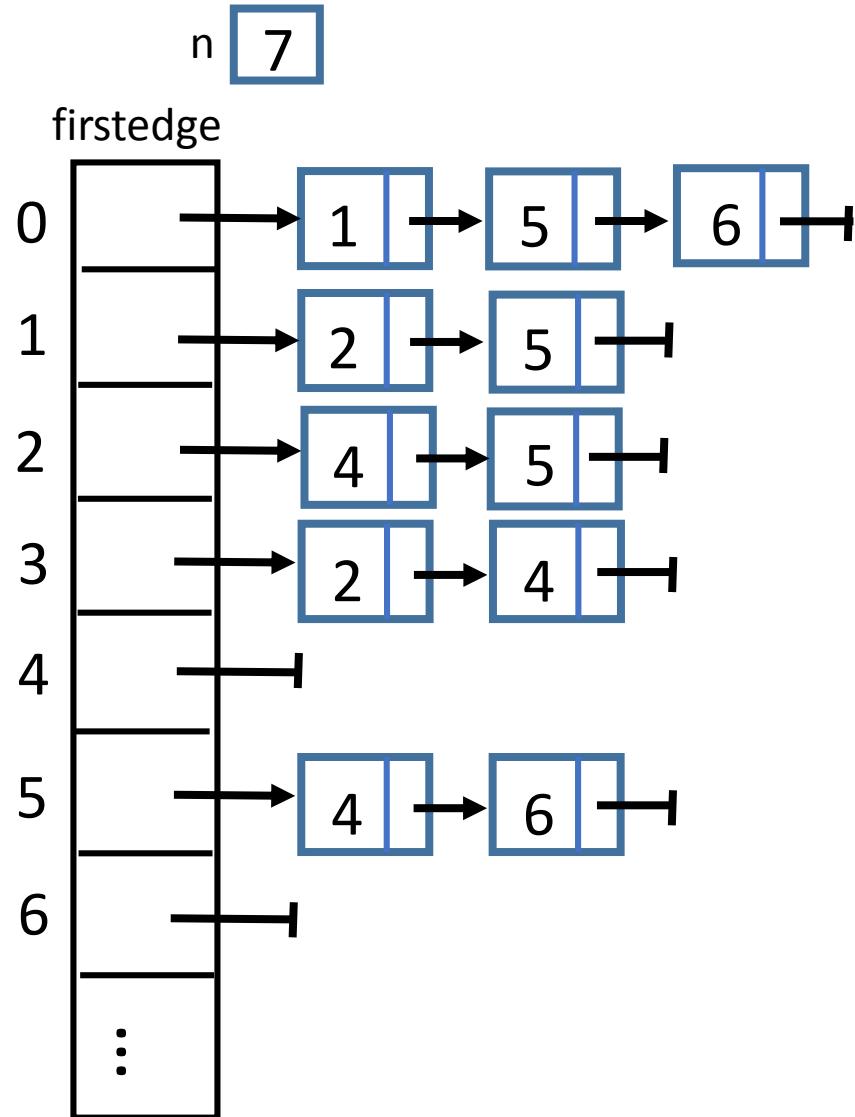
יער ה DFS



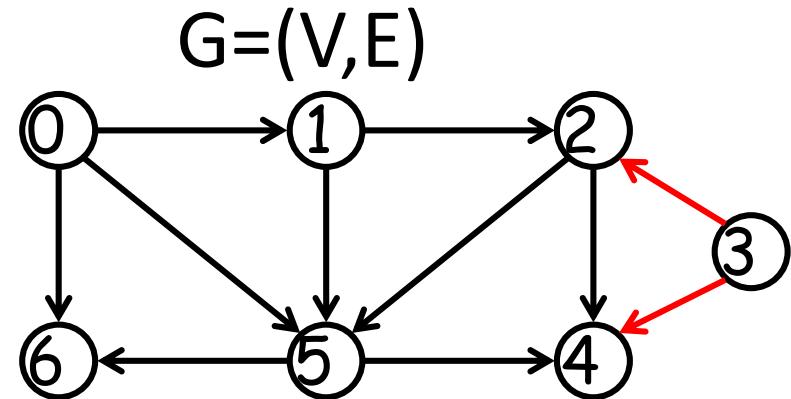
air משטנה הסריקה אם
משנים את כיווני הקשתות
המסומנות?

© פרופ' אביבית לוי

	visited
0	F
1	F
2	F
3	F
4	F
5	F
6	F
:	

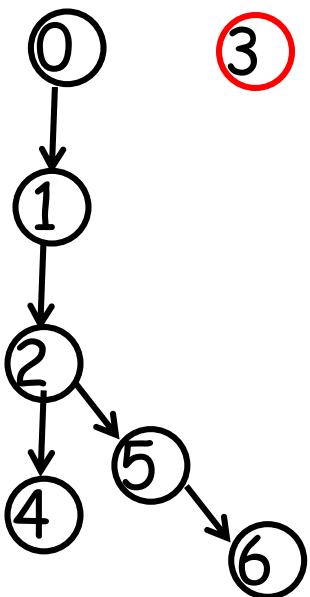


סריקת גרף בהיפוך לעומק (DFS)



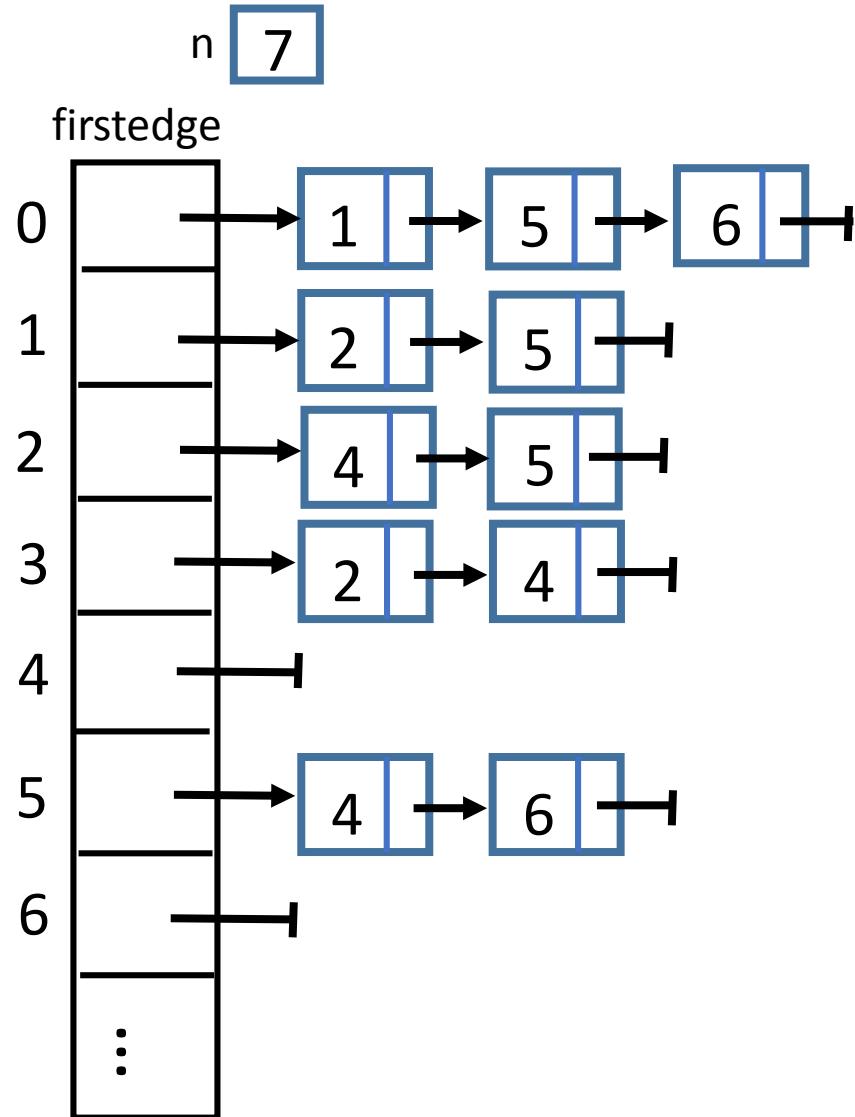
DFS(G)

יער ה DFS

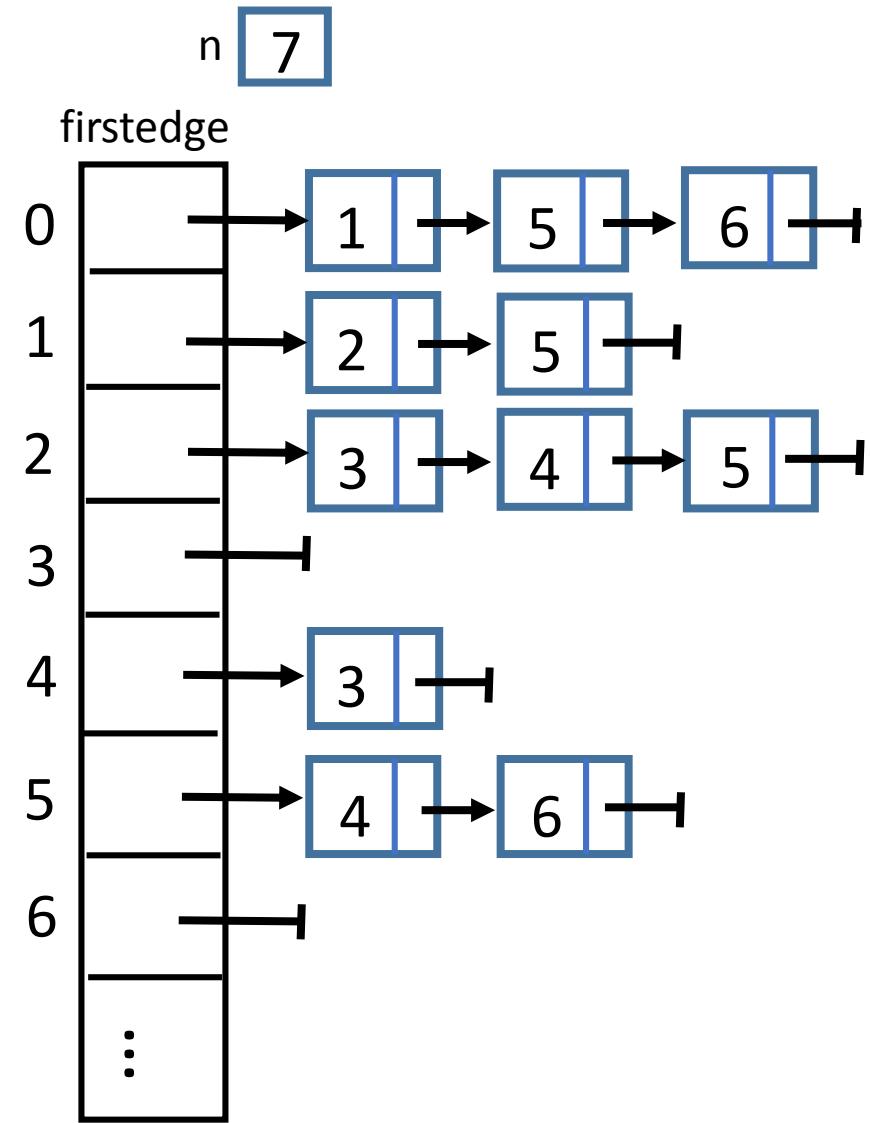
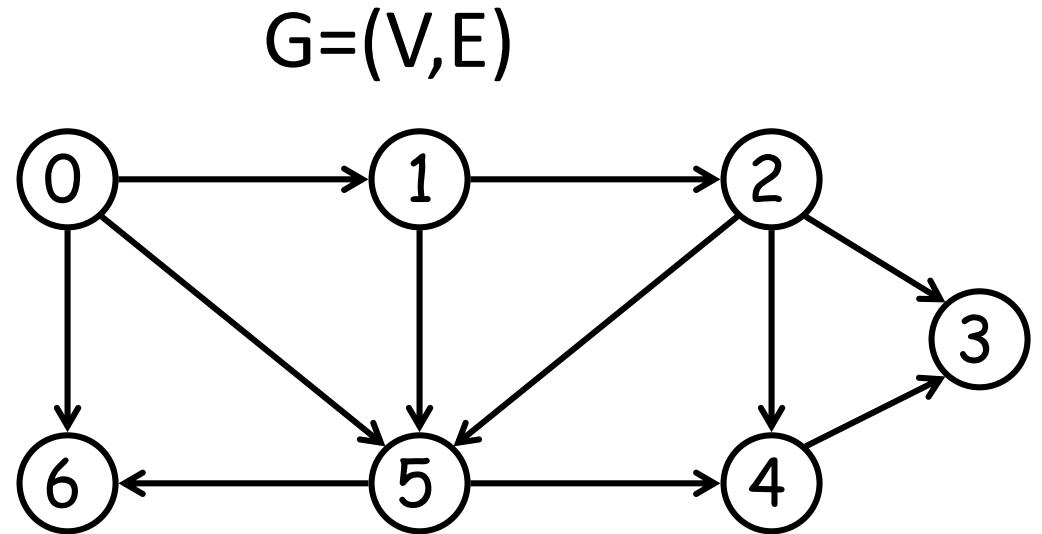


נקבל שהסריקה יוצרת יער
ולא עץ ייחיד!

	visited
0	F
1	F
2	F
3	F
4	F
5	F
6	F
:	

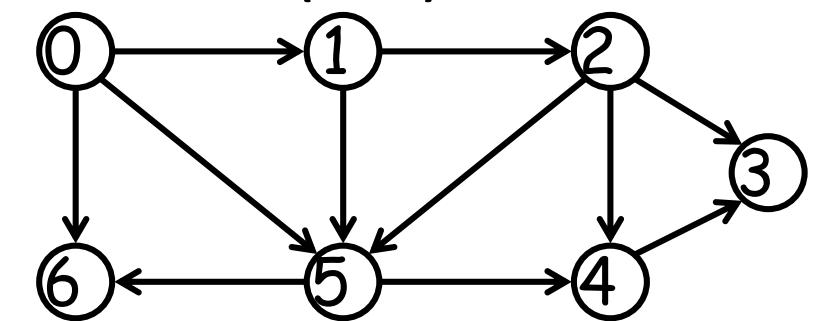


סריקת גרף בחיפוש לרוחב (BFS)



סריקת גרף בחיפוש לרוחב (BFS)

$G = (V, E)$



BFS(G)

visited

0	F
1	F
2	F
3	F
4	F
5	F
6	F
⋮	

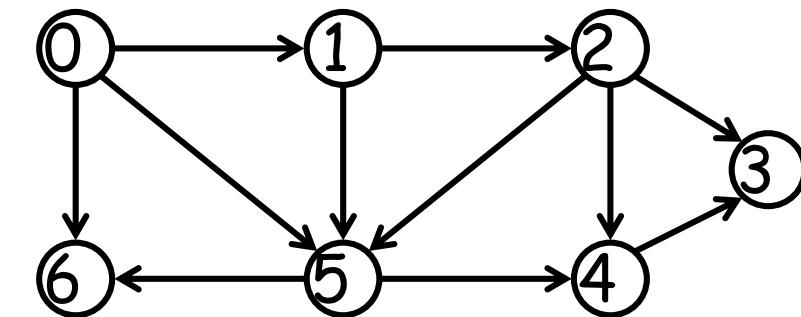
n
7

firstedge

0	1	5	6
1	2	5	
2	3	4	5
3			
4	3		
5	4	6	
6			
⋮			

סרייקת גראף בחיפוש לרוחב (BFS)

$$G = (V, E)$$



BFS(G)

V 

W 

עיר ה BFS

0

The diagram illustrates two vertical stacks of horizontal bars, each representing an array of size 7. The left stack is labeled **Q** and the right stack is labeled **visited**. The bars are indexed from 0 at the top to 6 at the bottom. In the **Q** stack, only index 0 contains a value '0'. In the **visited** stack, indices 0, 1, 2, 4, 5, and 6 contain the value 'F', while index 3 is empty.

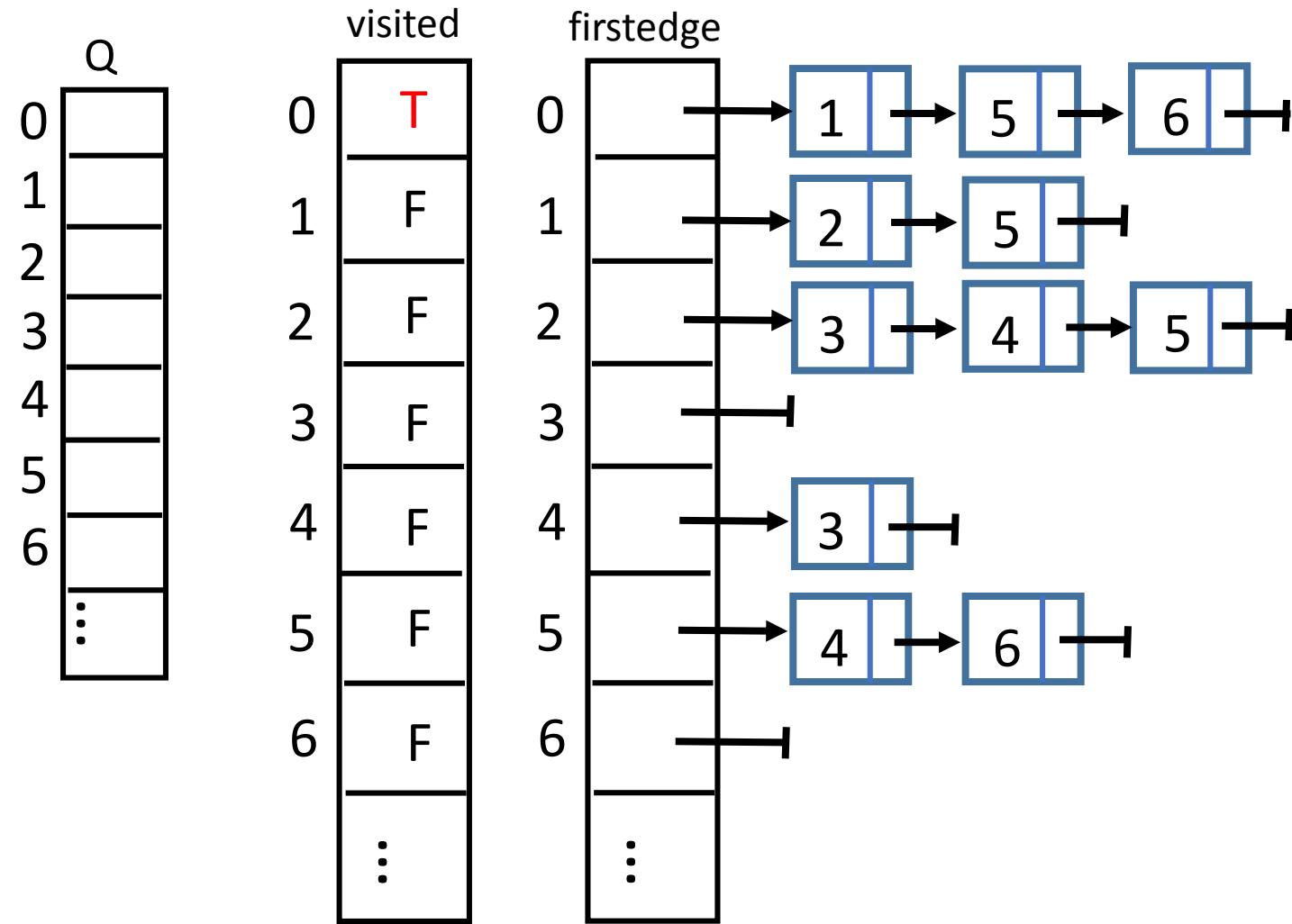
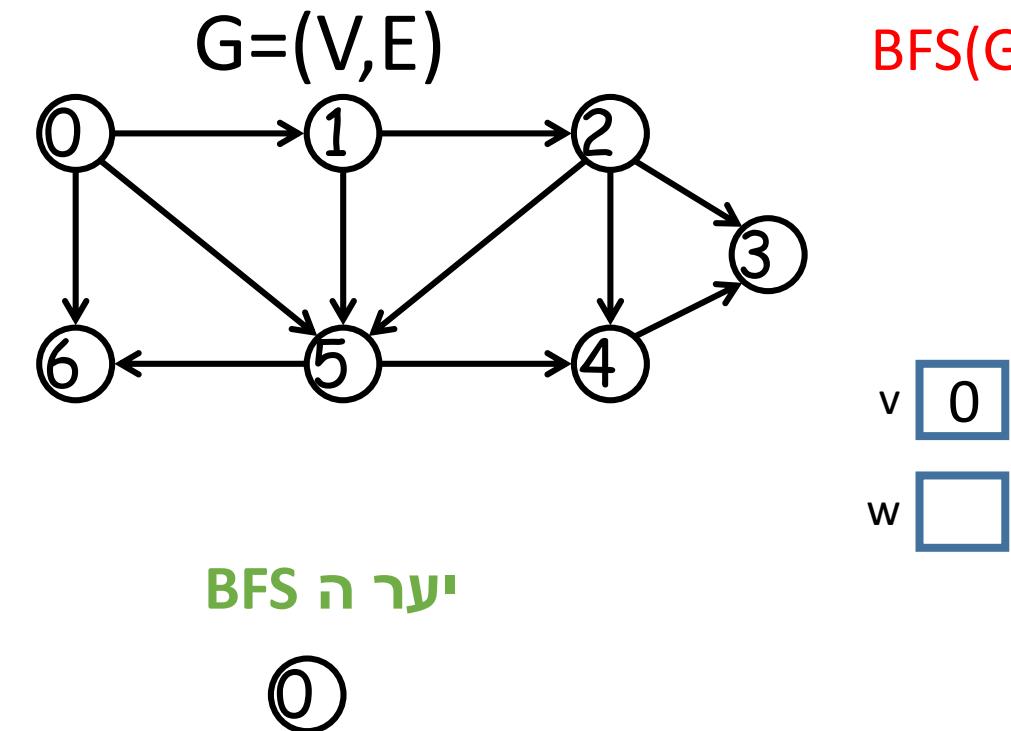
n 7

firstedge

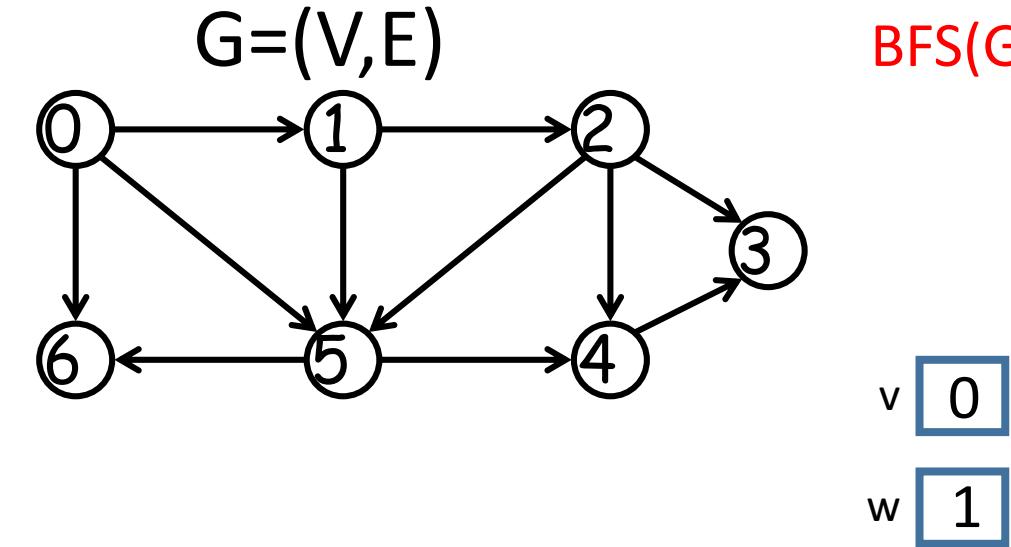
```

graph LR
    0[0] --> 1[1]
    0[0] --> 2[2]
    1[2] --> 5[5]
    2[1] --> 5[5]
    3[3] --> 4[4]
    4[4] --> 5[5]
    3[3] --> 5[5]
    5[5] --> 6[6]
    6[6] --> 7[7]
  
```

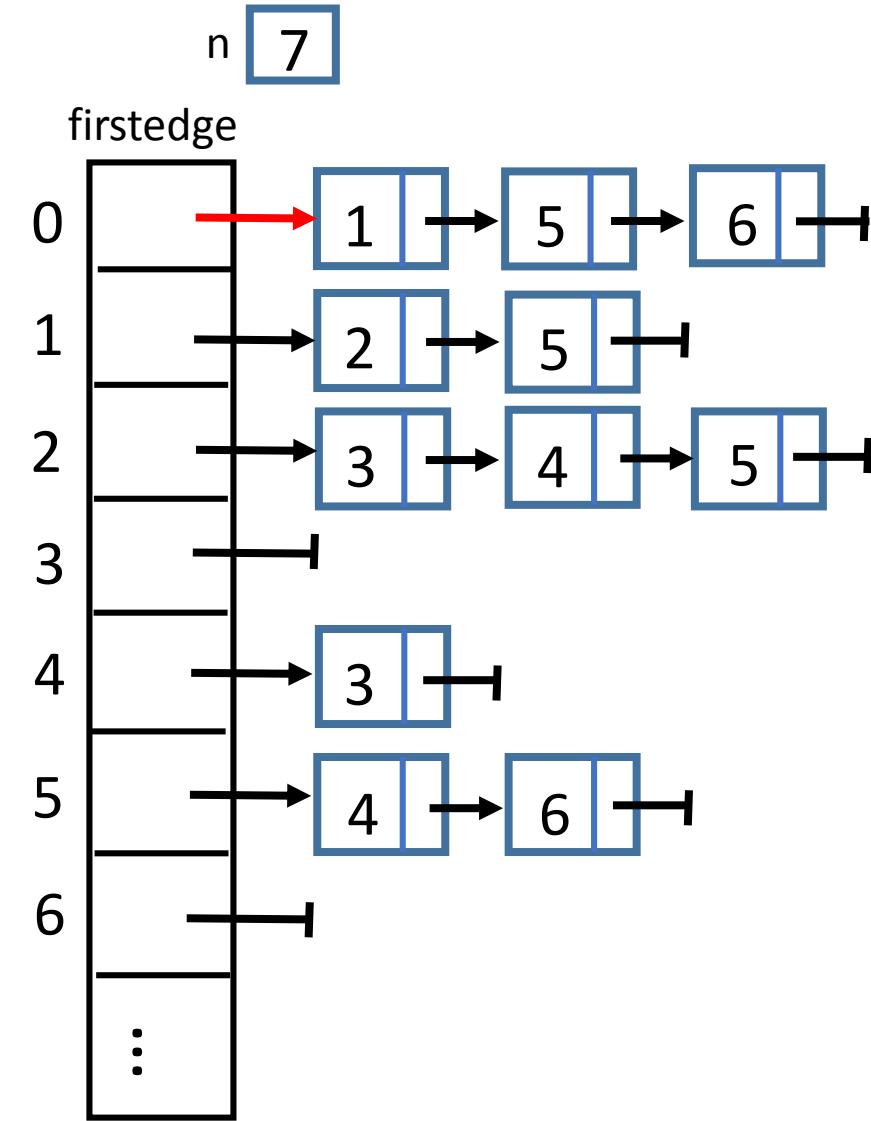
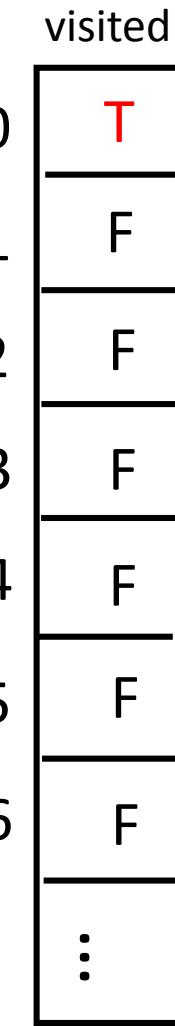
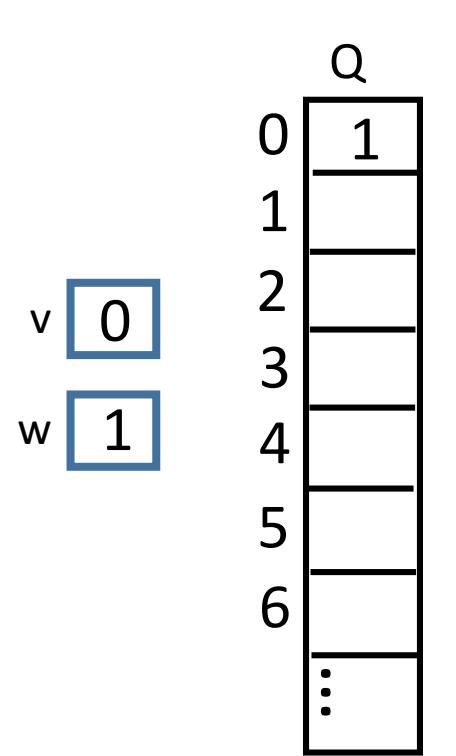
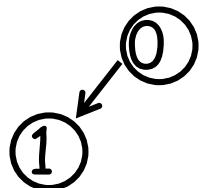
סריקת גרף בחיפוש לרוחב (BFS)



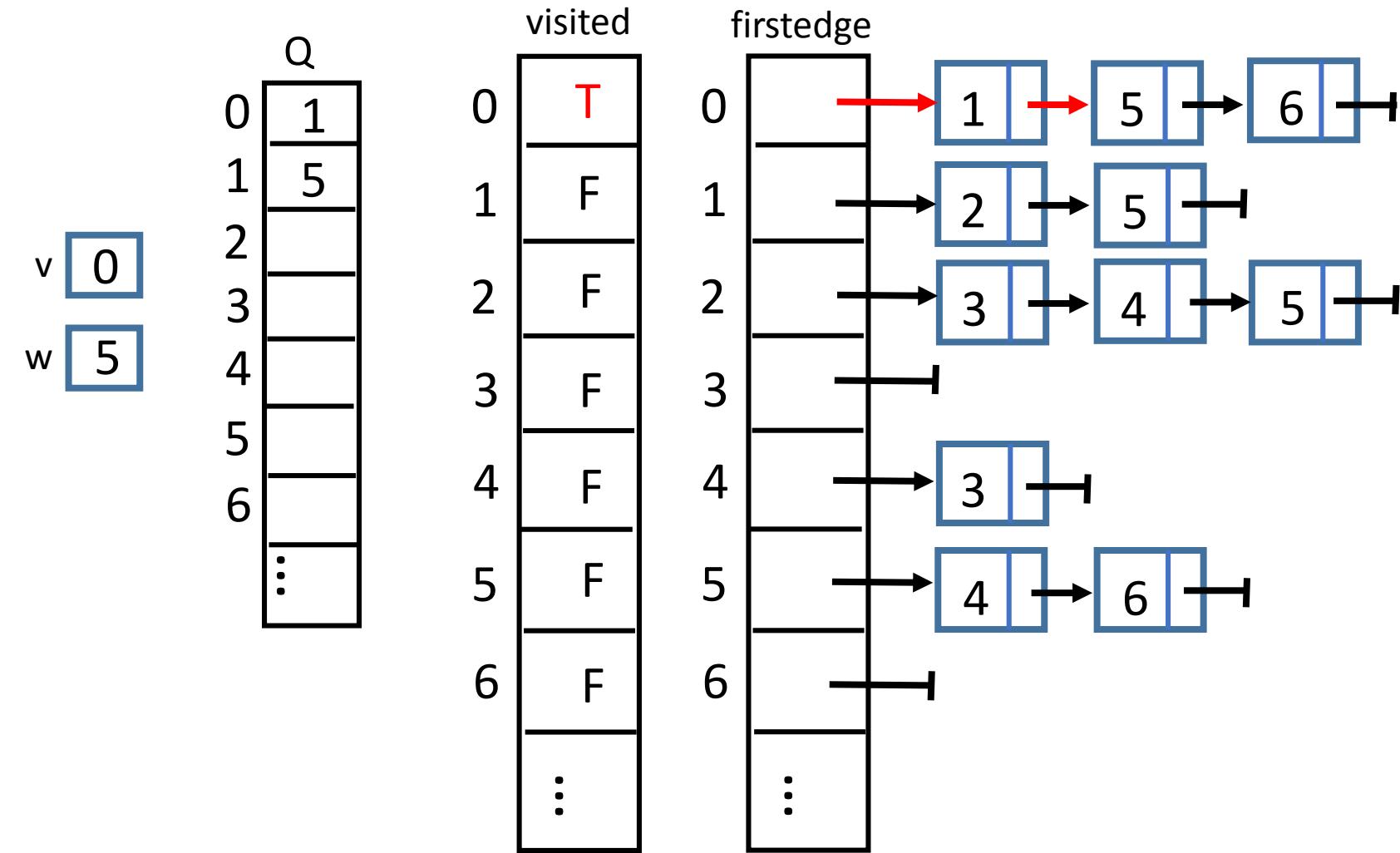
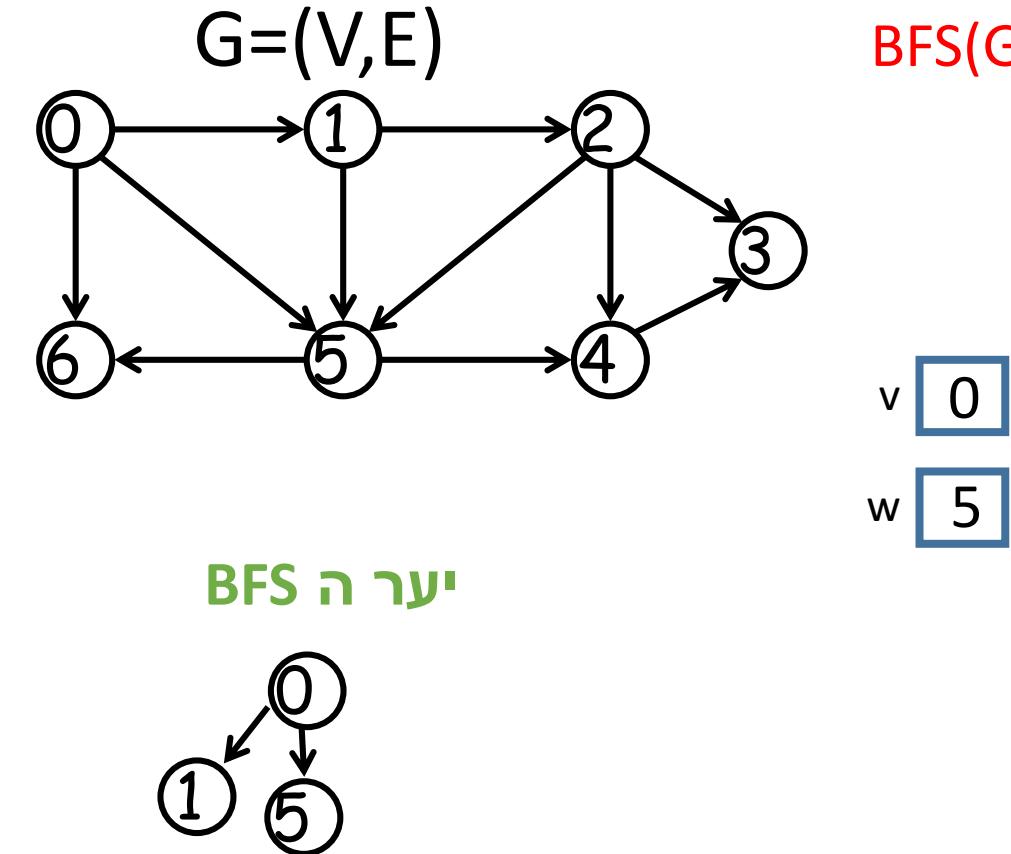
סריקת גרף בחיפוש לרוחב (BFS)



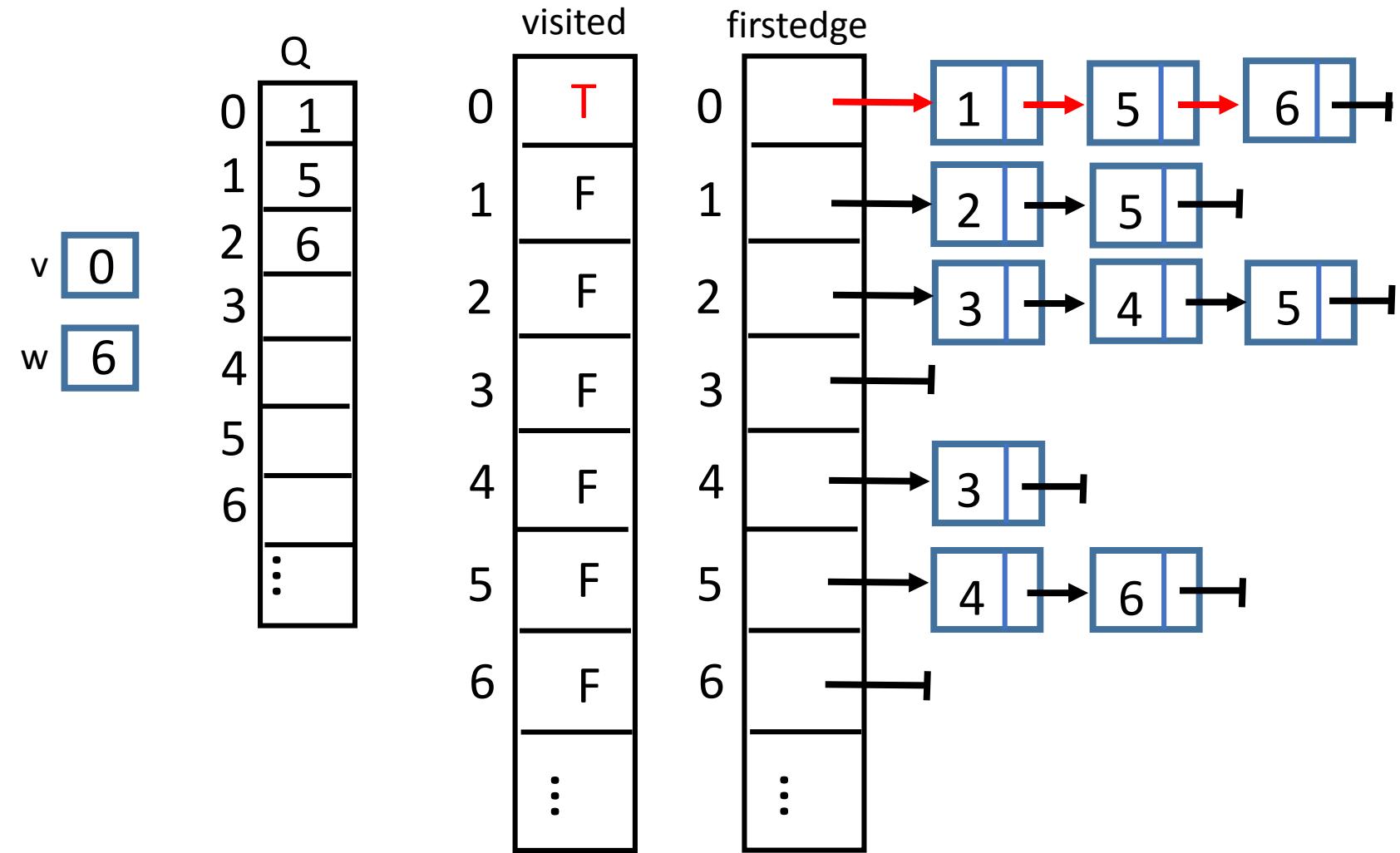
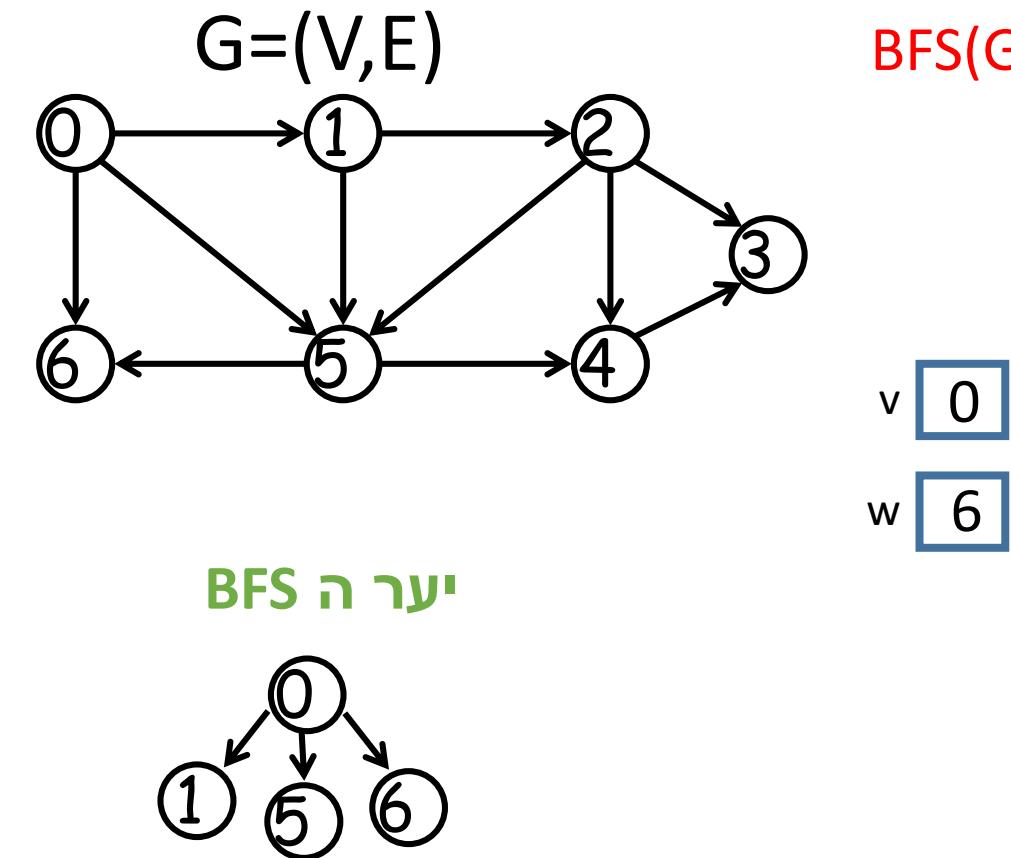
יער ה



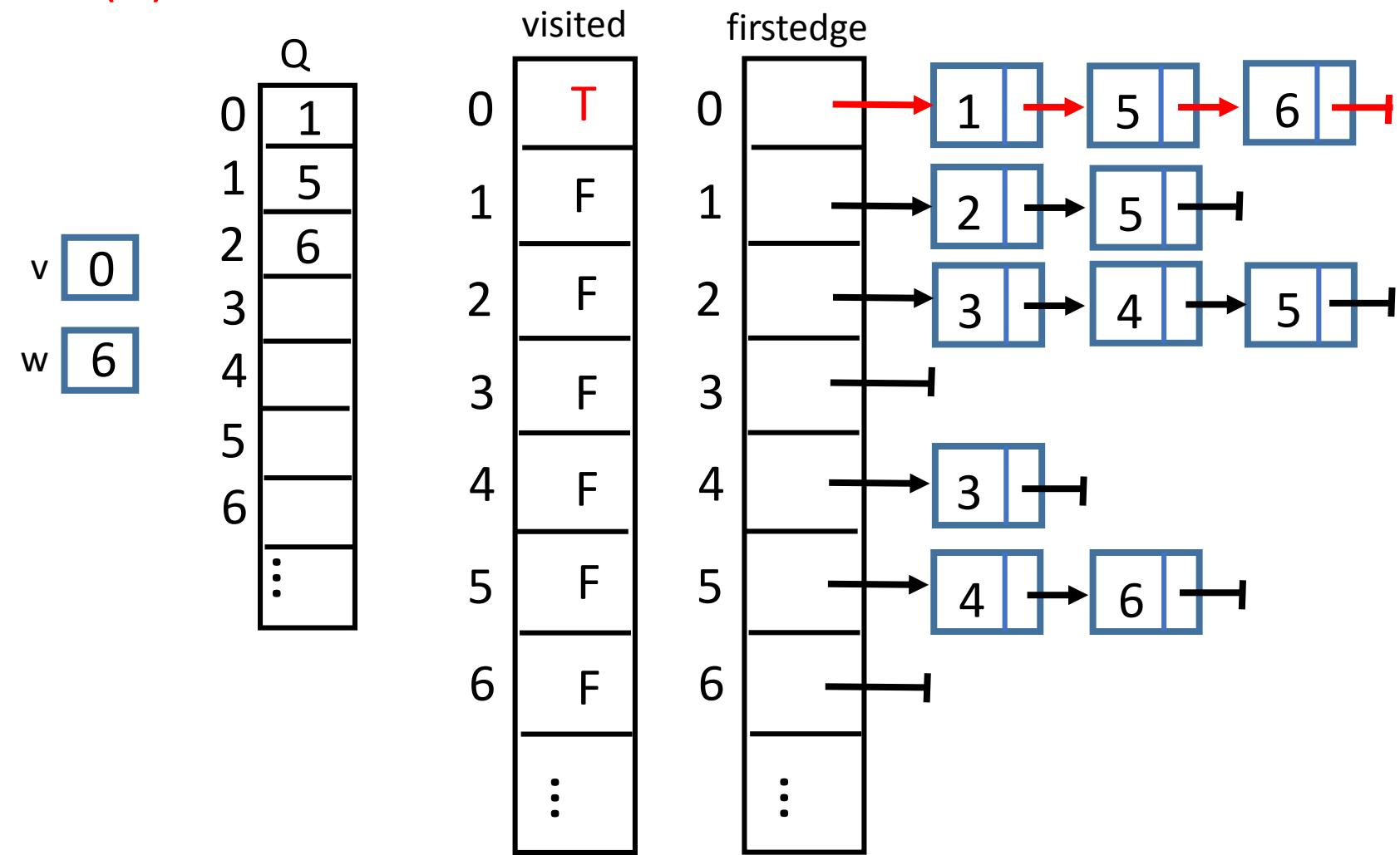
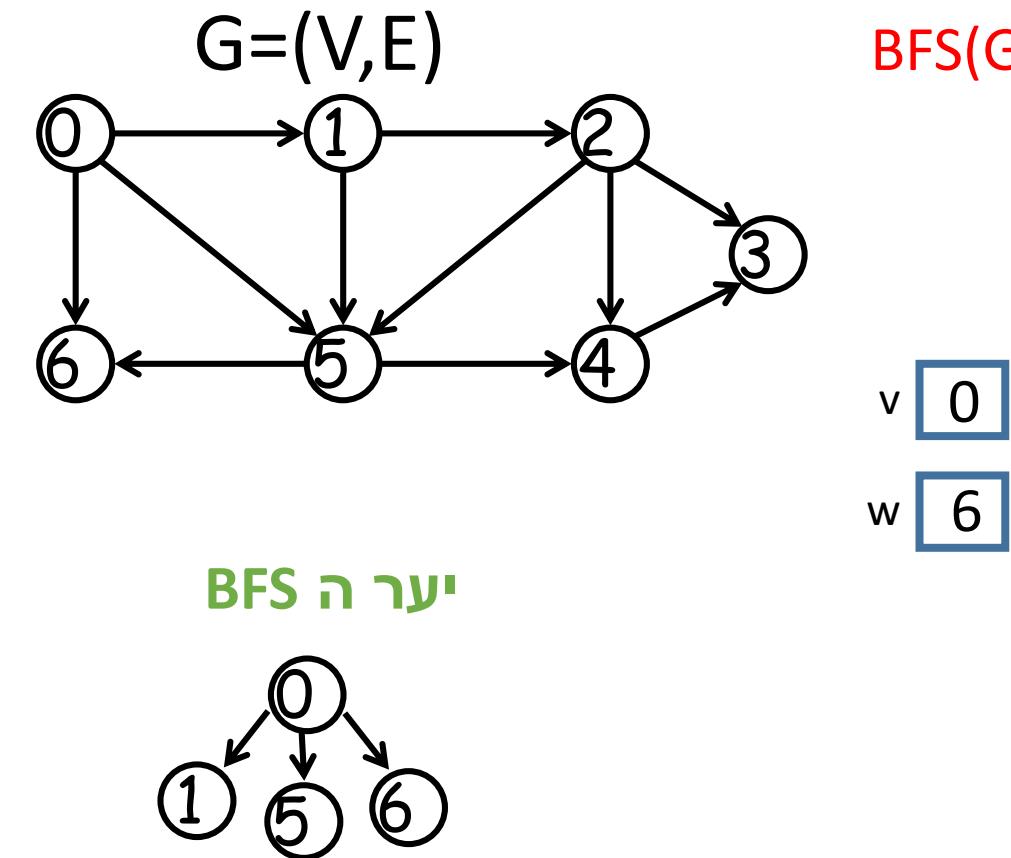
סריקת גרף בחיפוש לרוחב (BFS)



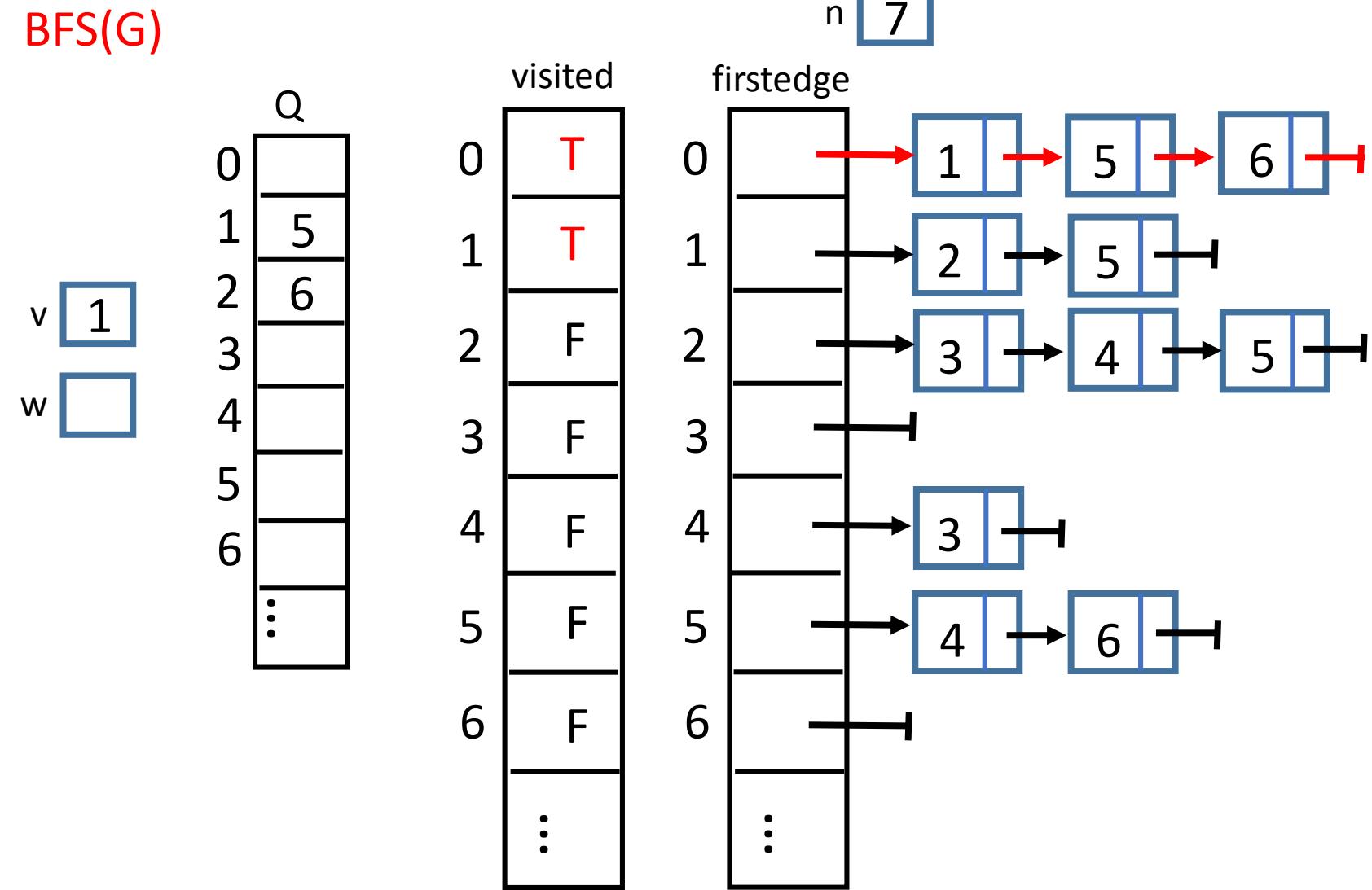
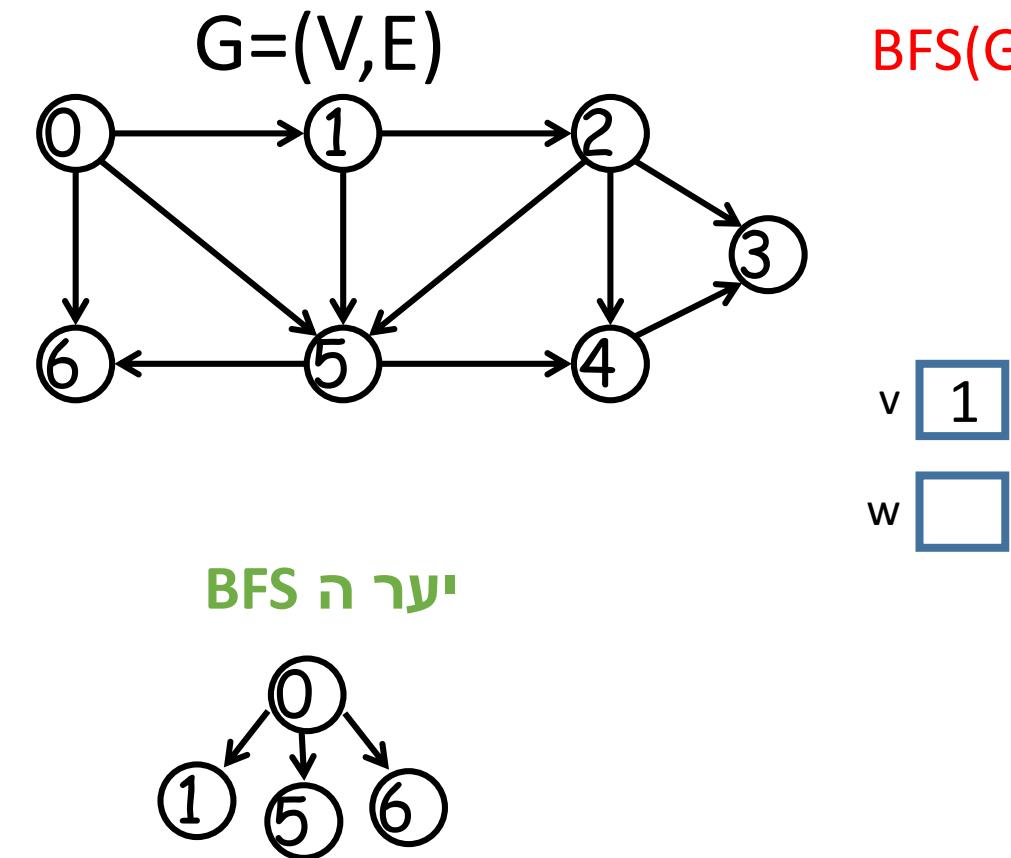
סריקת גרף בחיפוש לרוחב (BFS)



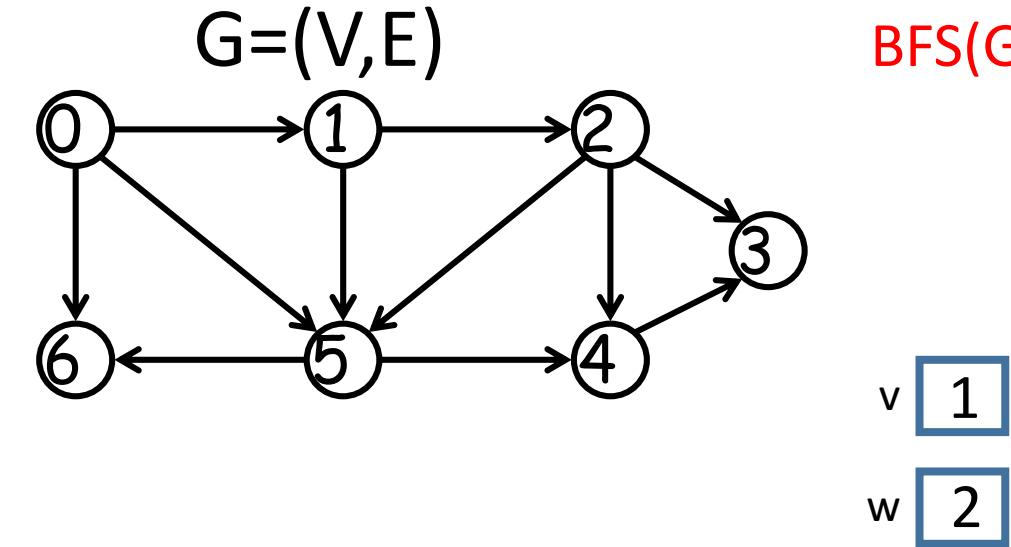
סריקת גרף בחיפוש לרוחב (BFS)



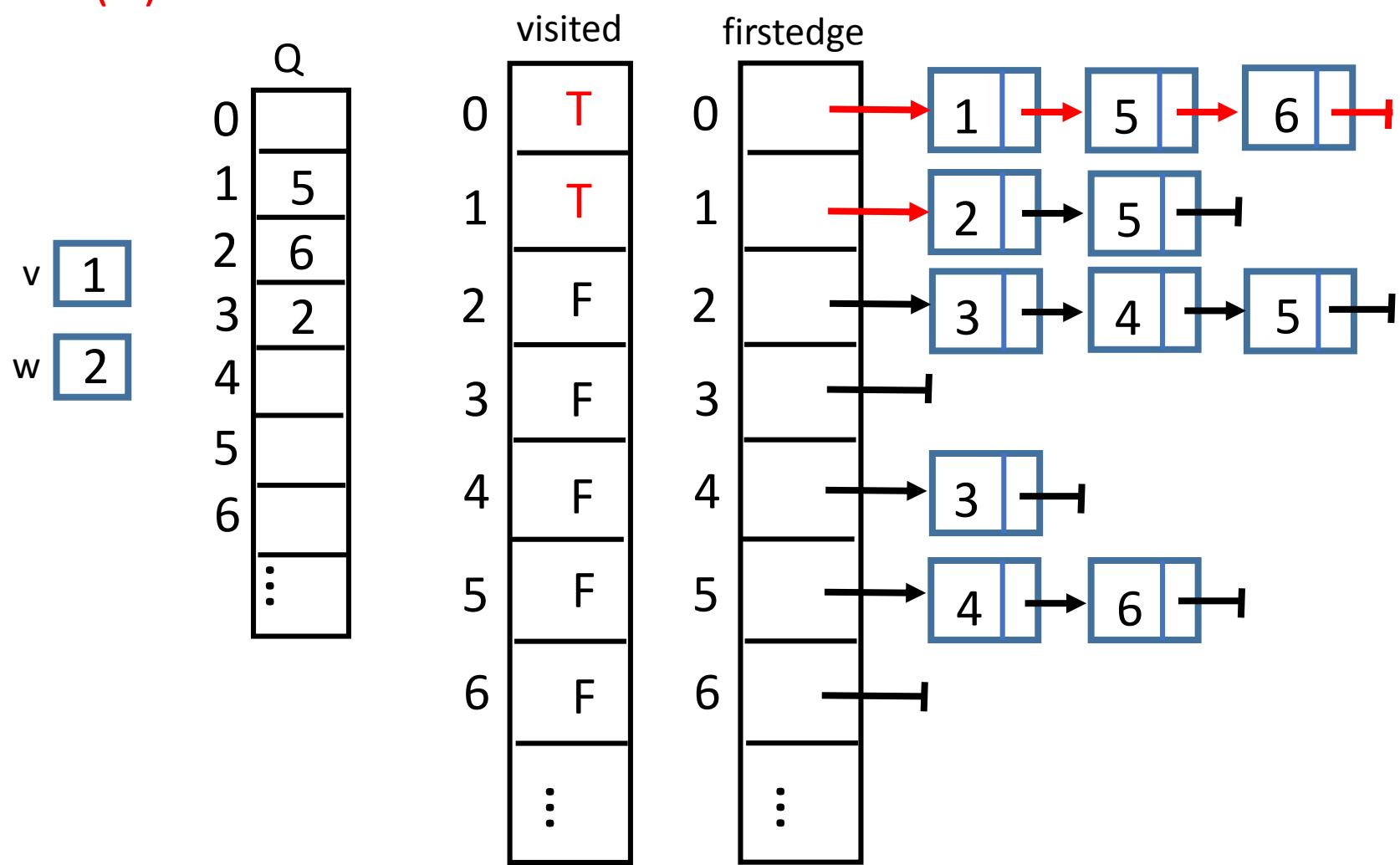
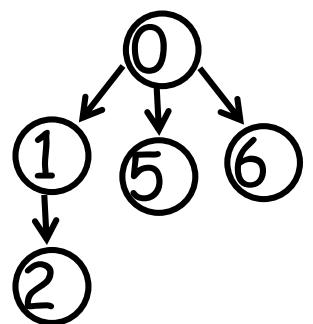
סריקת גרף בחיפוש לרוחב (BFS)



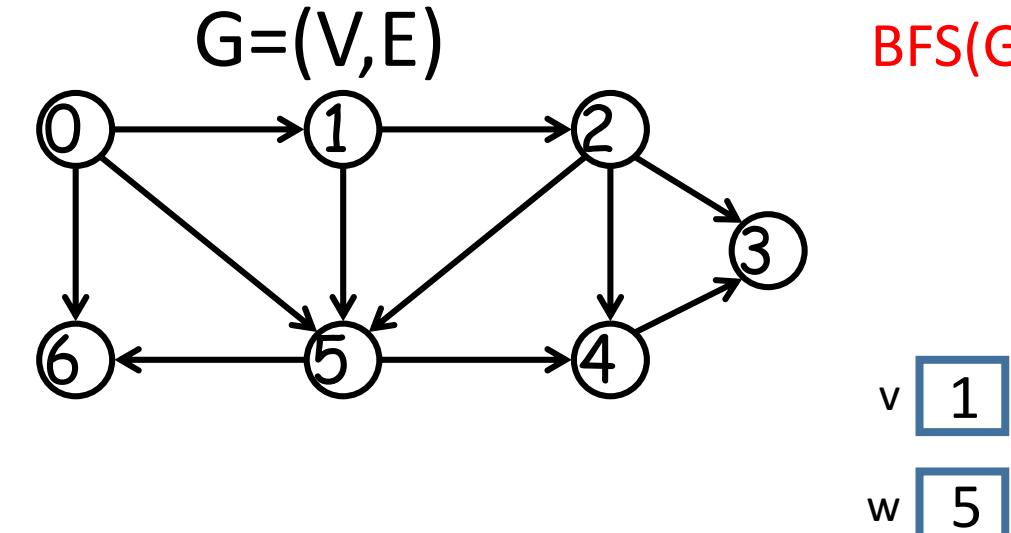
סריקת גרף בחיפוש לרוחב (BFS)



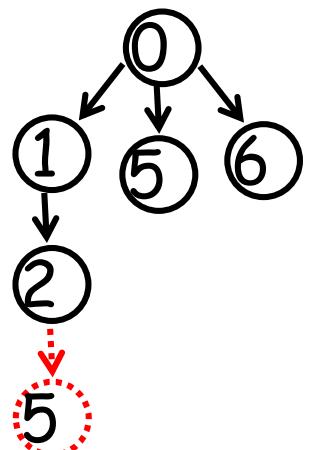
יער ה



סריקת גרף בחיפוש לרוחב (BFS)

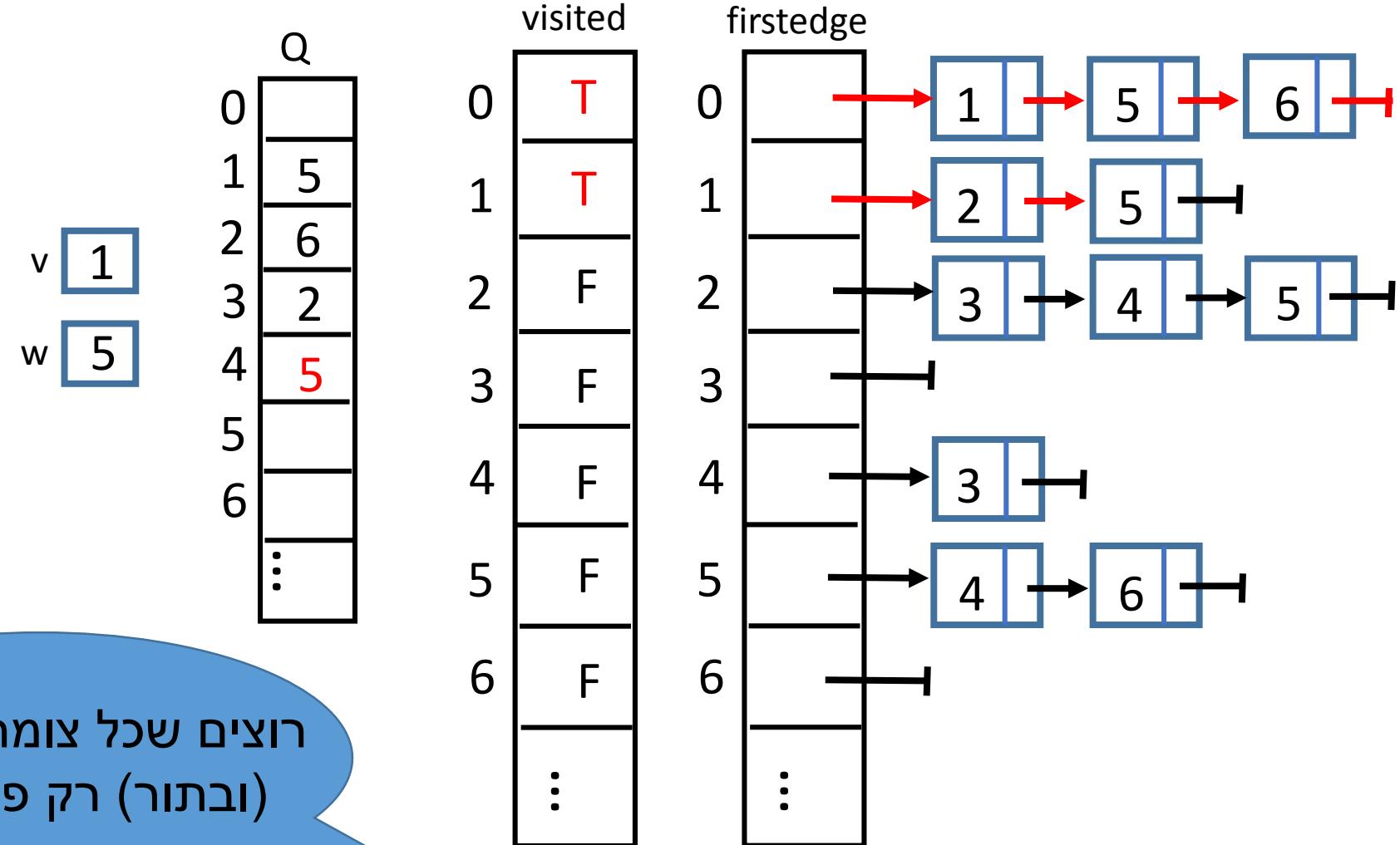


יער ה

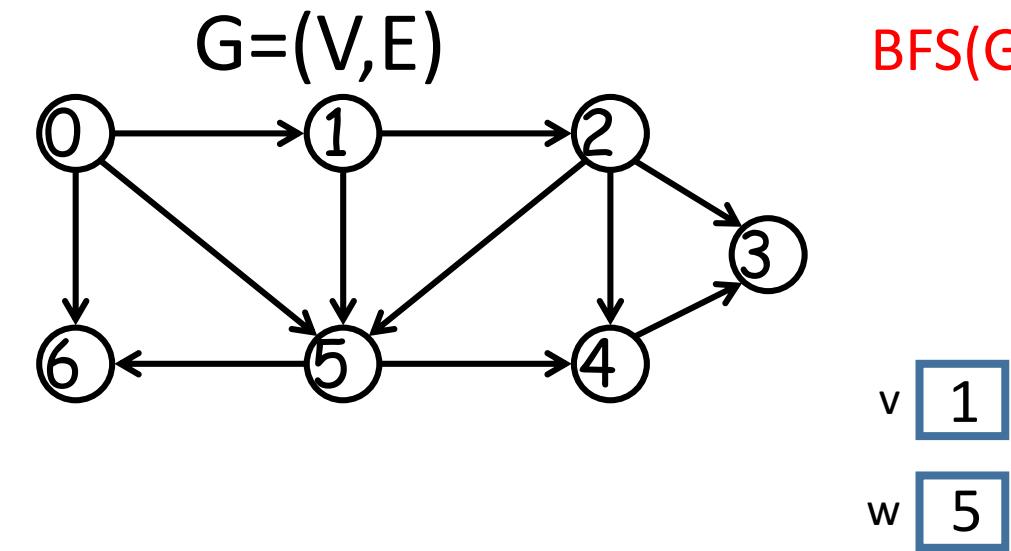


רוצים שכל צומת יהיה בעץ
(ובתור) רק פעם אחת!

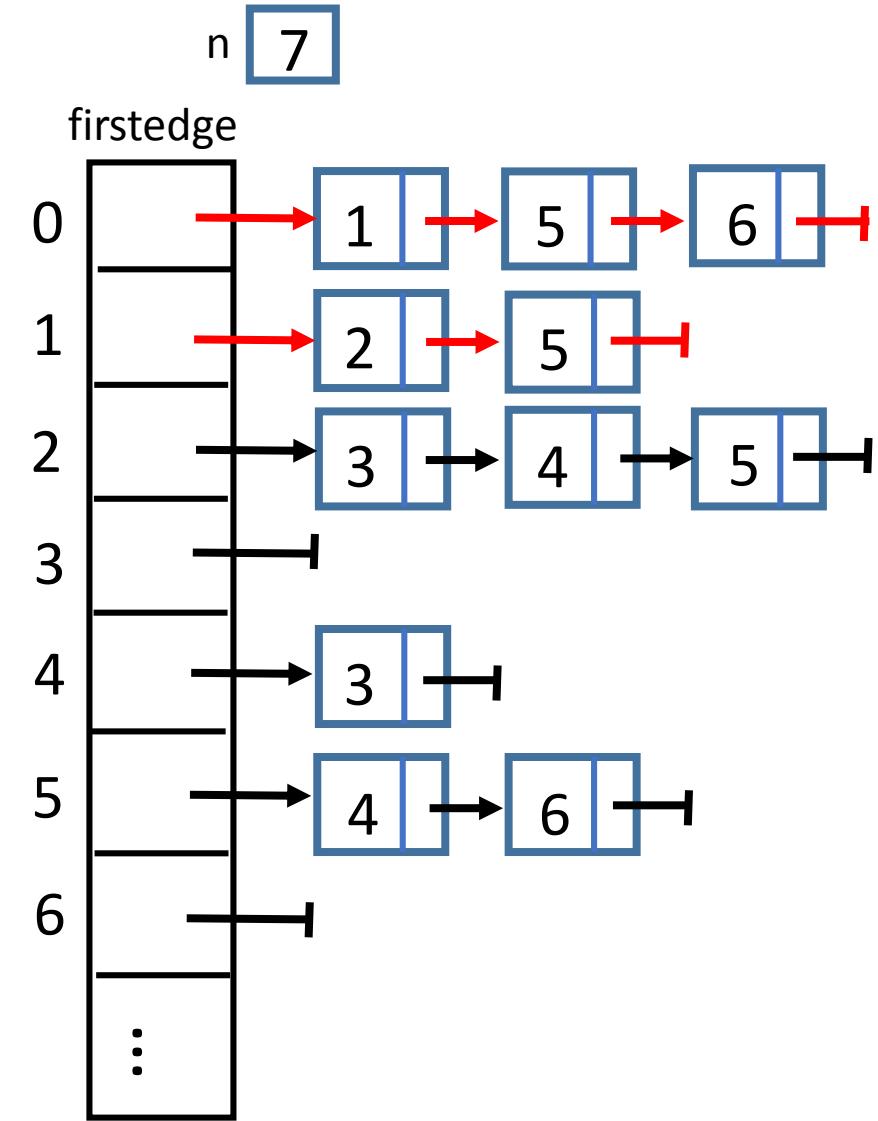
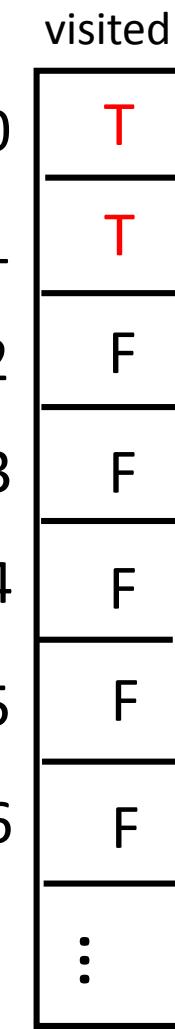
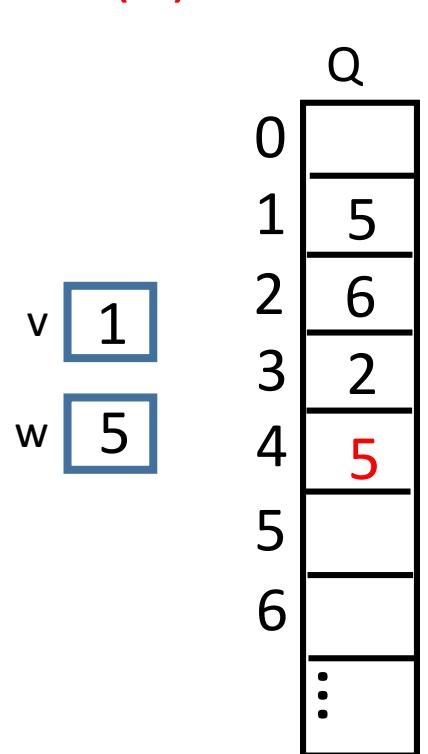
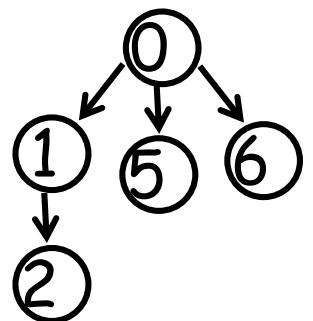
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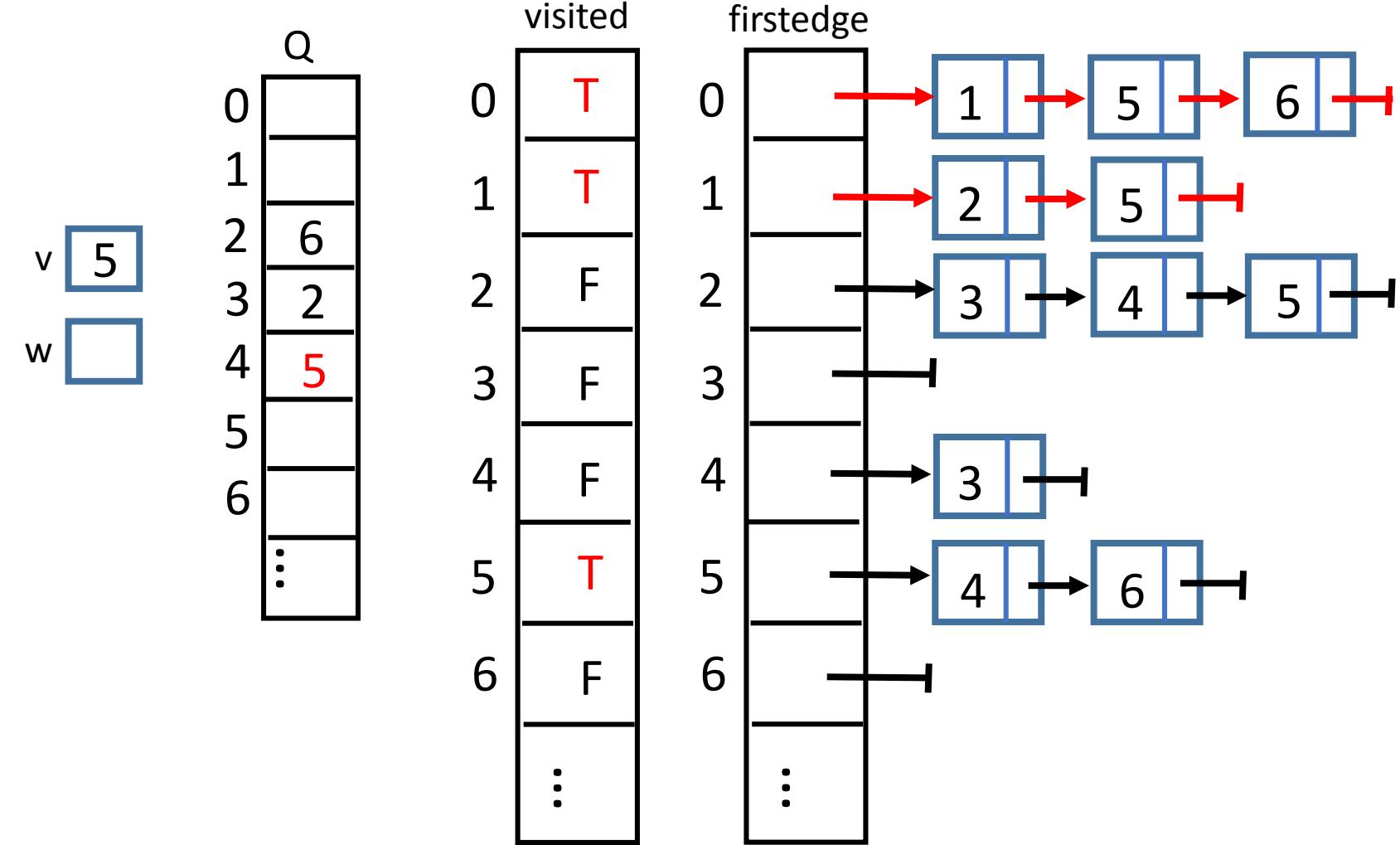
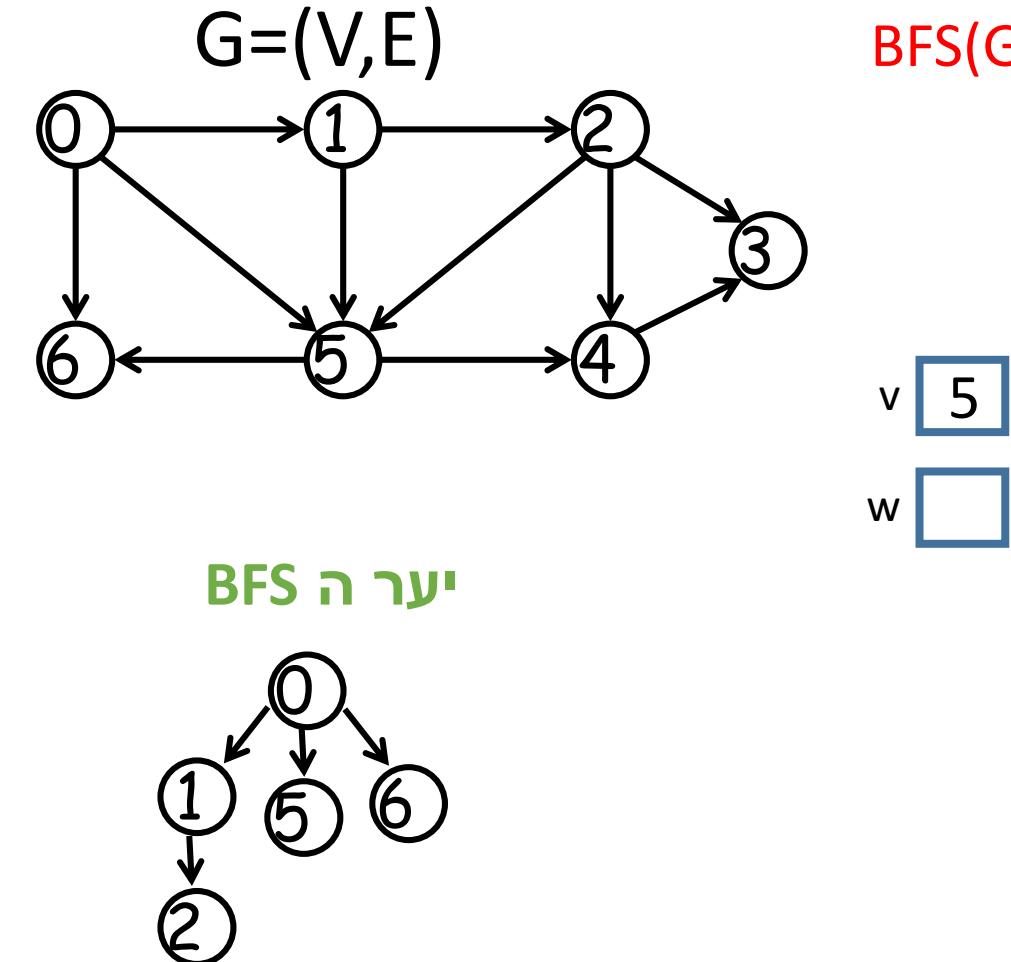
סריקת גרף בחיפוש לרוחב (BFS)



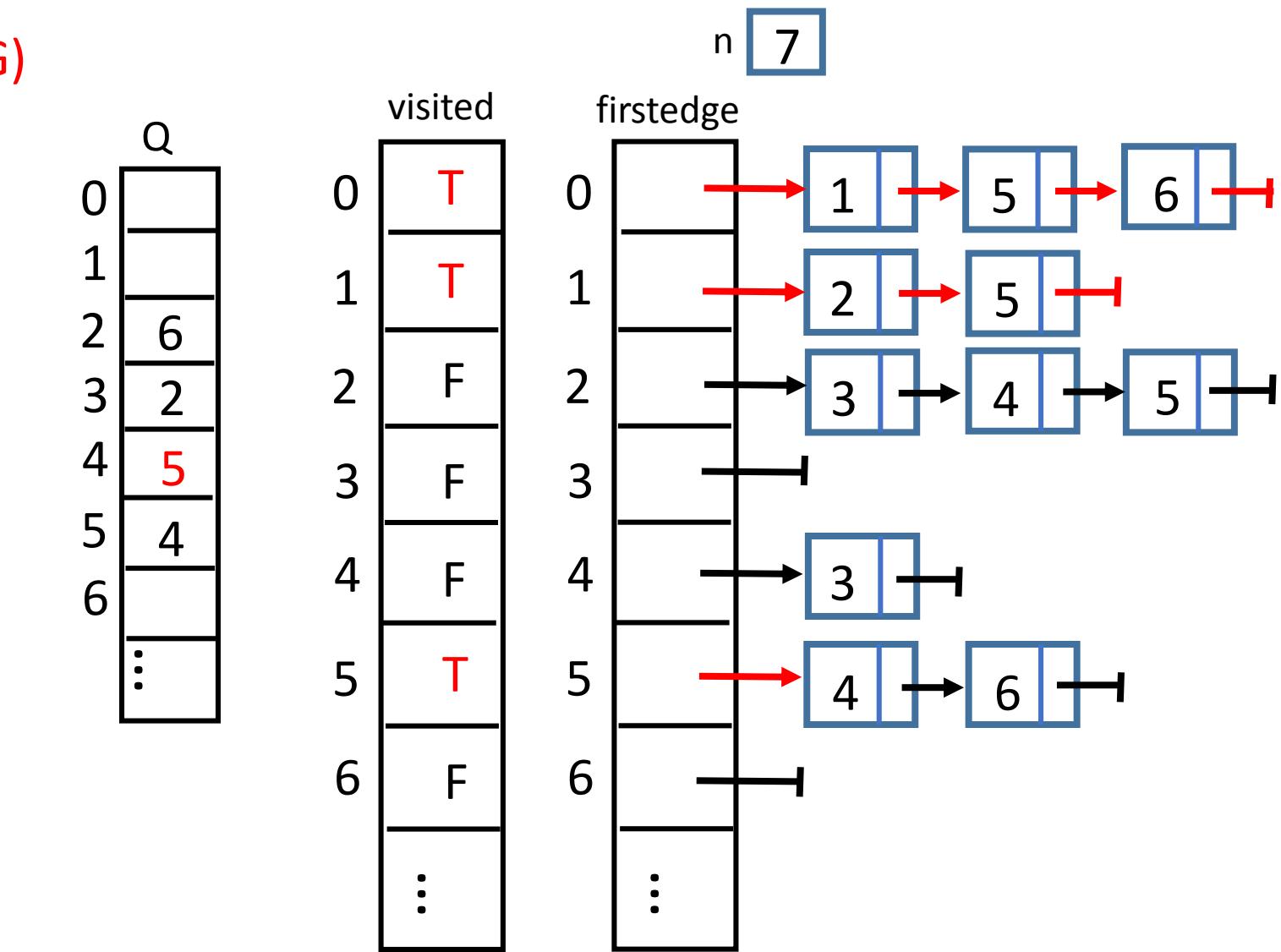
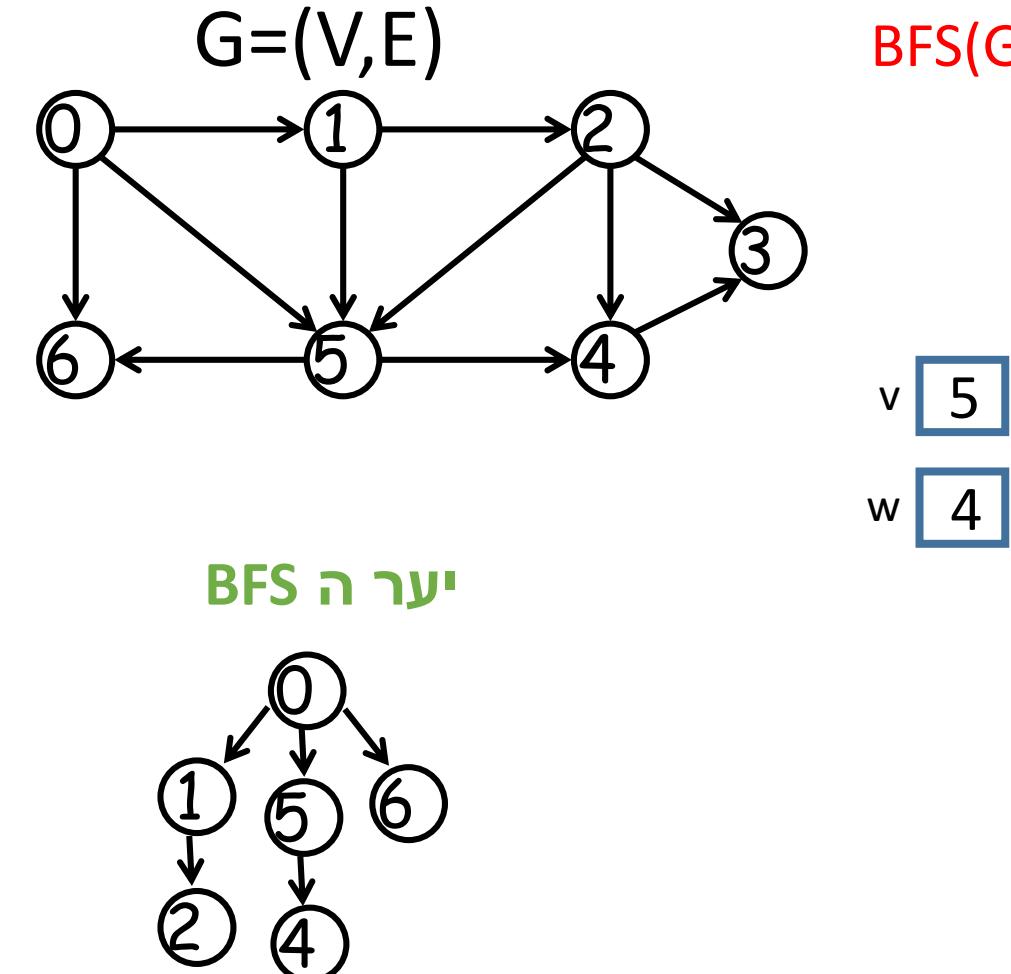
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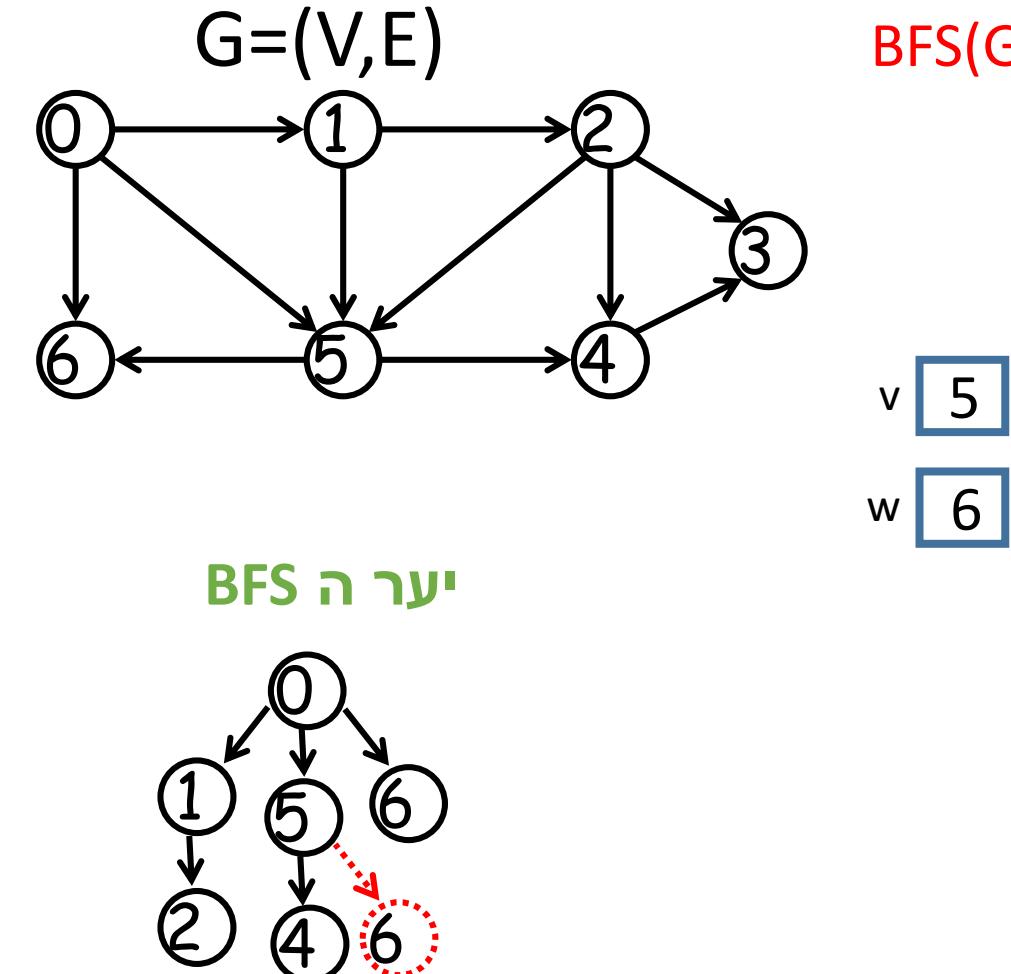
סריקת גרף בחיפוש לרוחב (BFS)



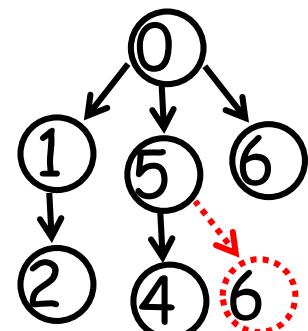
סריקת גרף בחיפוש לרוחב (BFS)



סריקת גרף בחיפוש לרוחב (BFS)



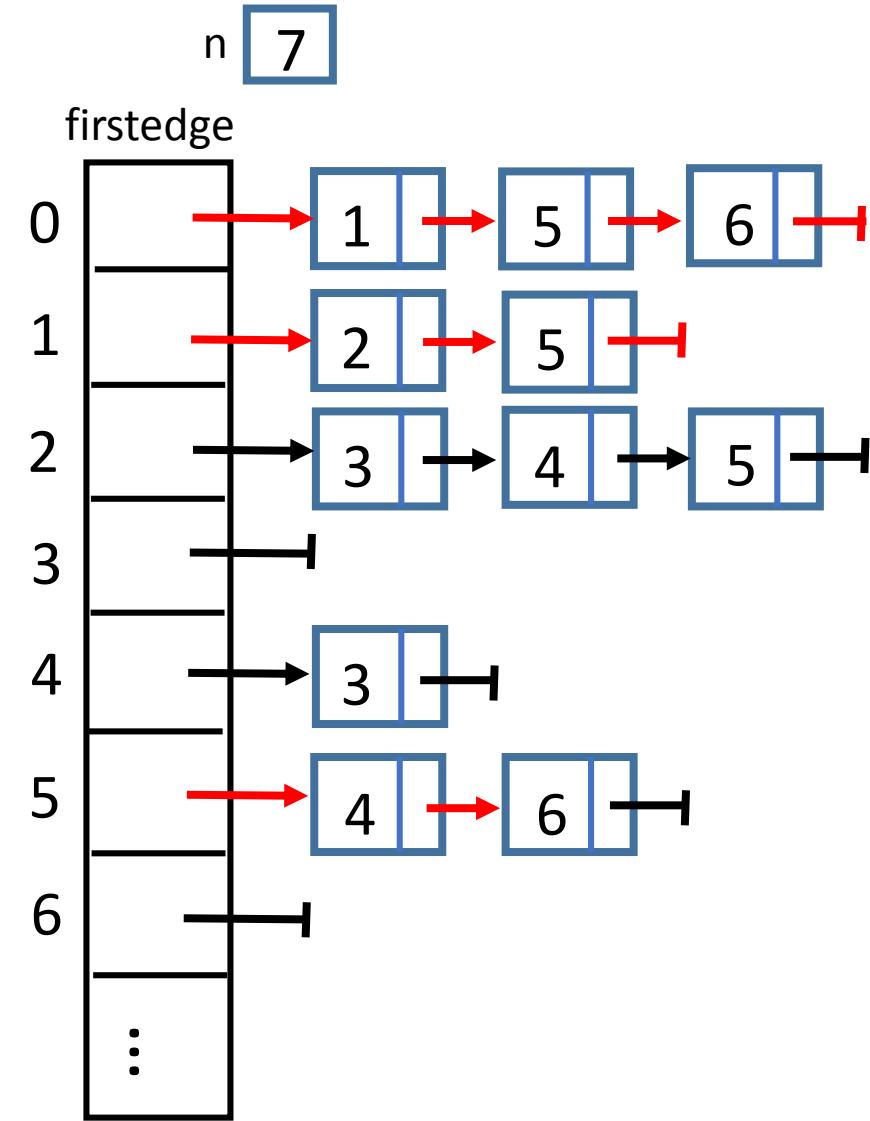
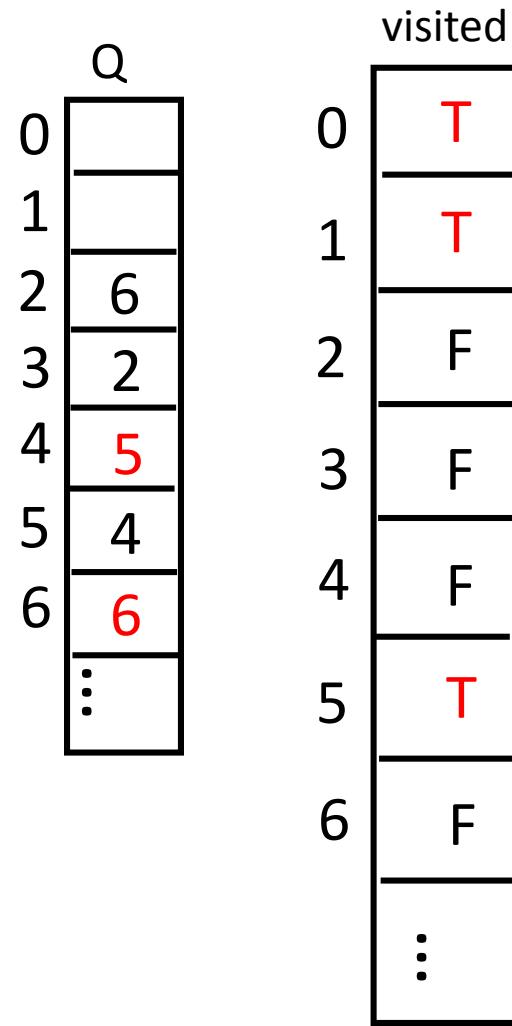
יער ה



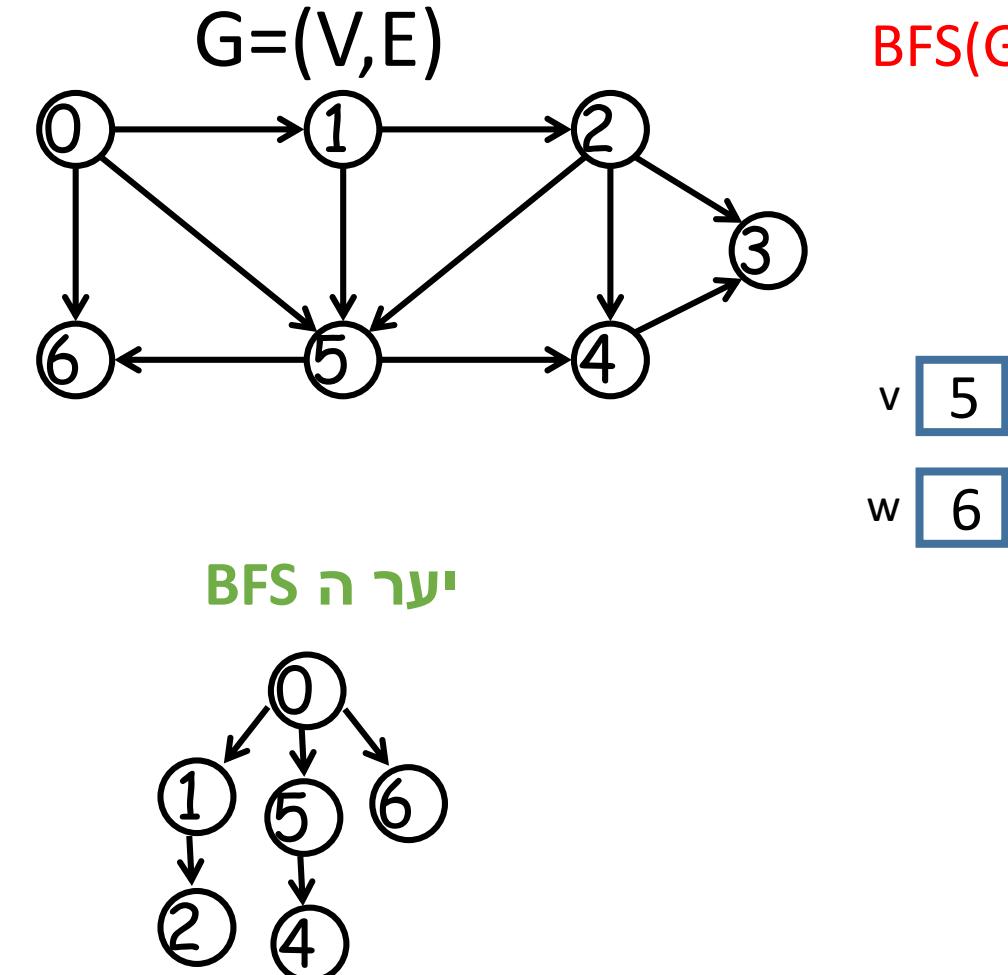
$BFS(G)$

Variables:

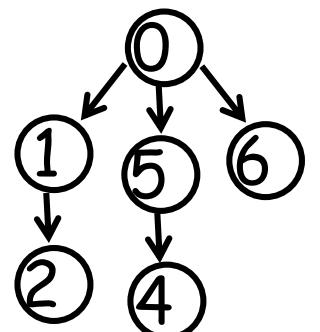
- v : 5
- w : 6



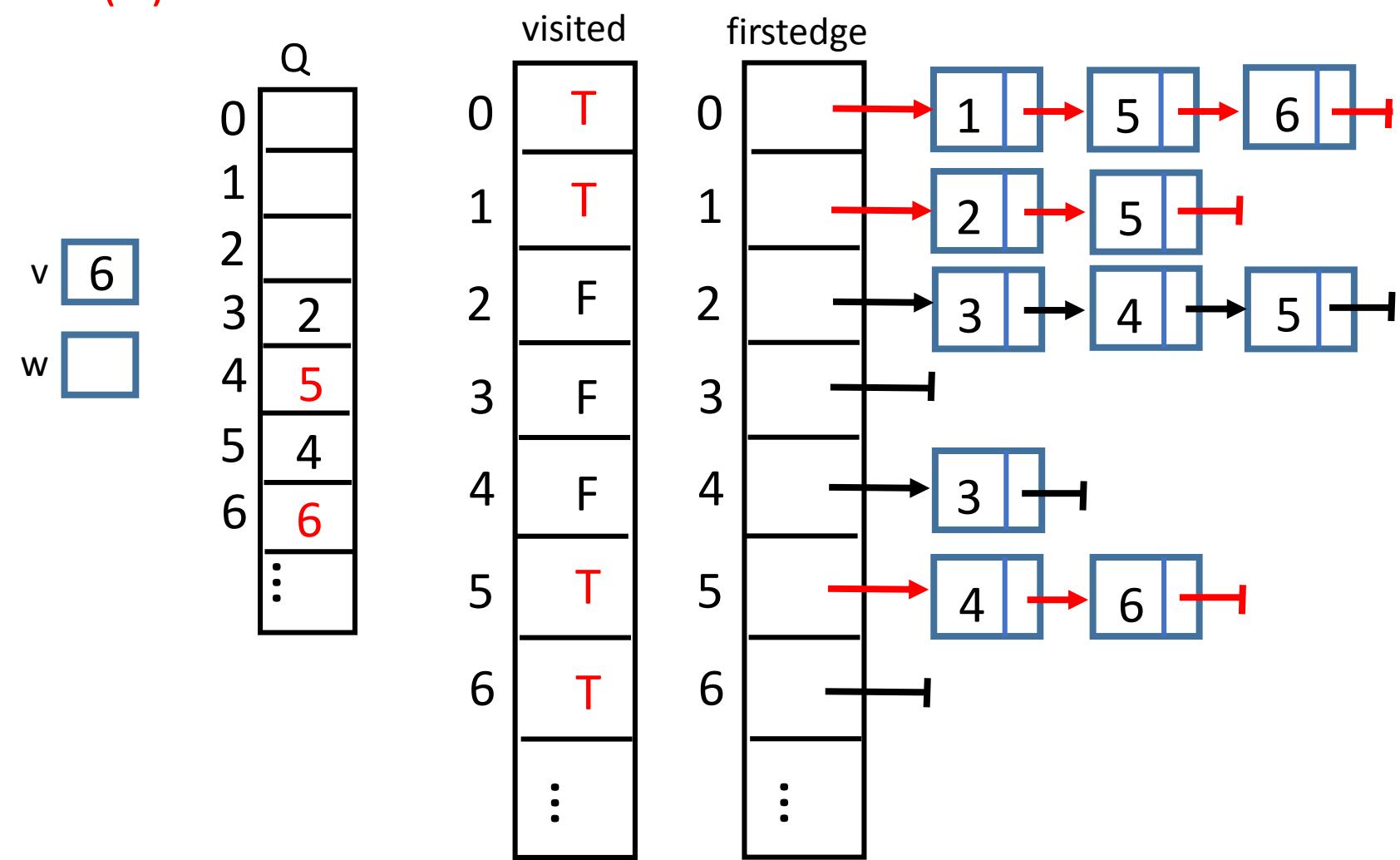
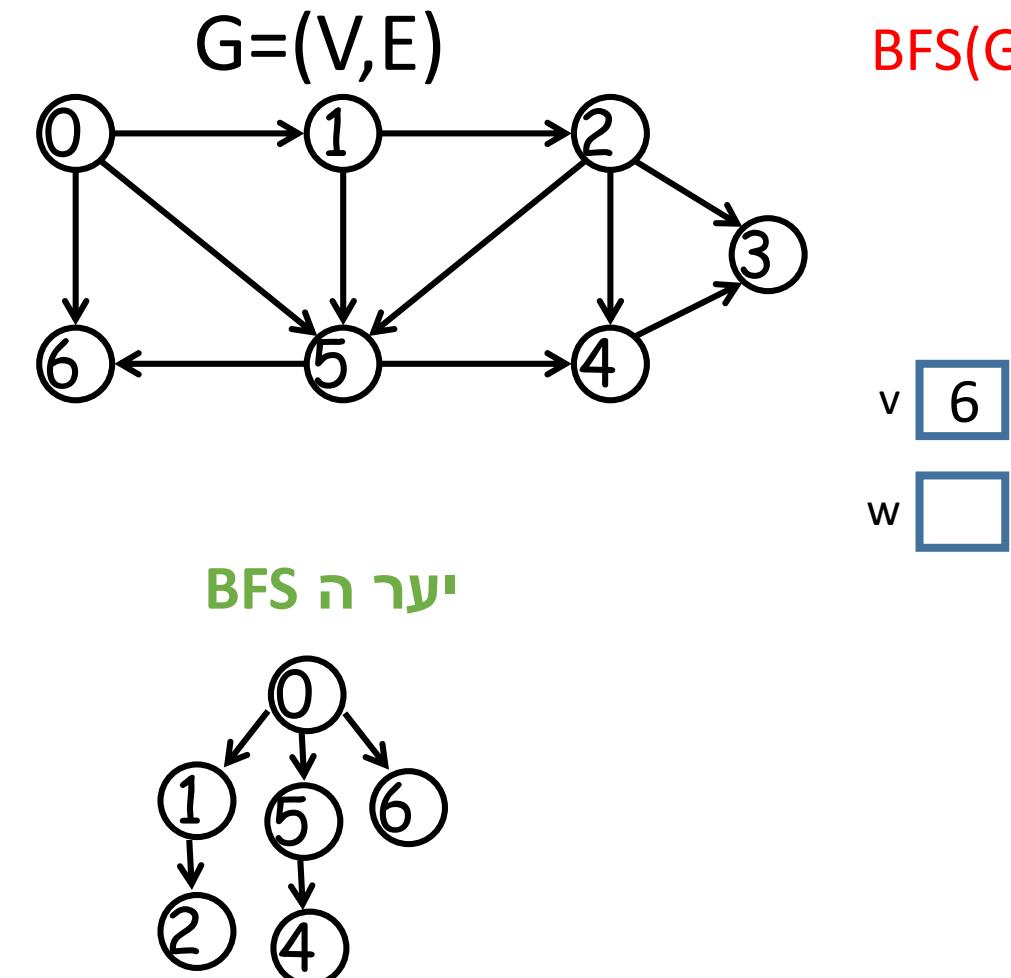
סריקת גרף בחיפוש לרוחב (BFS)



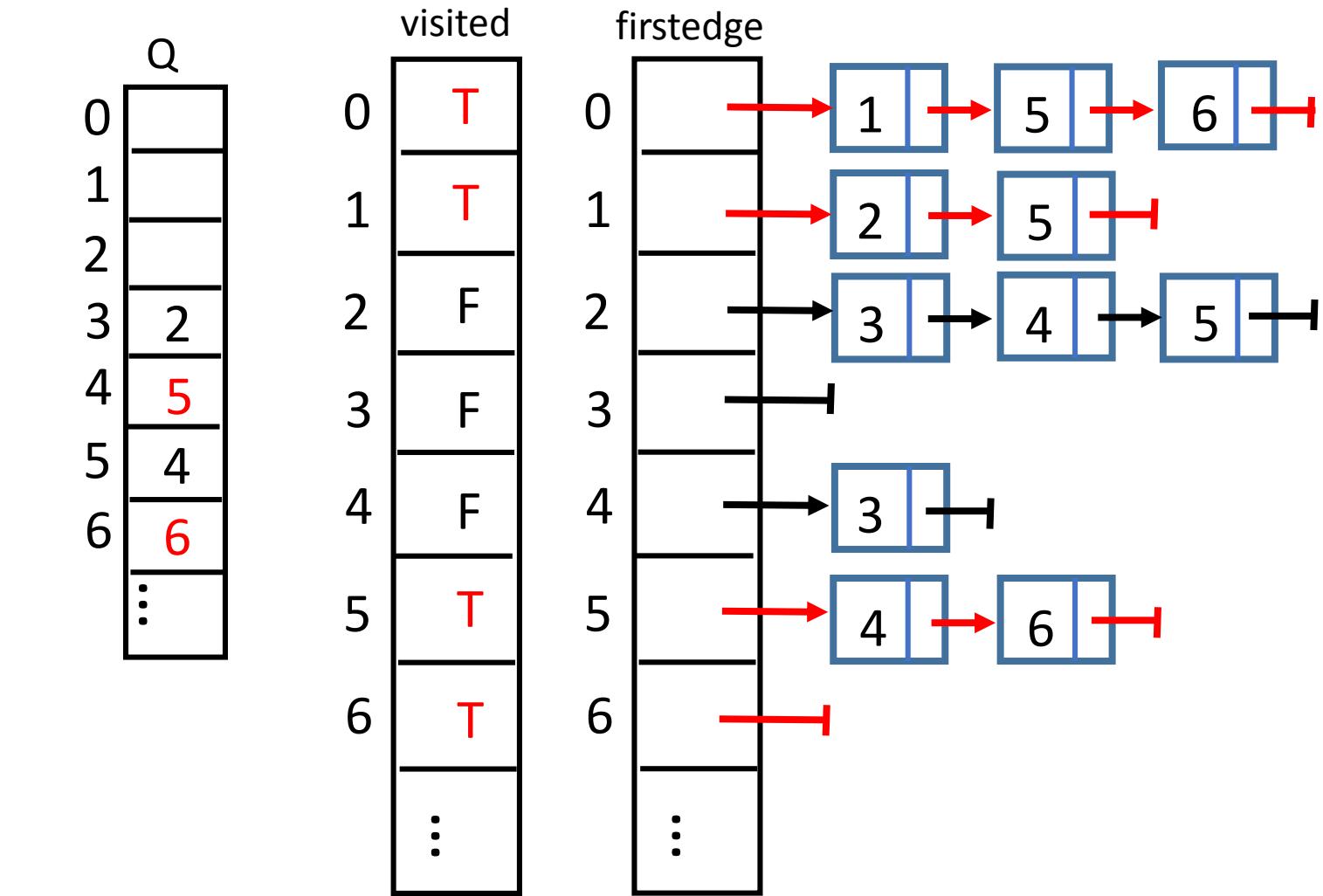
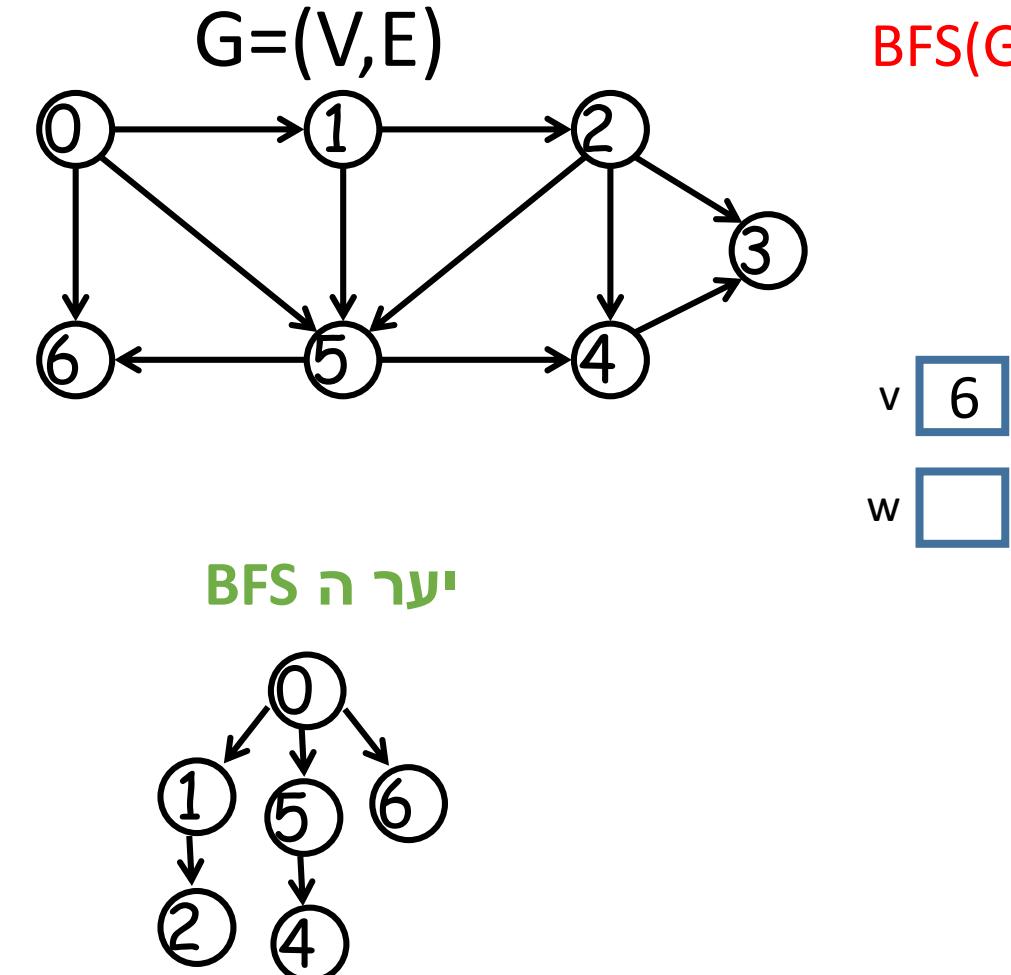
יער ה



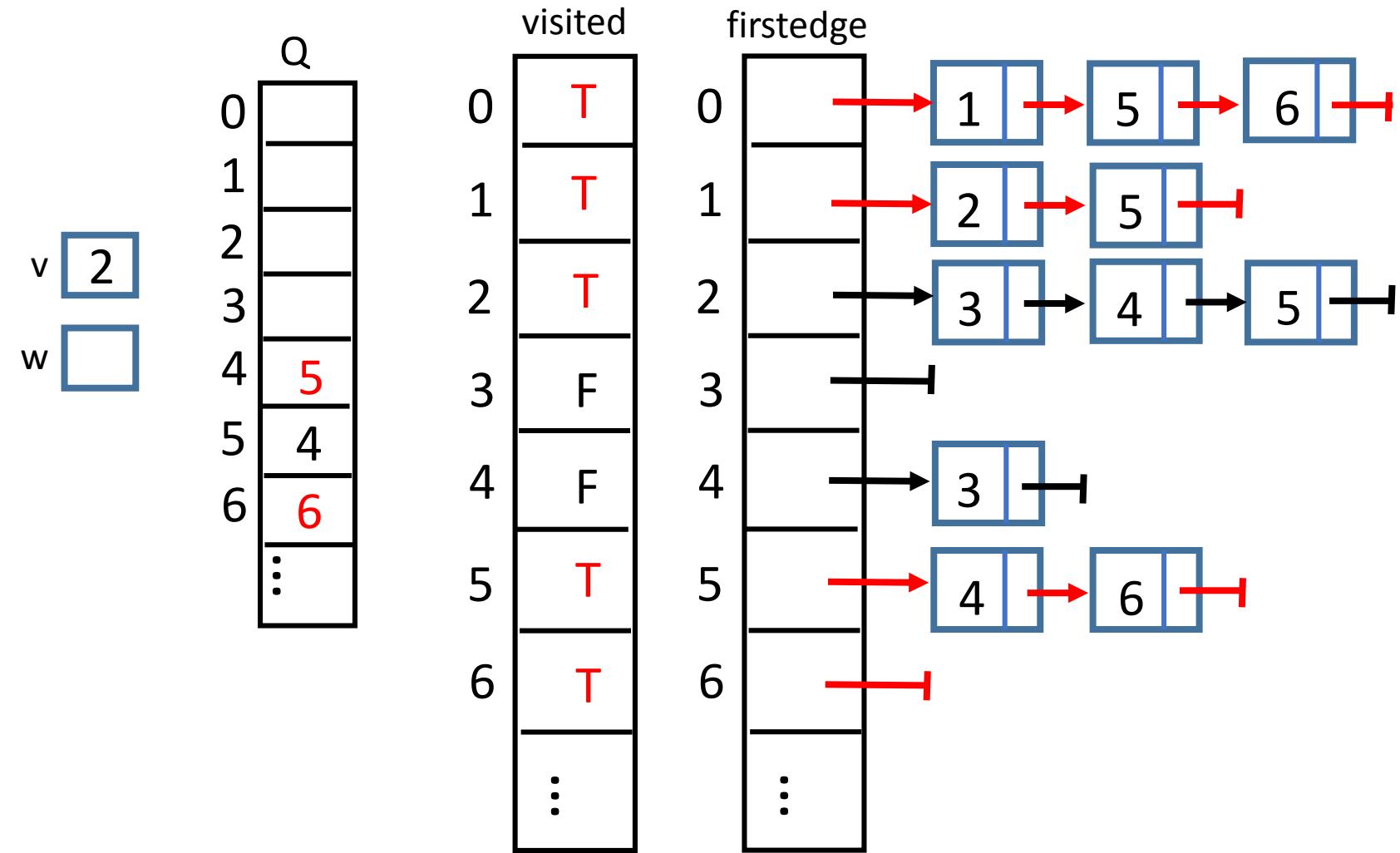
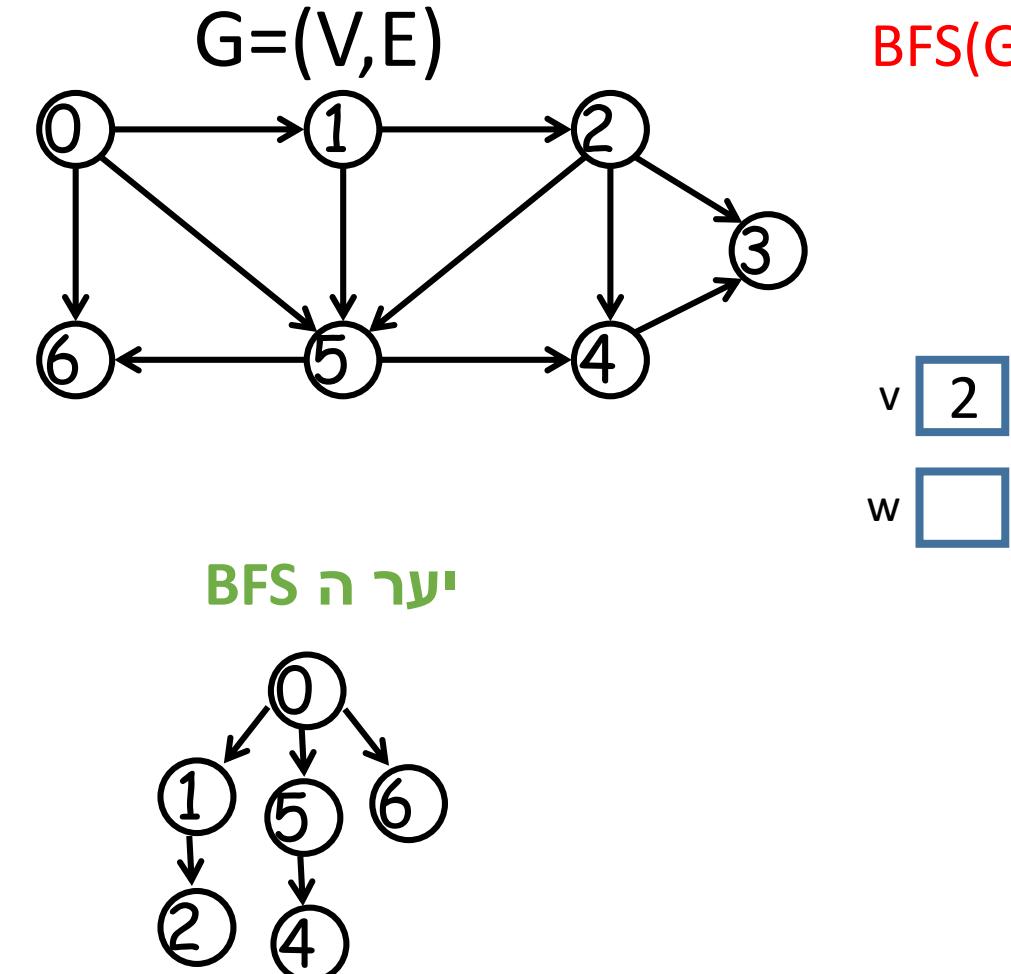
סריקת גרף בחיפוש לרוחב (BFS)



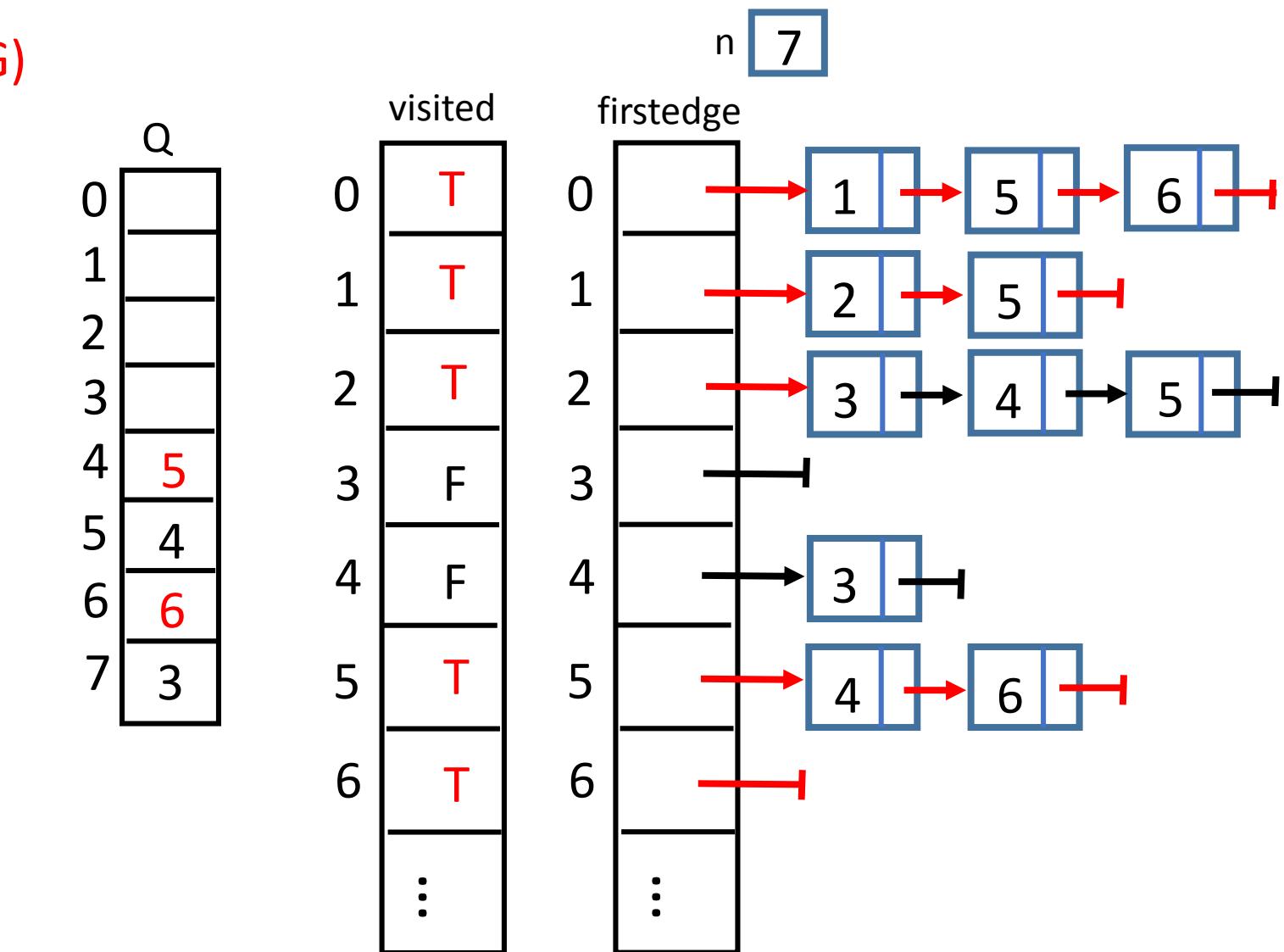
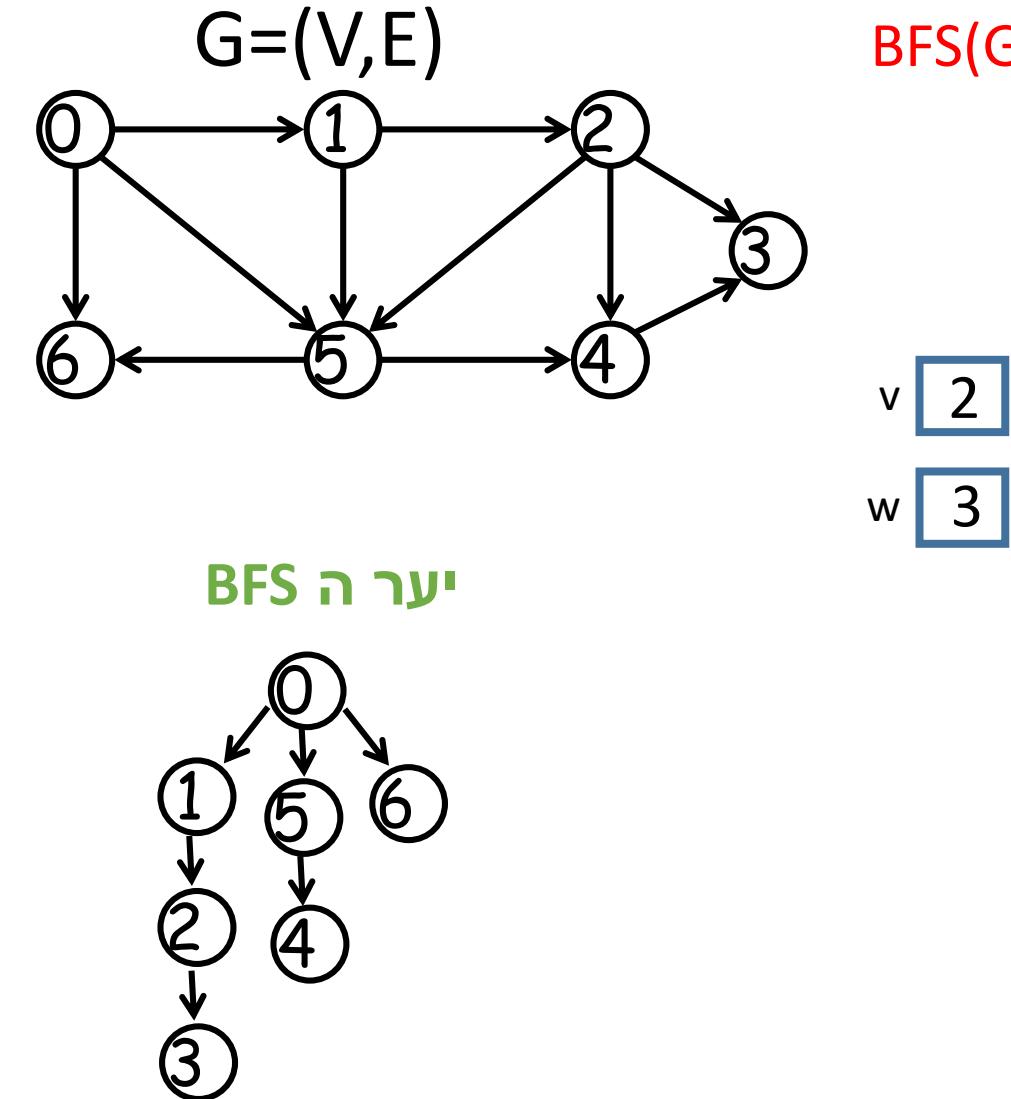
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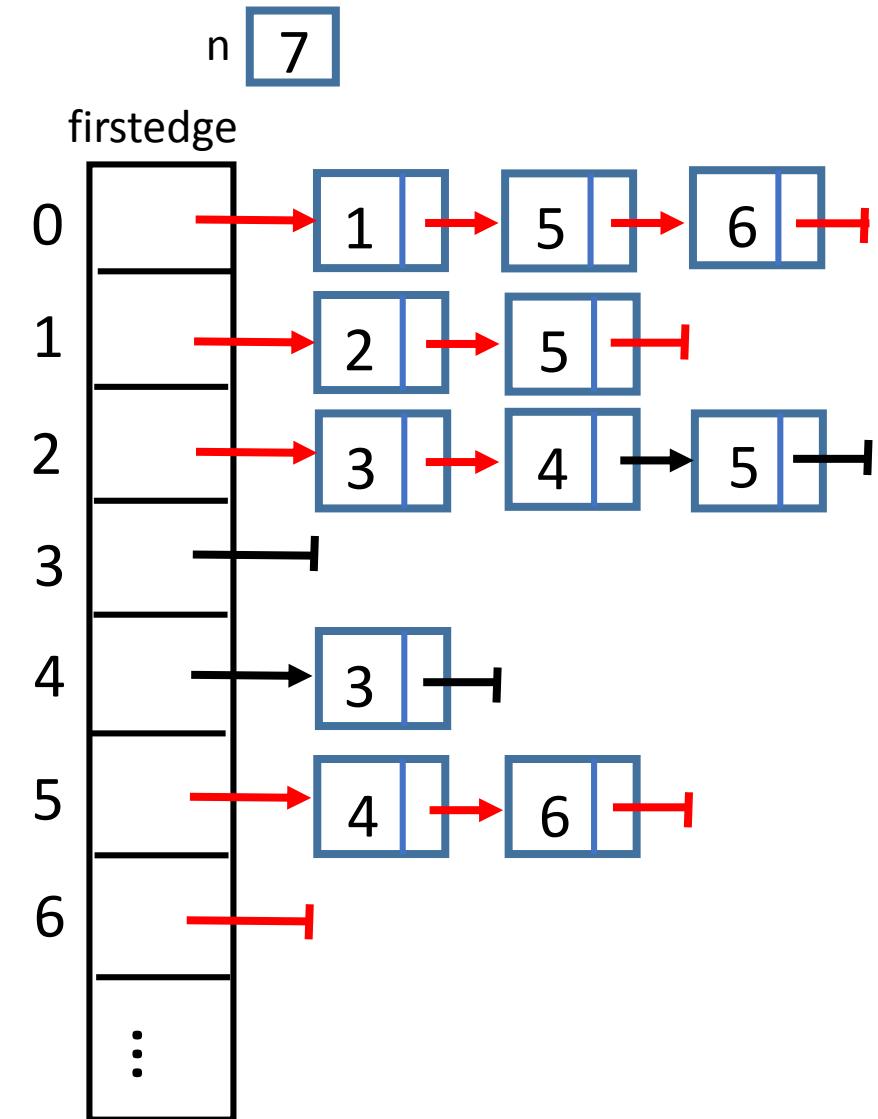
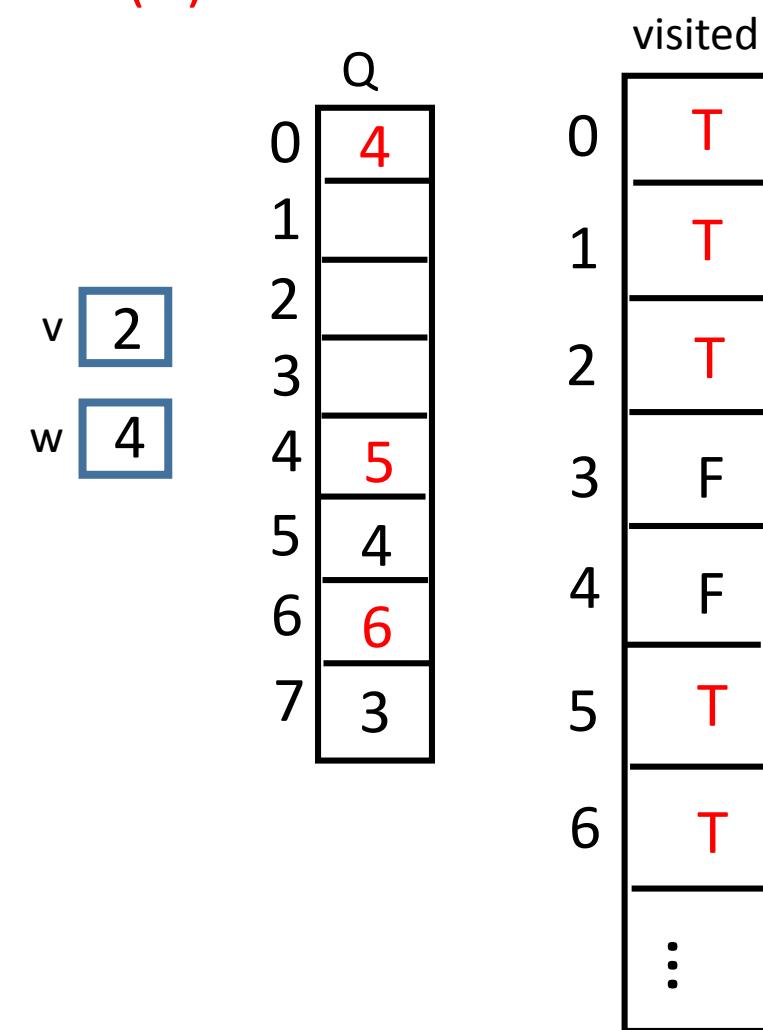
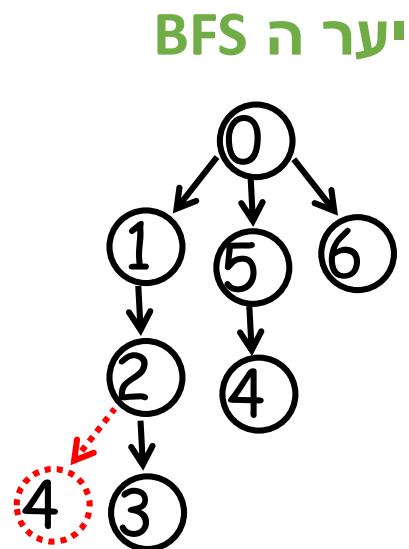
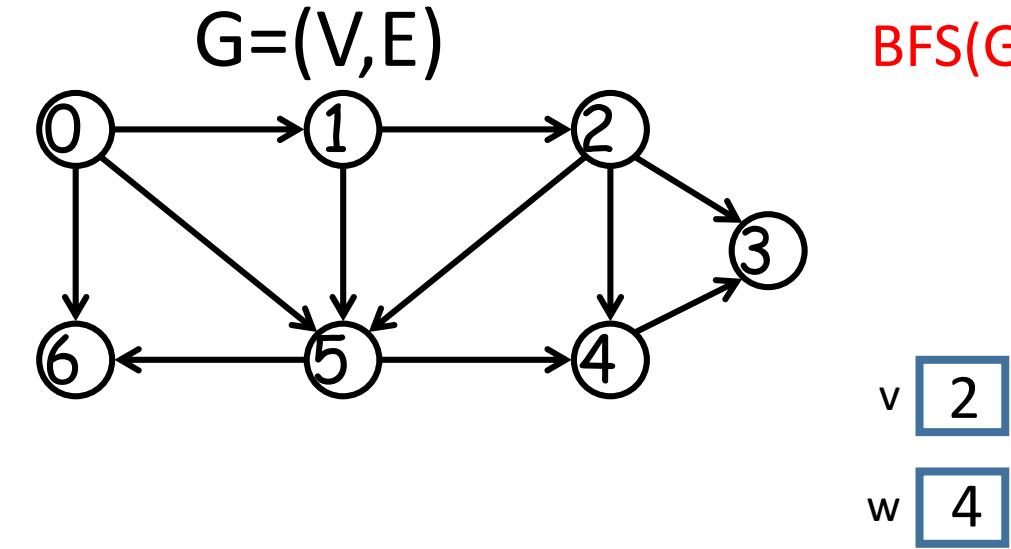
סריקת גרף בחיפוש לרוחב (BFS)



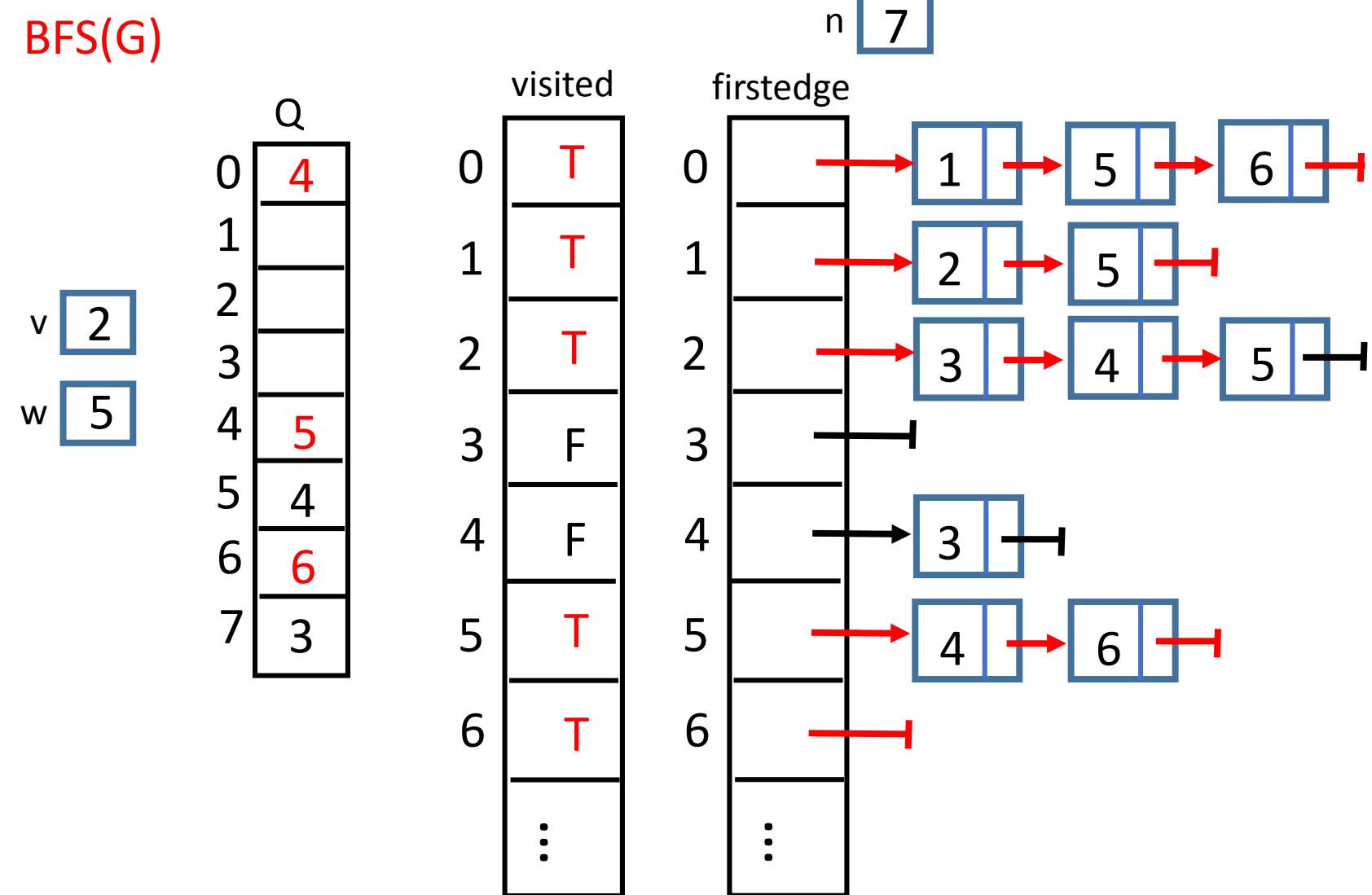
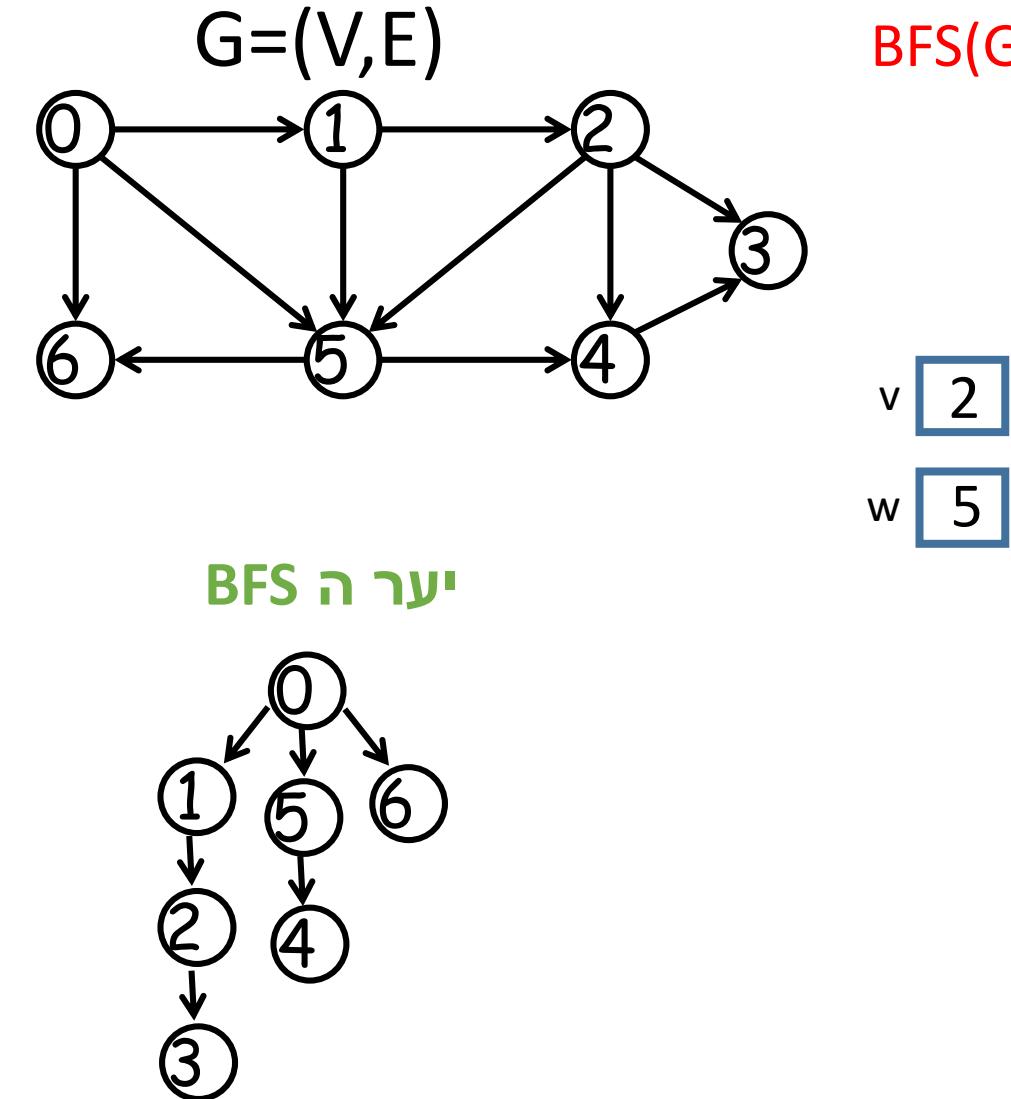
סריקת גרף בחיפוש לרוחב (BFS)



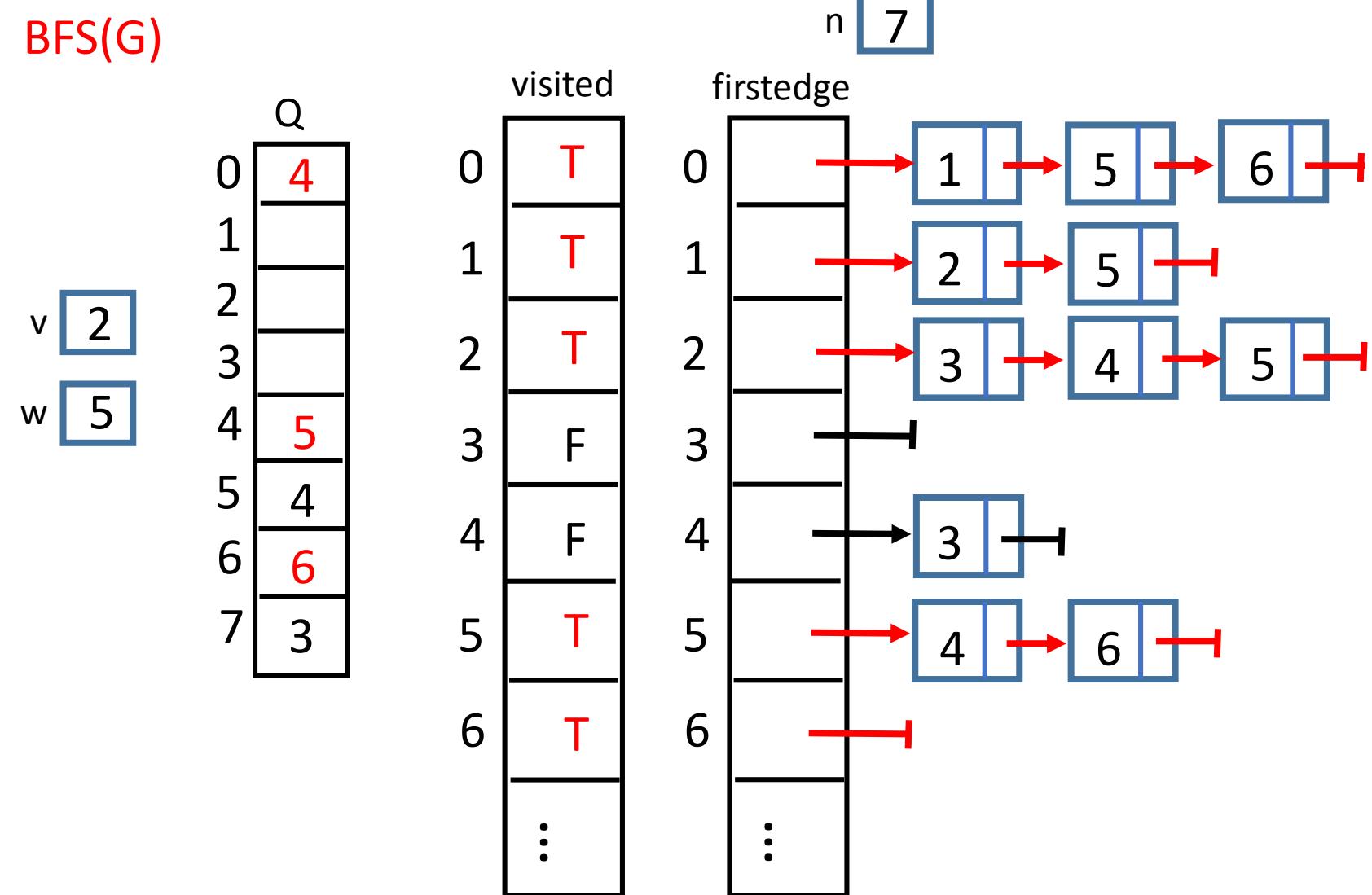
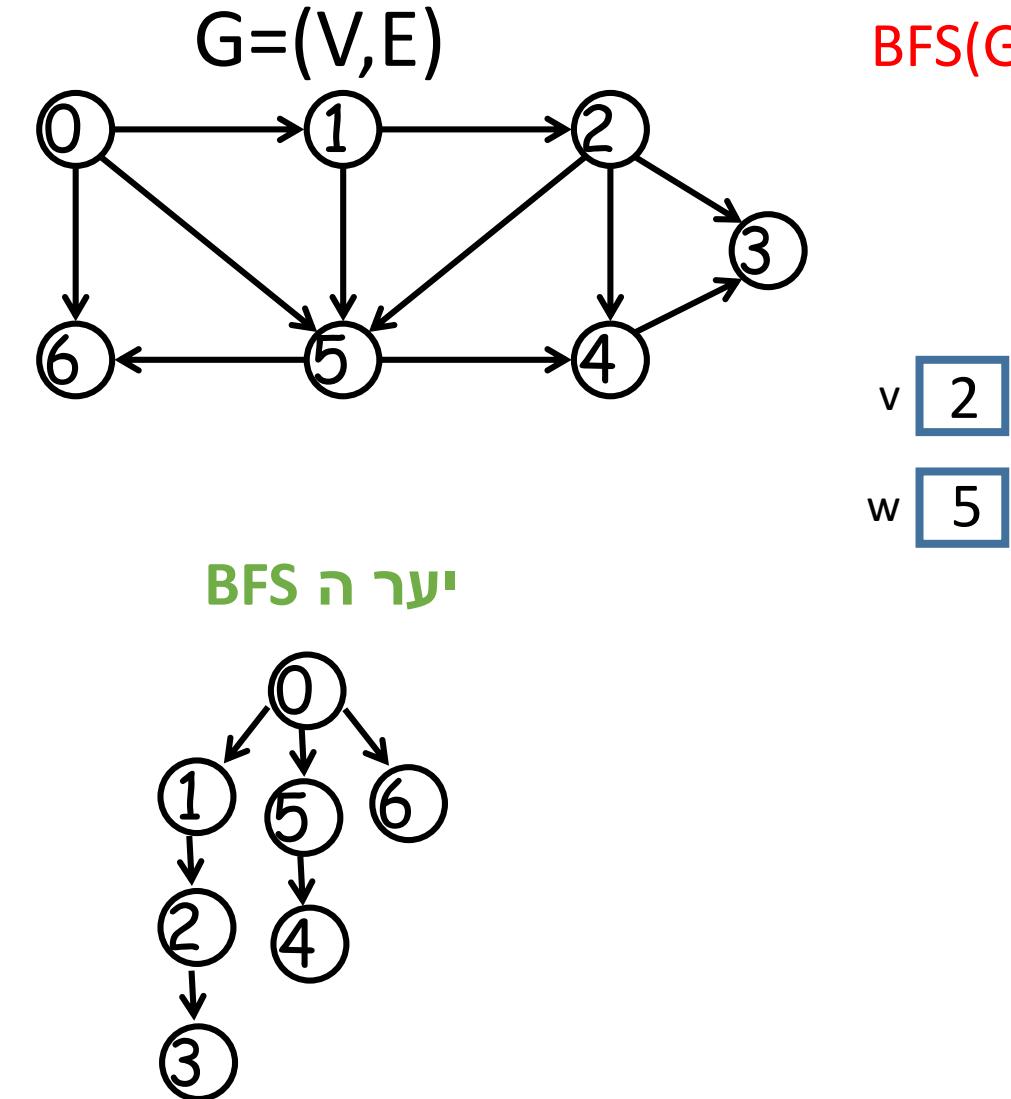
סריקת גרף בחיפוש לרוחב (BFS)



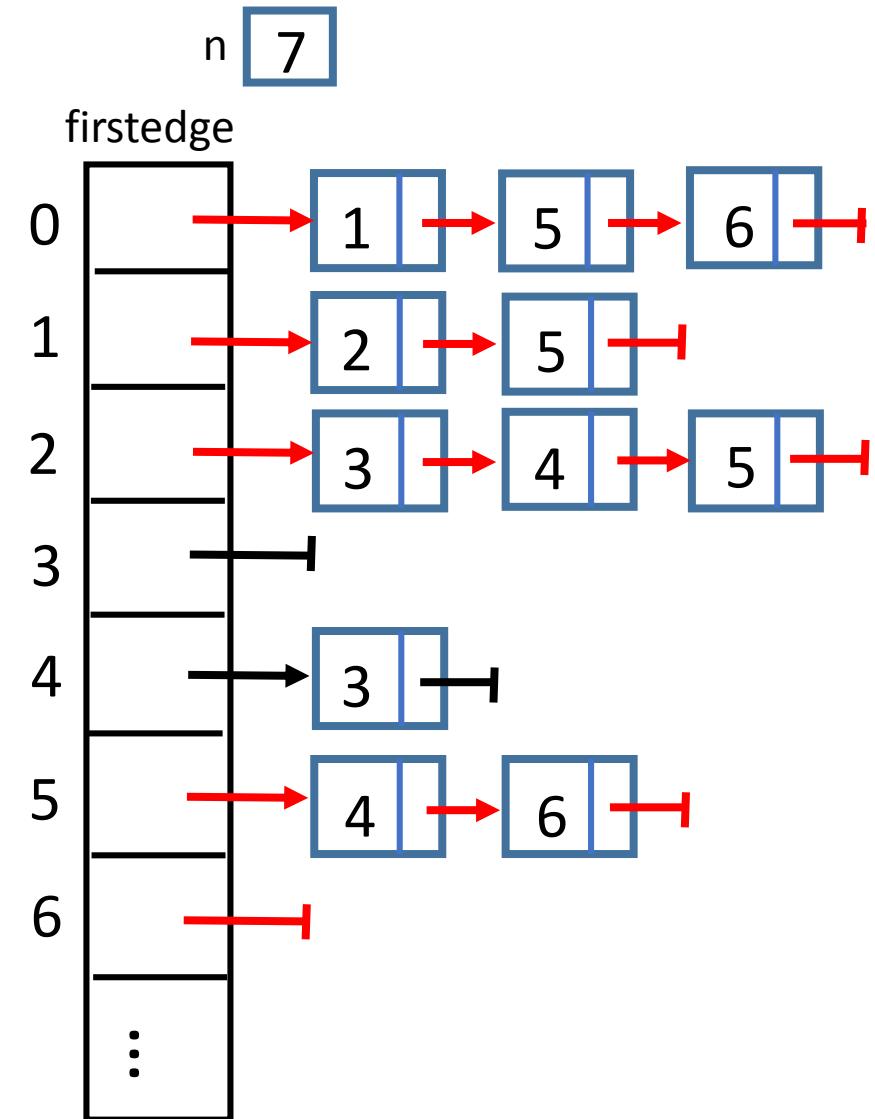
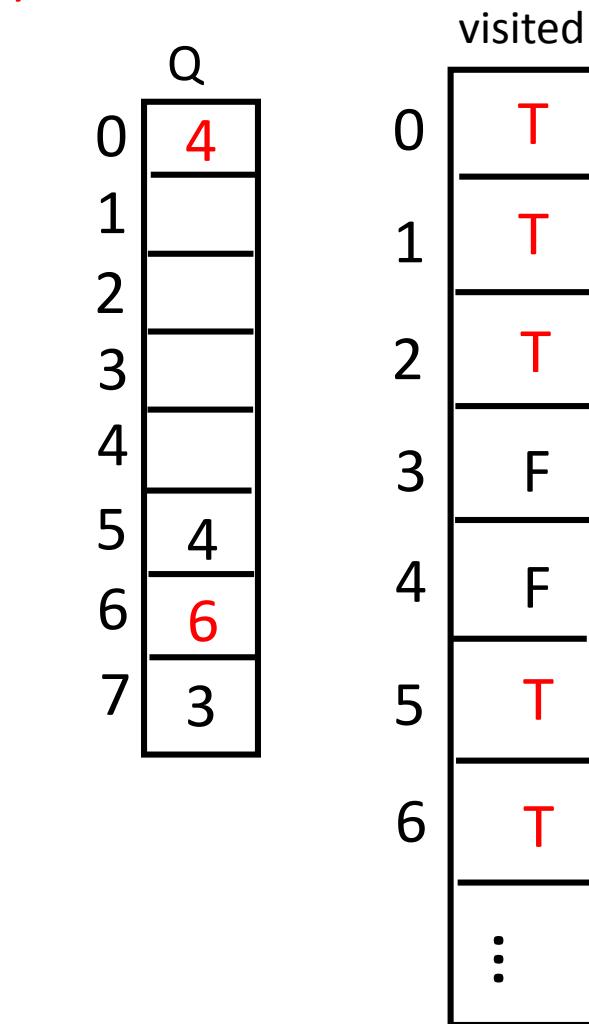
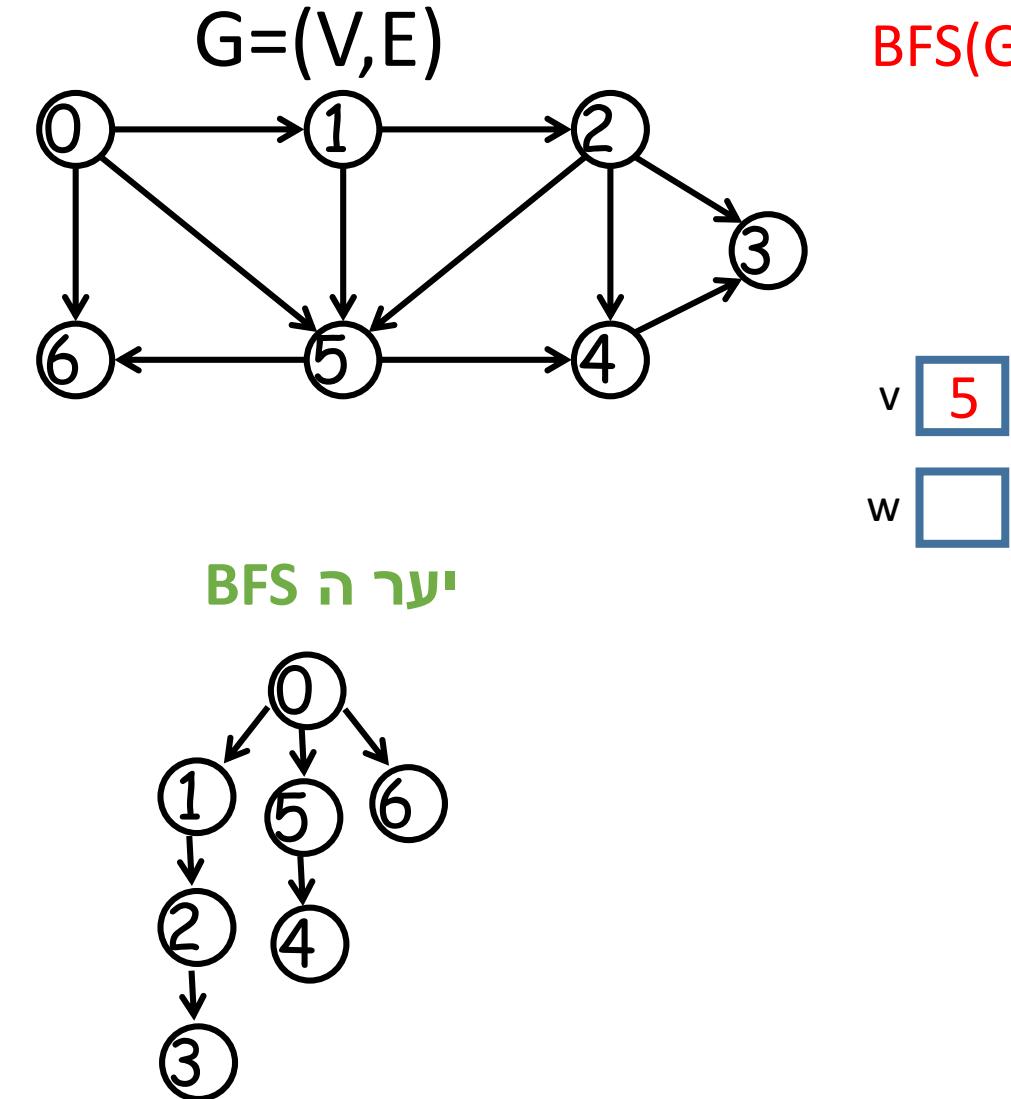
סריקת גרף בחיפוש לרוחב (BFS)



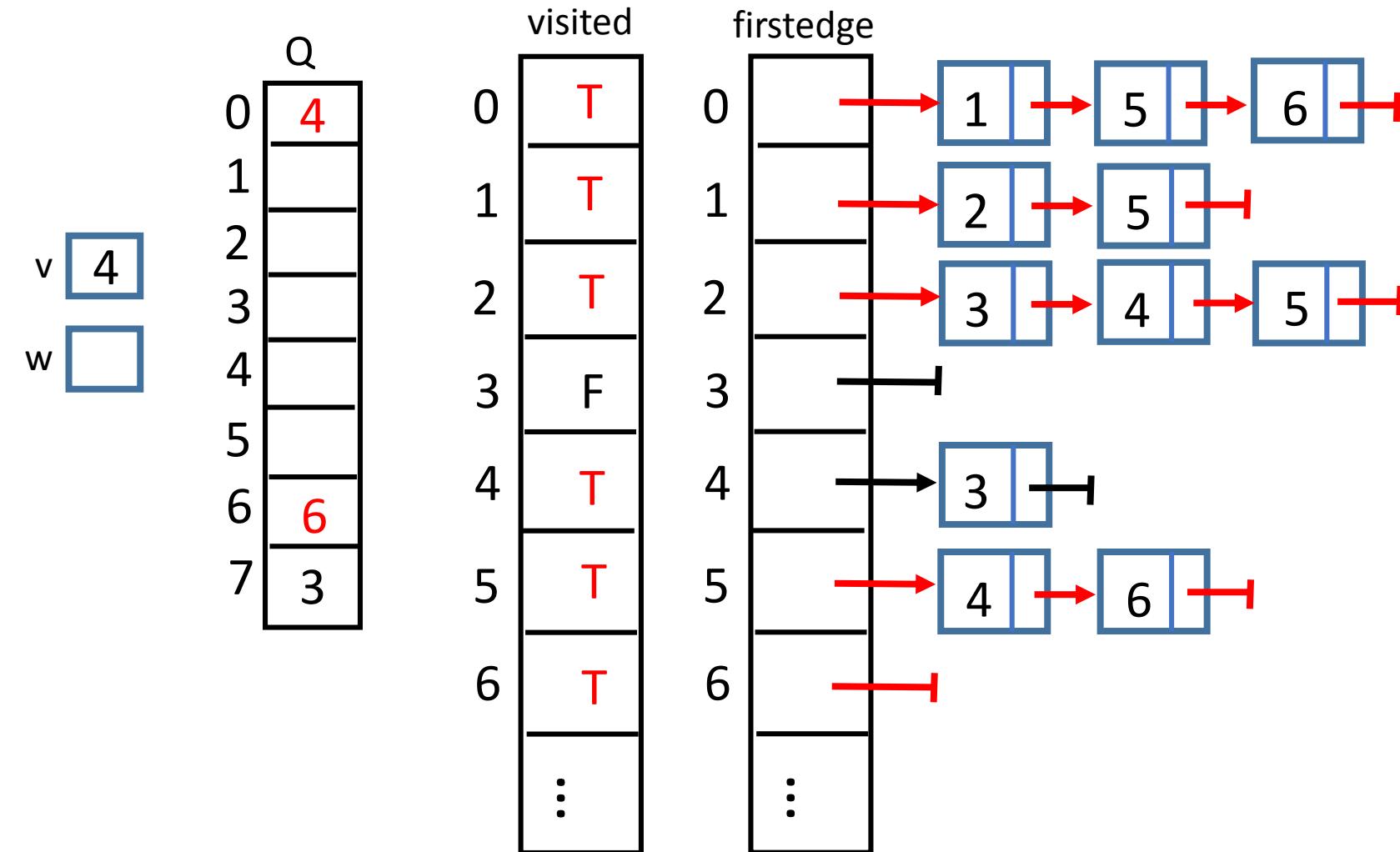
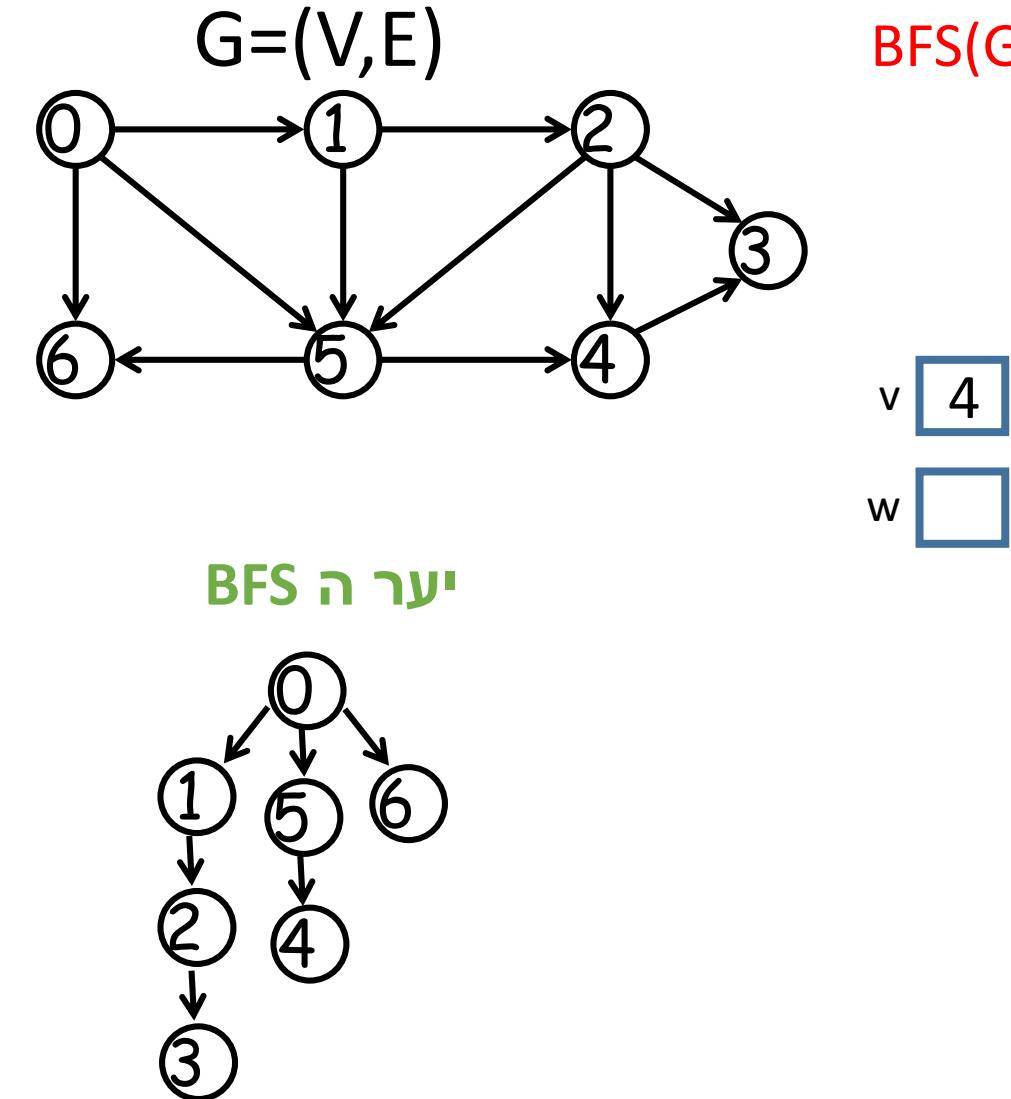
סריקת גרף בחיפוש לרוחב (BFS)



סריקת גרף בחיפוש לרוחב (BFS)

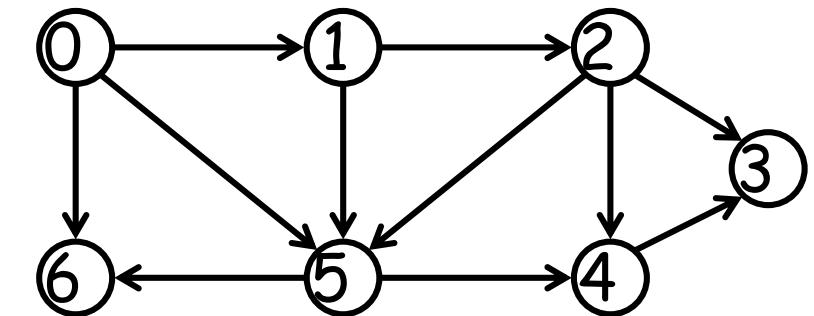


סריקת גרף בחיפוש לרוחב (BFS)



סרייקת גראף בחיפוש לרוחב (BFS)

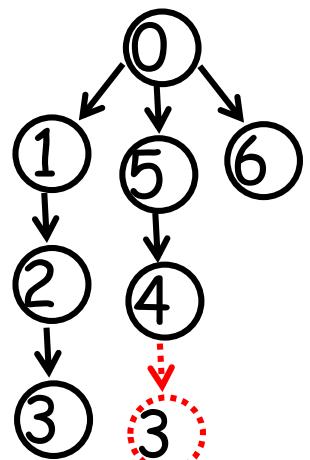
$$G = (V, E)$$



BFS(G)

v 4
w 3

עיר ה BFS



visited

Q
0 4
1 3
2
3
4
5
6 6
7 3

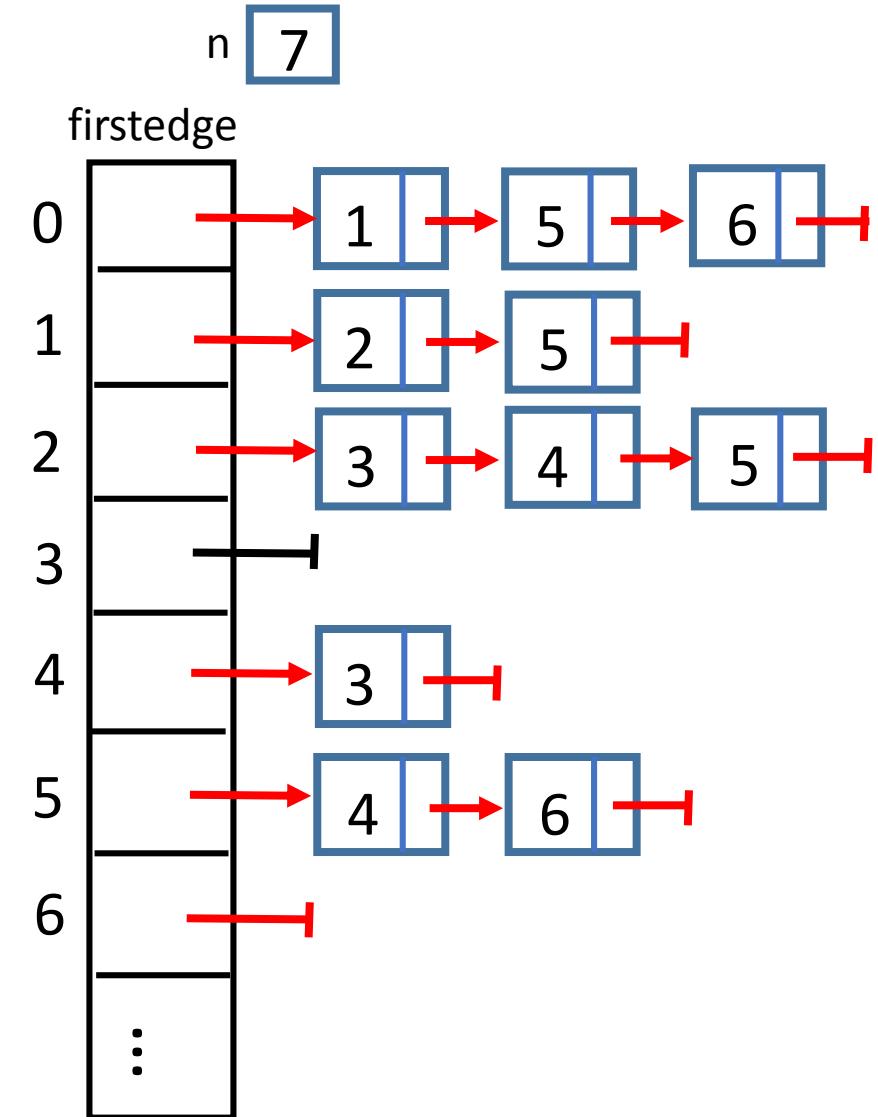
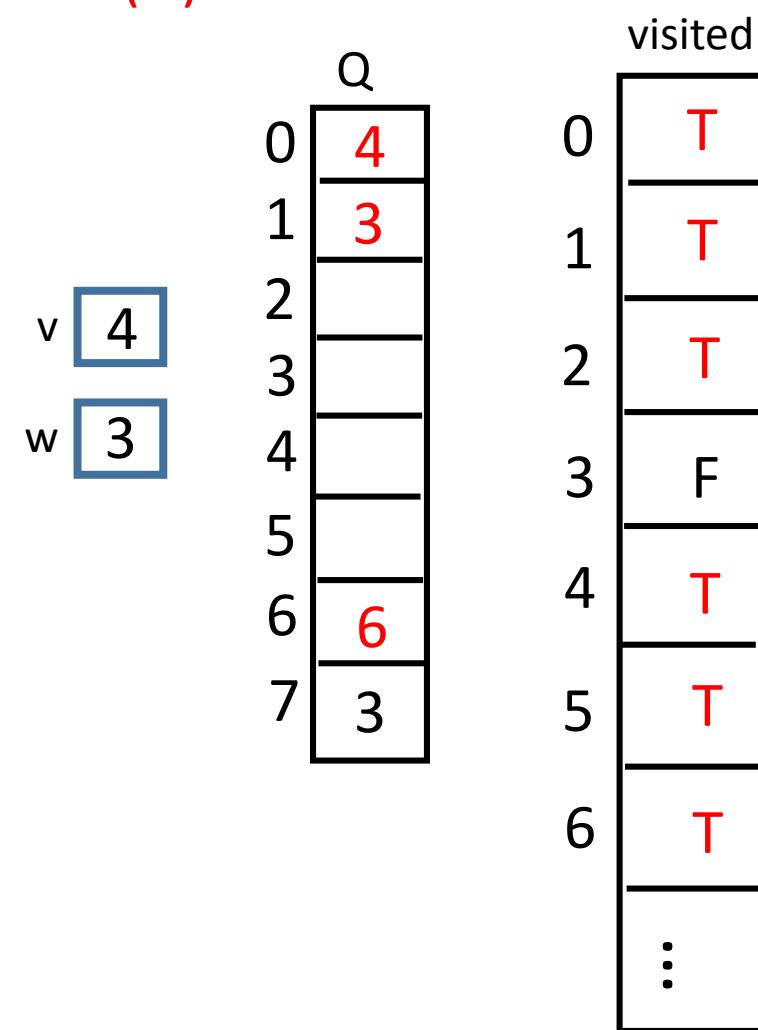
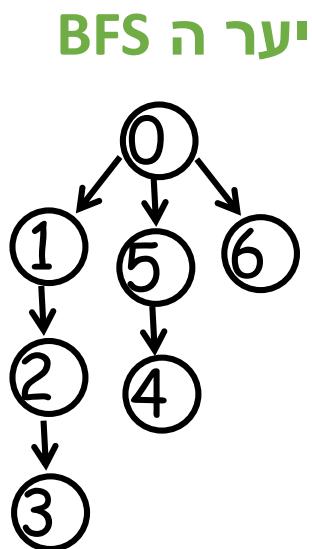
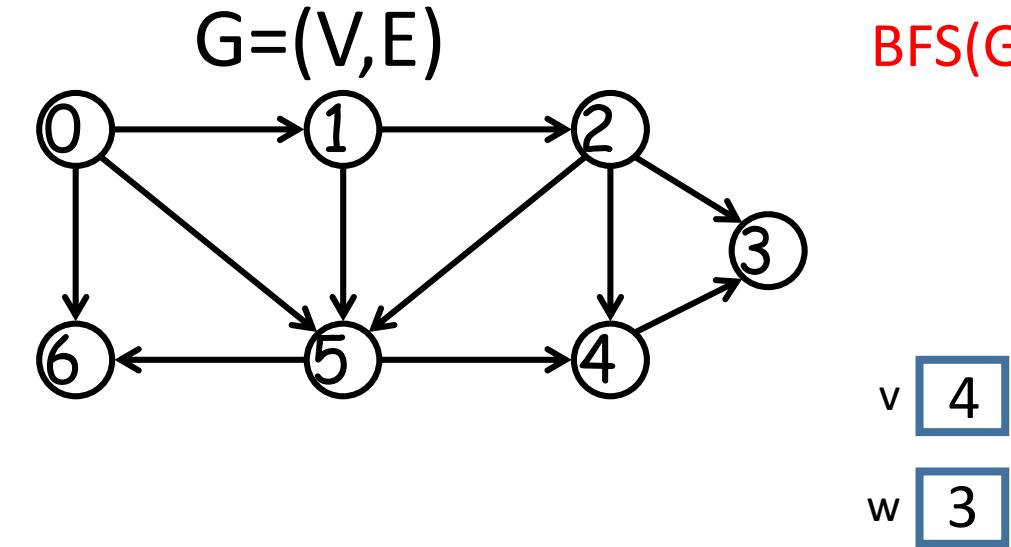
0	T
1	T
2	T
3	F
4	T
5	T
6	T
⋮	

n 7

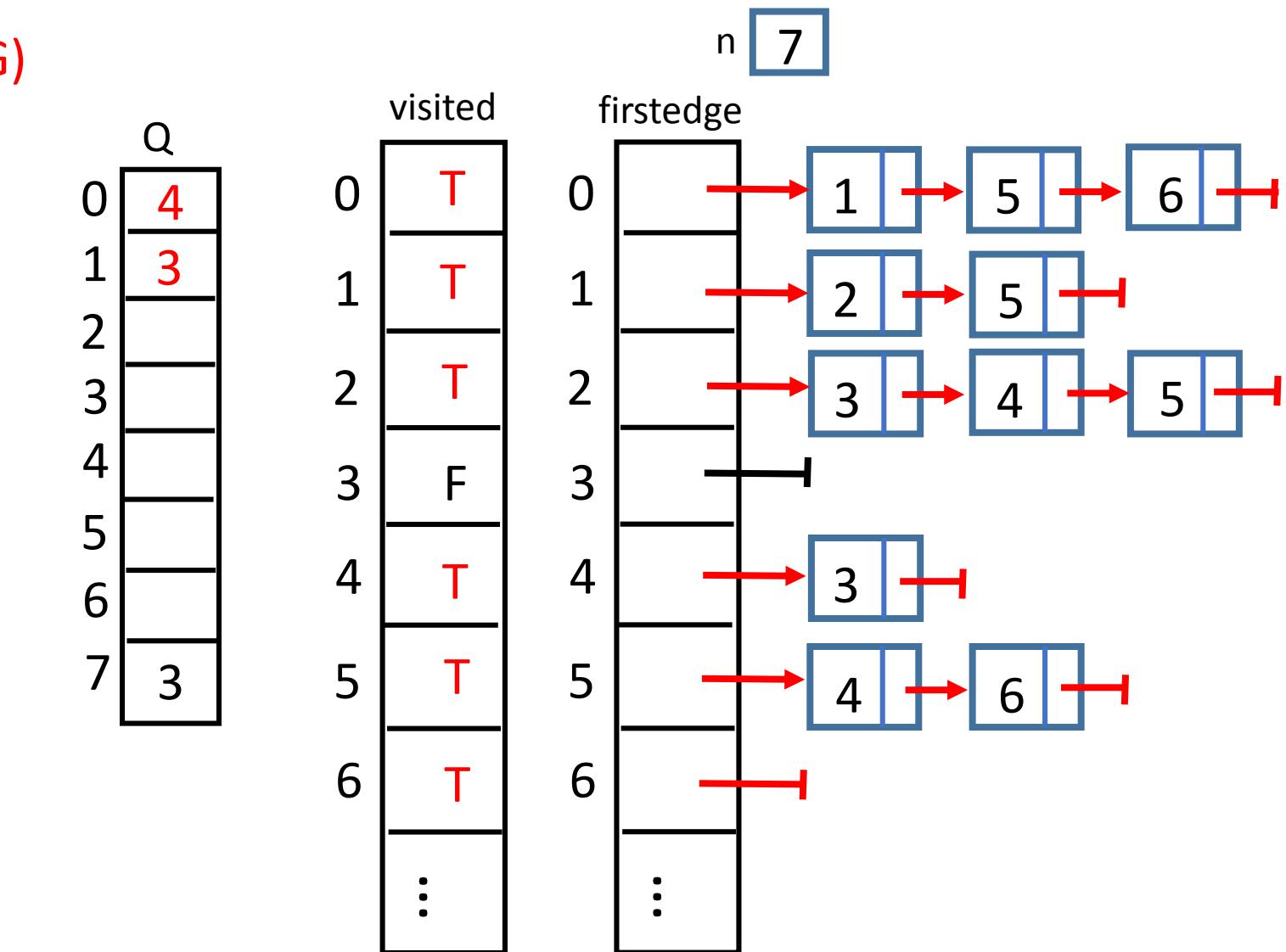
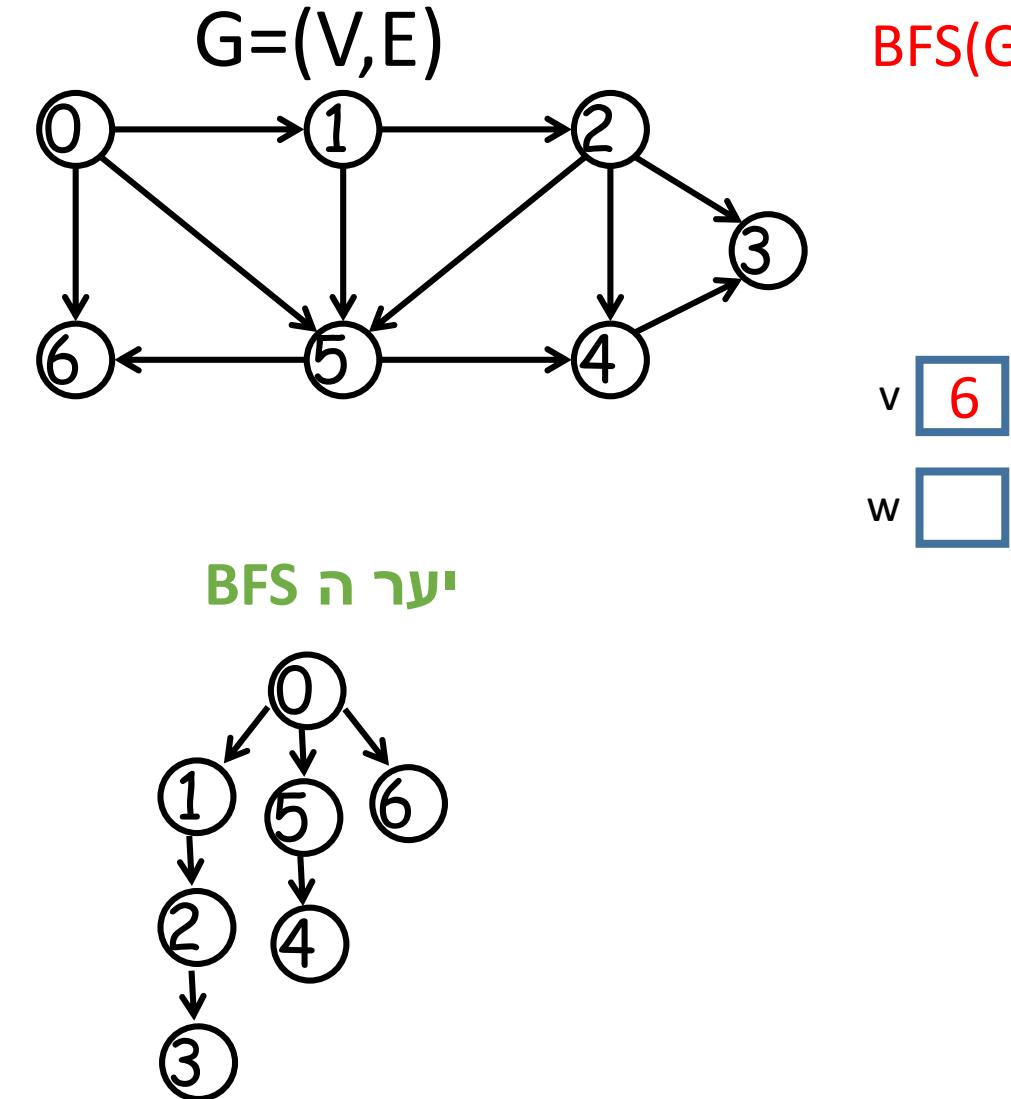
firstedge

```
graph TD; 0[0] --> 1[1]; 0[0] --> 2[2]; 1[1] --> 3[3]; 1[1] --> 4[4]; 2[2] --> 5[5]; 2[2] --> 6[6]; 7[7] --- 7[7]
```

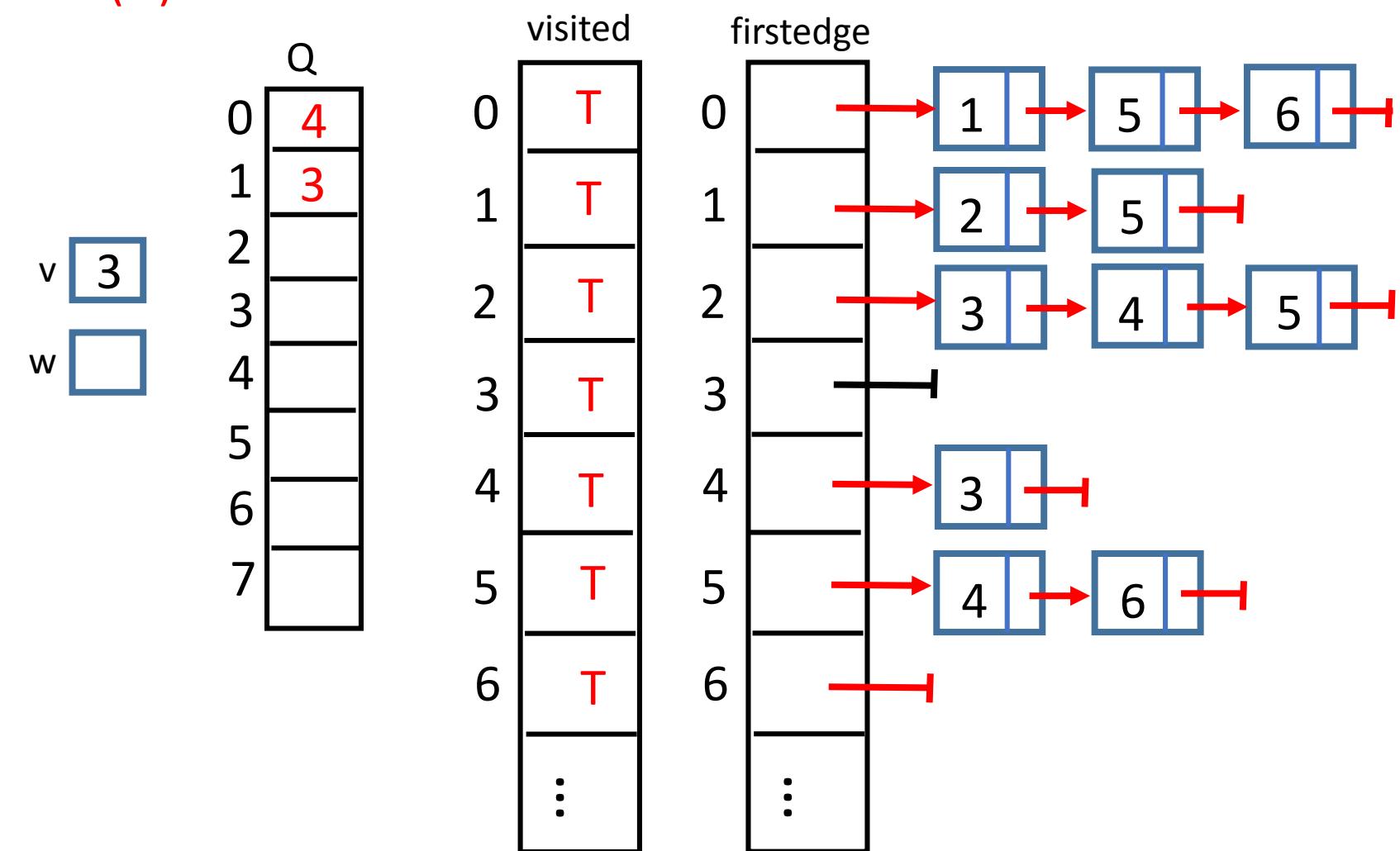
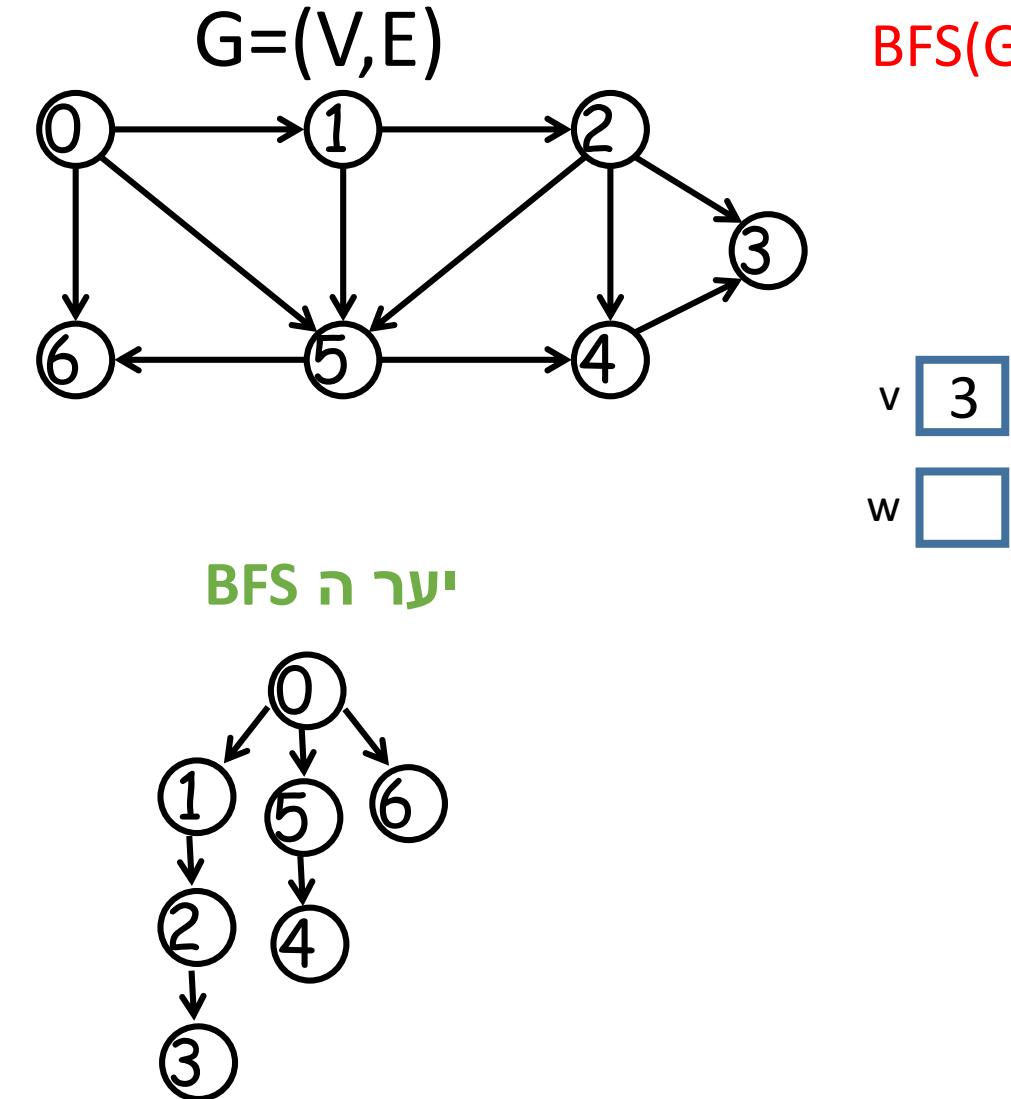
סריקת גרף בחיפוש לרוחב (BFS)



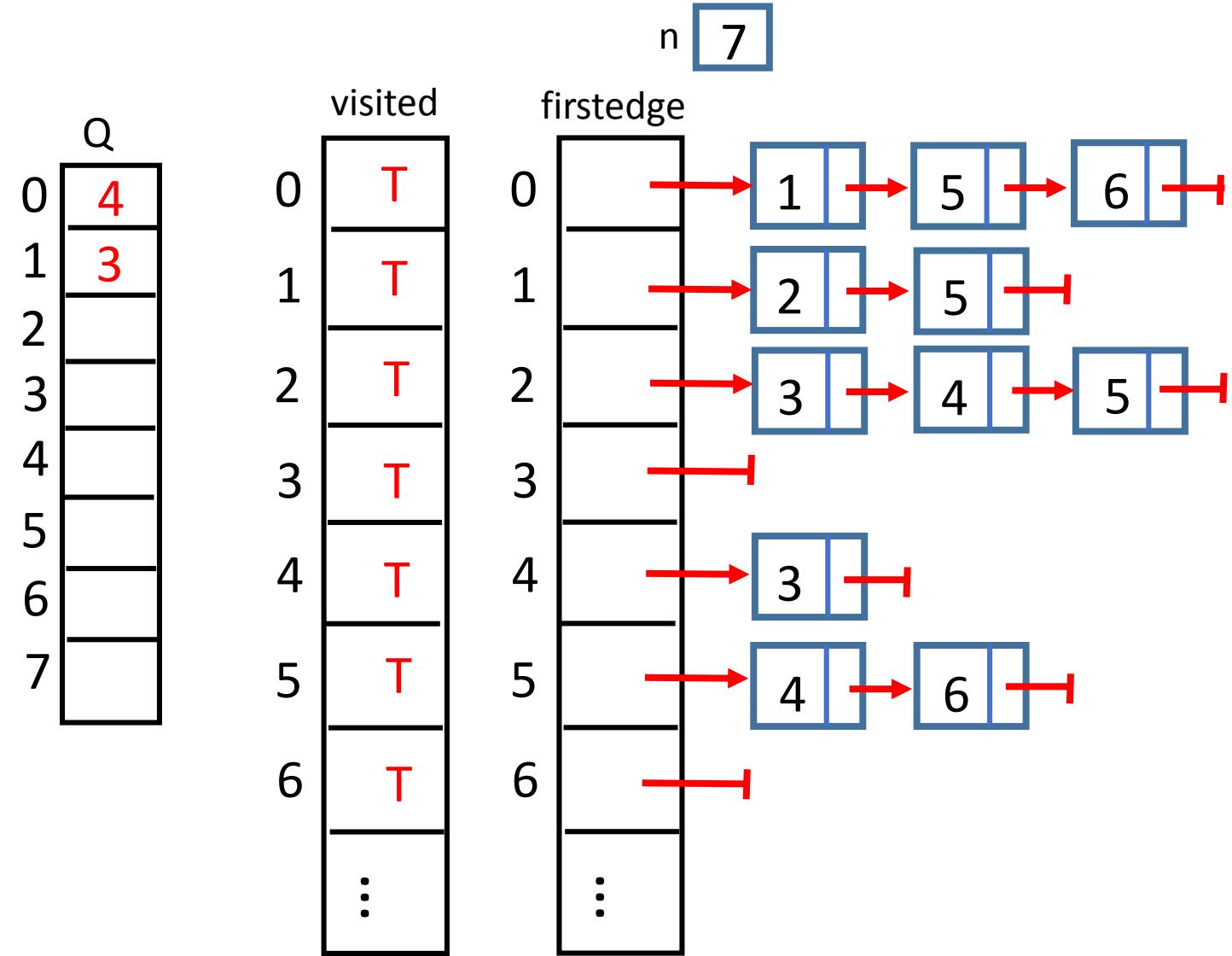
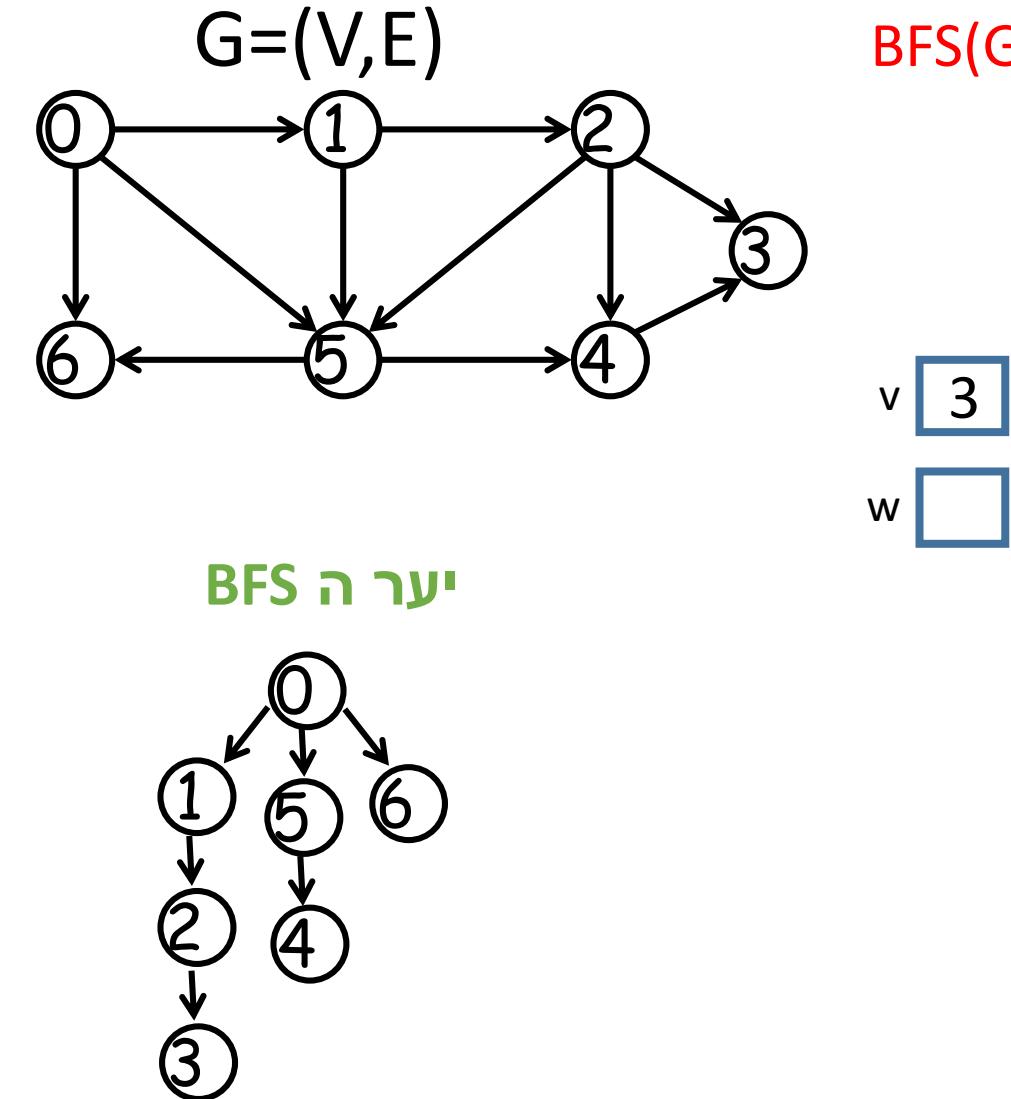
סריקת גרף בחיפוש לרוחב (BFS)



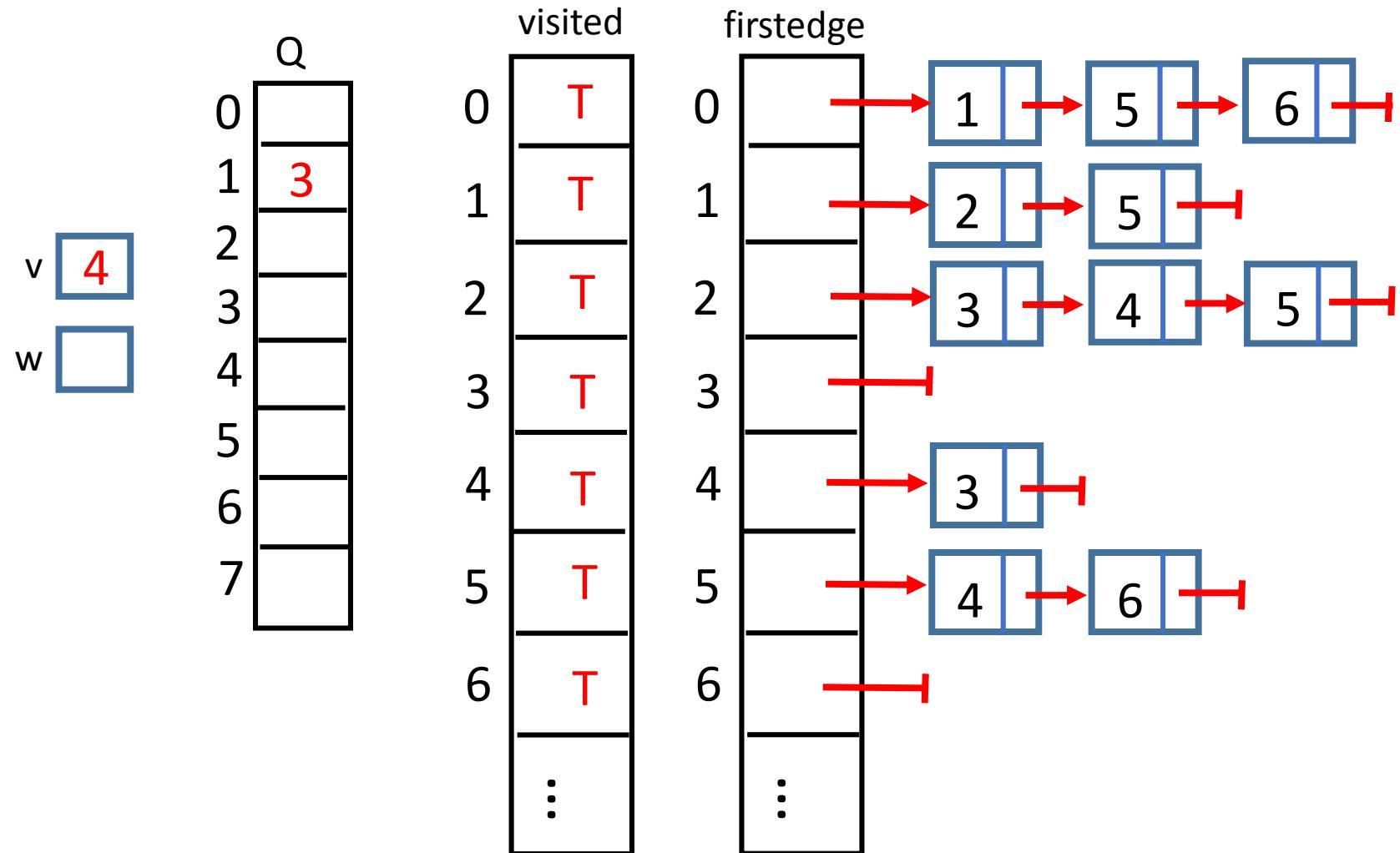
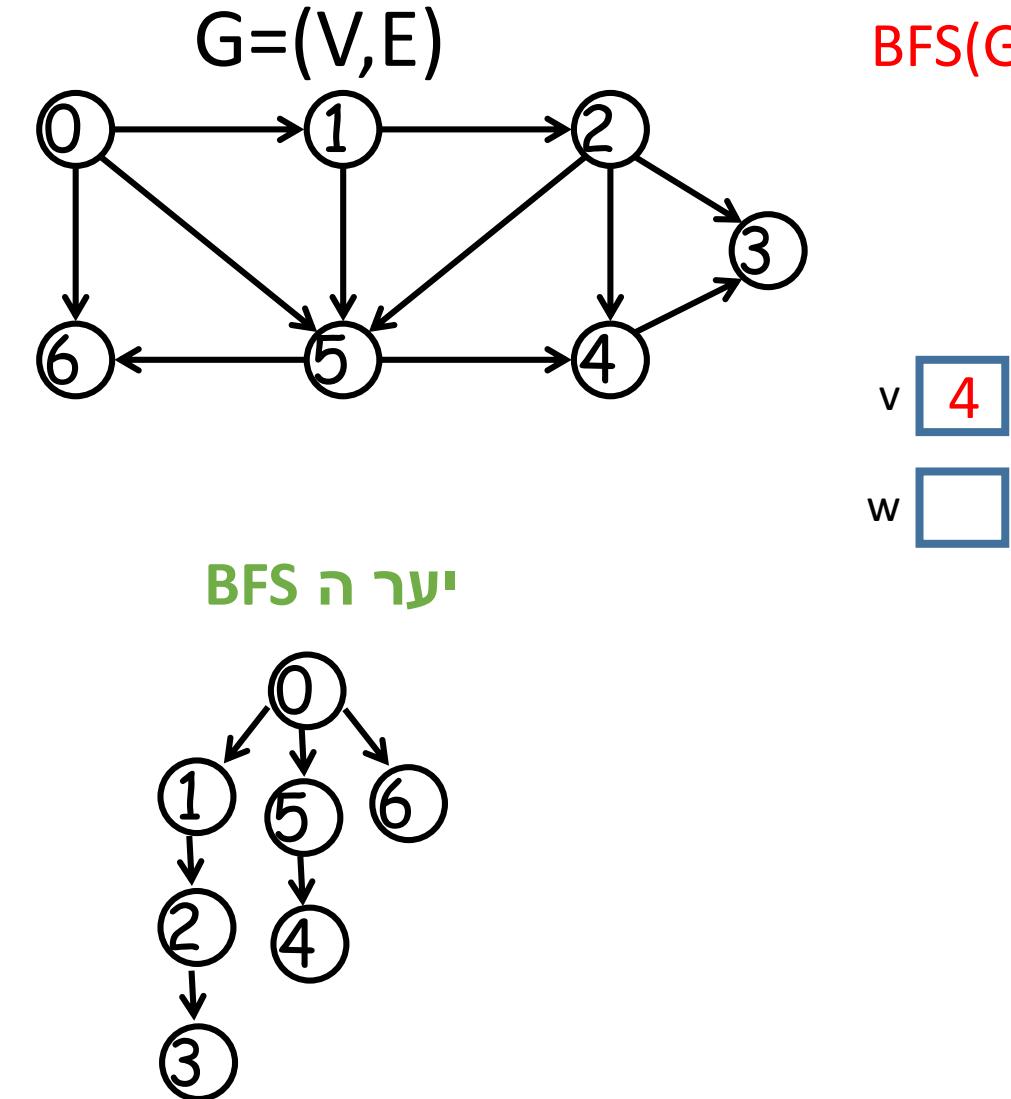
סריקת גרף בחיפוש לרוחב (BFS)



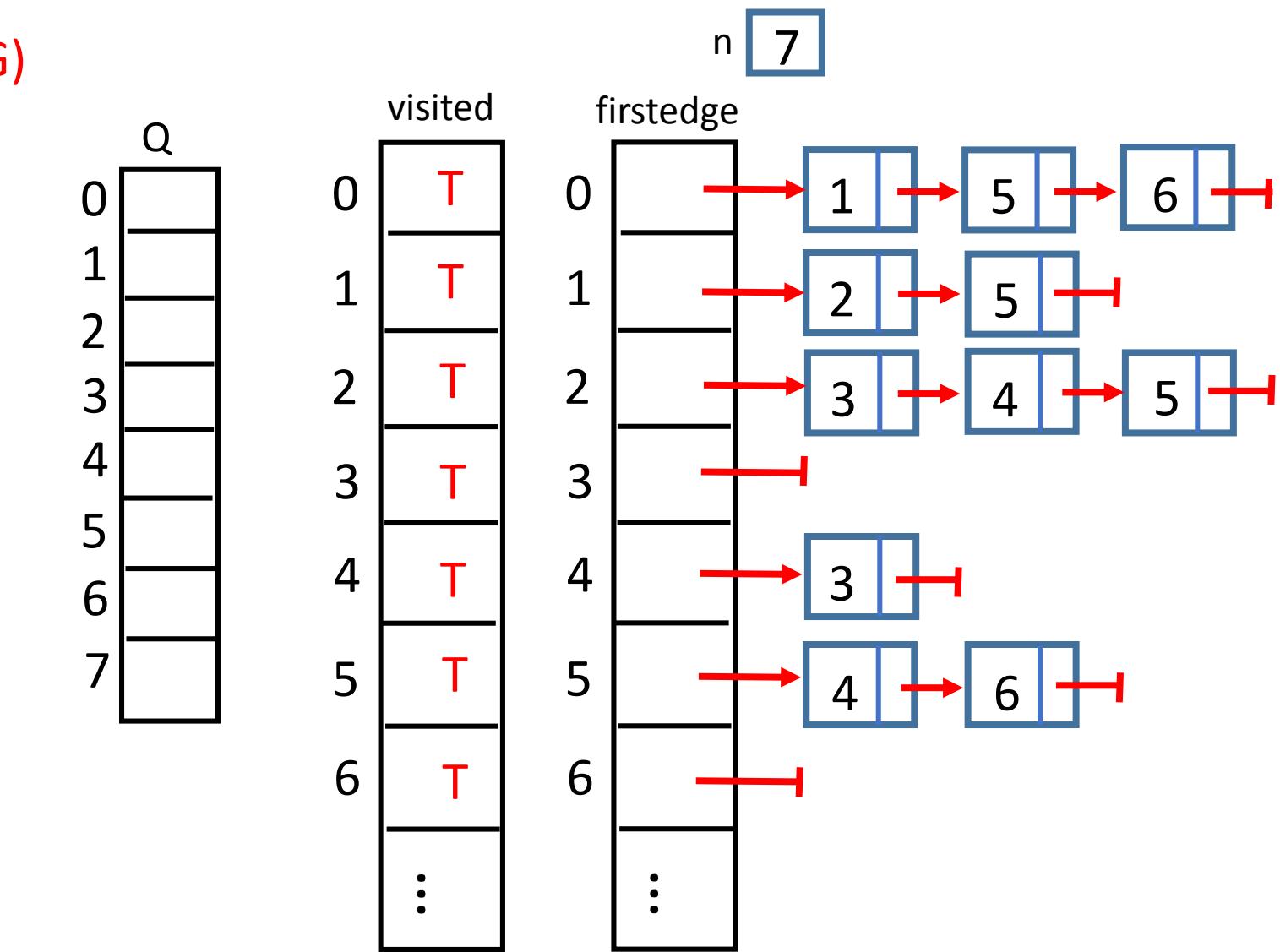
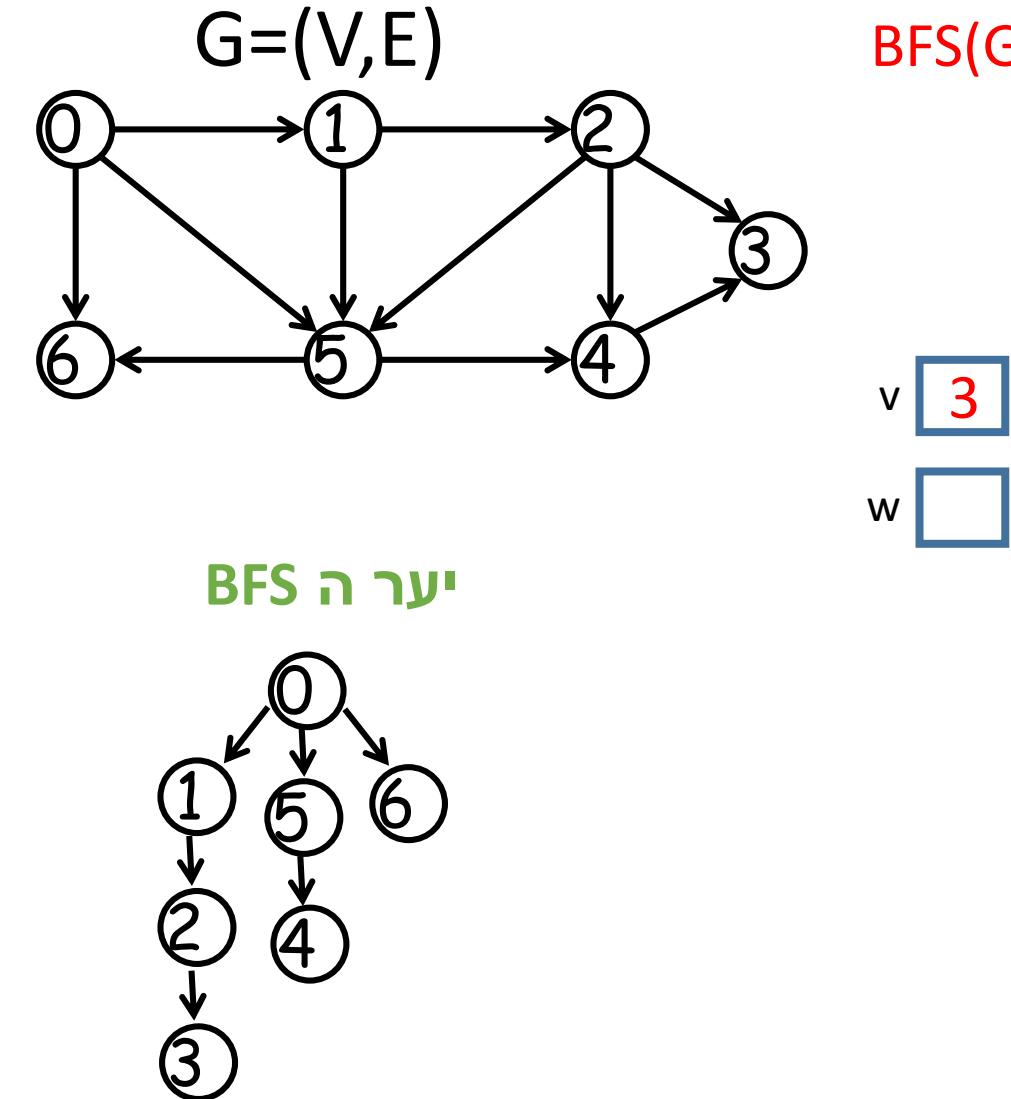
סריקת גרף בחיפוש לרוחב (BFS)



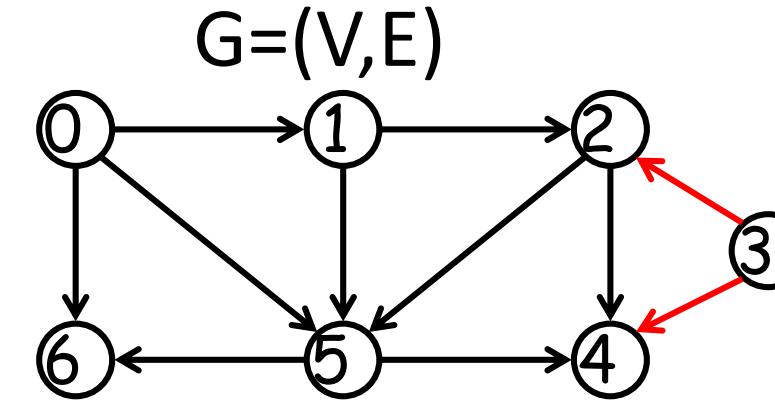
סריקת גרף בחיפוש לרוחב (BFS)



סריקת גרף בחיפוש לרוחב (BFS)

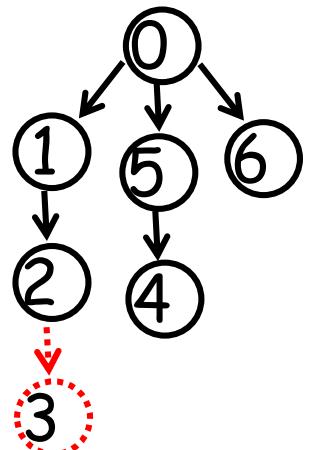


סריקת גרף בחיפוש לרוחב (BFS)



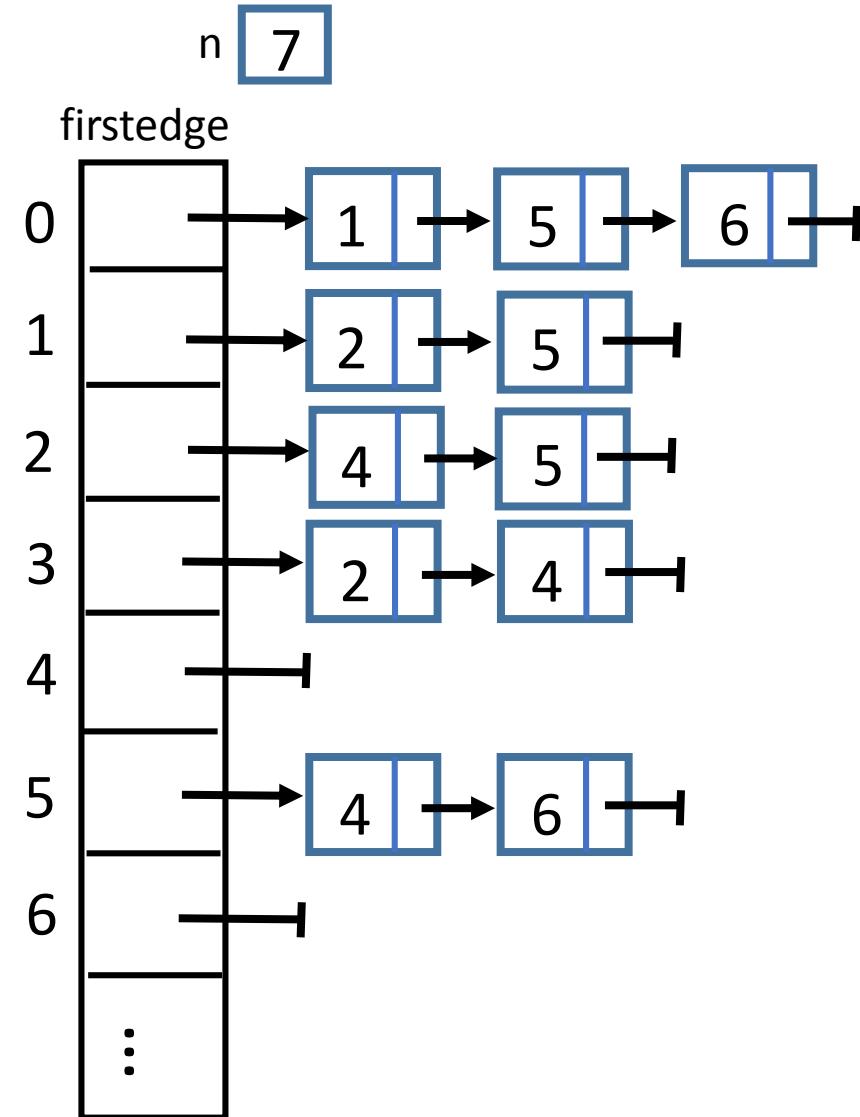
BFS(G)

יער ה BFS

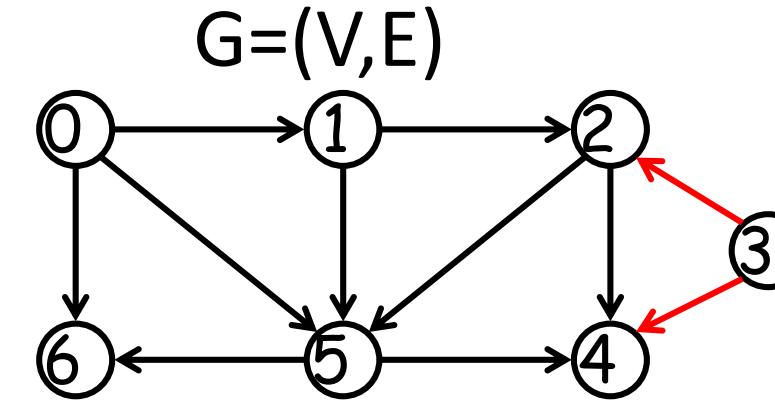


air משטנה הסריקה אם
משנים את כיווני הקשתות
המסומנות?

	visited
0	F
1	F
2	F
3	F
4	F
5	F
6	F
:	

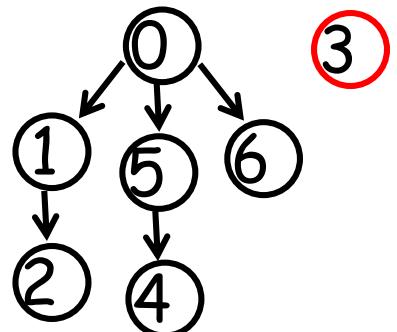


סריקת גרף בחיפוש לרוחב (BFS)



BFS(G)

יער ה BFS



נקבל שהסריקה יוצרת יער
ולא עץ יחיד!

	visited
0	F
1	F
2	F
3	F
4	F
5	F
6	F
:	

