

Usmjereni grafovi

DISKRETNE STRUKTURE S TEORIJOM GRAFOVA

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FOI, Varaždin

Sadržaj

prvi zadatak

drugi zadatak

treći zadatak

četvrti zadatak

DFS algoritam na usmjerenom grafu

peti zadatak

šesti zadatak

prvi zadatak

Propozicija

Neka je $M = [m_{ij}]$ matrica susjedstva digrafa D . Neka je $m_{ij}^{(k)}$ element na poziciji (i, j) u matrici M^k . Tada je $m_{ij}^{(k)}$ jednak ukupnom broju svih (v_i, v_j) usmjerenih šetnji duljine k . Stoga je broj svih usmjerenih šetnji duljine k u digrafu D jednak sumi svih elemenata matrice M^k .

Karakterizacija Eulerovih digrafa

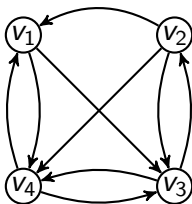
Digraf D je Eulerov akko D je povezan i $d^+(v) = d^-(v)$ za svaki $v \in V(D)$.

Korolar

Digraf D ima usmjerenu Eulerovu stazu akko je povezan i svi vrhovi, osim njih dva, imaju jednaki broj ulaznih i izlaznih lukova. Nadalje, kod ta dva vrha se broj ulaznih i izlaznih lukova razlikuje za jedan.

Zadatak 1

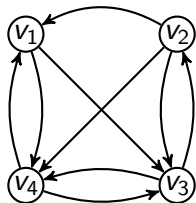
Zadan je digraf D .



- Odredite matricu susjedstva A digrafa D .
- Bez direktnog računanja potencija matrice A , odredite element na poziciji $(4, 2)$ u matrici A^3 . Obrazložite svoj odgovor.
- Ima li digraf D usmjerenu Eulerovu stazu? Ima li digraf D neusmjerenu Eulerovu stazu? Obrazložite svoje odgovore.
- Je li D dipovezani digraf? Obrazložite svoj odgovor.

Rješenje

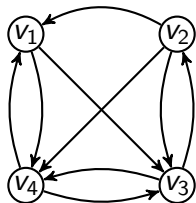
a)



$A =$

Rješenje

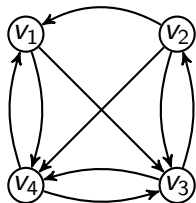
a)



$$A = \begin{bmatrix} & & & \\ & & & \\ & & & \\ & & & \end{bmatrix}$$

Rješenje

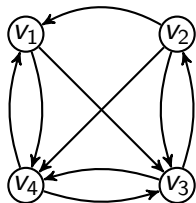
a)



$$A = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{bmatrix}$$

Rješenje

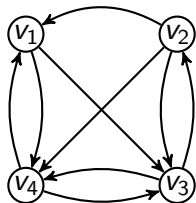
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} & & & \\ & & & \\ & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

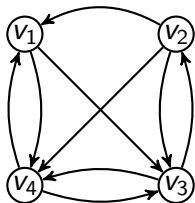
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & & & \\ & & & \\ & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

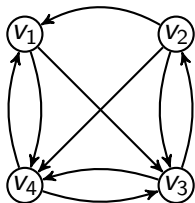
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Rješenje

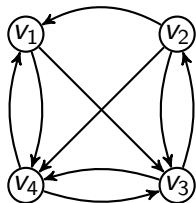
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$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} \end{matrix}$$

Rješenje

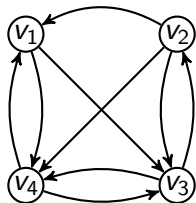
a)



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Rješenje

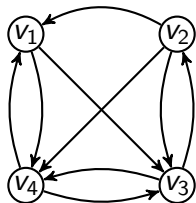
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & & & \\ & 1 & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

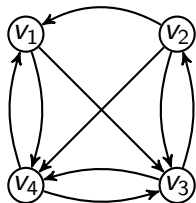
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & & \\ & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

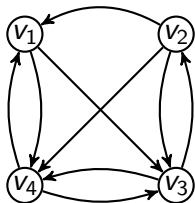
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$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & \\ & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

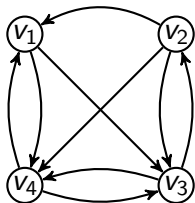
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$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

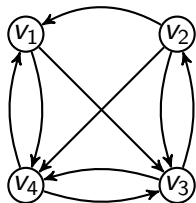
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

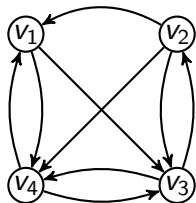
a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & & \\ & & & \end{bmatrix} \end{matrix}$$

Rješenje

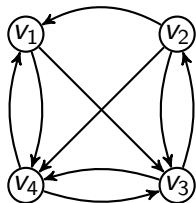
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Rješenje

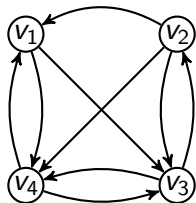
a)



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Rješenje

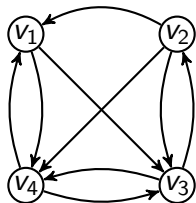
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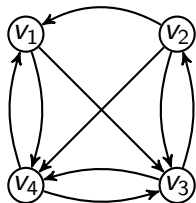
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Rješenje

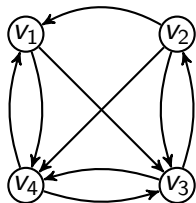
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Rješenje

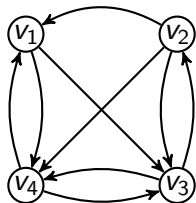
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Rješenje

a)

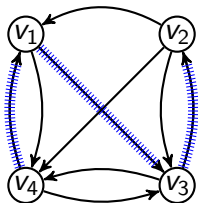


$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix}$$

b) Neka je $A^3 = [a_{ij}^{(3)}]$.

Rješenje

a)

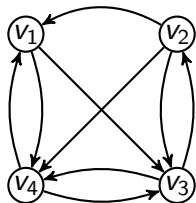


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b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

Rješenje

a)

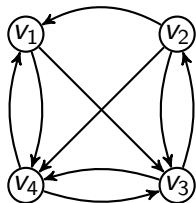


$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix} \quad \begin{matrix} d^+(v_1) = 2 \\ d^+(v_2) = 3 \\ d^+(v_3) = 2 \\ d^+(v_4) = 2 \end{matrix}$$

b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

Rješenje

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$$d^+(v_1) = 2 \quad d^-(v_1) = 2$$

$$d^+(v_2) = 3 \quad d^-(v_2) = 1$$

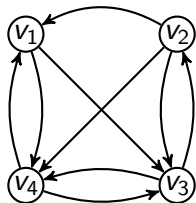
$$d^+(v_3) = 2 \quad d^-(v_3) = 3$$

$$d^+(v_4) = 2 \quad d^-(v_4) = 3$$

b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

Rješenje

a)



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$$d^+(v_1) = 2 \quad d^-(v_1) = 2$$

$$d^+(v_2) = 3 \quad d^-(v_2) = 1$$

$$d^+(v_3) = 2 \quad d^-(v_3) = 3$$

$$d^+(v_4) = 2 \quad d^-(v_4) = 3$$

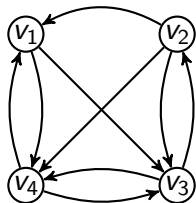
b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

c) Digraf D nema usmjerenu Eulerovu stazu jer se izlazni i ulazni stupnjevi kod vrha v_2 razlikuju za više od 1.

Rješenje

$$d(v_1) = 4, \quad d(v_2) = 4, \quad d(v_3) = 5, \quad d(v_4) = 5$$

a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix} \quad \begin{matrix} d^+(v_1) = 2 & d^-(v_1) = 2 \\ d^+(v_2) = 3 & d^-(v_2) = 1 \\ d^+(v_3) = 2 & d^-(v_3) = 3 \\ d^+(v_4) = 2 & d^-(v_4) = 3 \end{matrix}$$

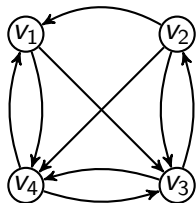
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b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

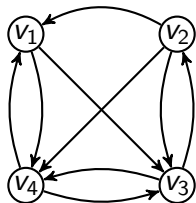
c) Digraf D nema usmjerenu Eulerovu stazu jer se izlazni i ulazni stupnjevi kod vrha v_2 razlikuju za više od 1.

Digraf D ima neusmjerenu Eulerovu stazu jer pripadni povezani graf ima točno dva vrha neparnog stupnja.

Rješenje

$$d(v_1) = 4, \quad d(v_2) = 4, \quad d(v_3) = 5, \quad d(v_4) = 5$$

a)



$$A = \begin{matrix} & \begin{matrix} v_1 & v_2 & v_3 & v_4 \end{matrix} \\ \begin{matrix} v_1 \\ v_2 \\ v_3 \\ v_4 \end{matrix} & \begin{bmatrix} 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \end{matrix} \quad \begin{matrix} d^+(v_1) = 2 & d^-(v_1) = 2 \\ d^+(v_2) = 3 & d^-(v_2) = 1 \\ d^+(v_3) = 2 & d^-(v_3) = 3 \\ d^+(v_4) = 2 & d^-(v_4) = 3 \end{matrix}$$

b) Neka je $A^3 = [a_{ij}^{(3)}]$. Kako je $v_4 v_1 v_3 v_2$ jedina usmjerena (v_4, v_2) -šetnja duljine 3 u digrafu D , slijedi da je $a_{42}^{(3)} = 1$.

c) Digraf D nema usmjerenu Eulerovu stazu jer se izlazni i ulazni stupnjevi kod vrha v_2 razlikuju za više od 1.

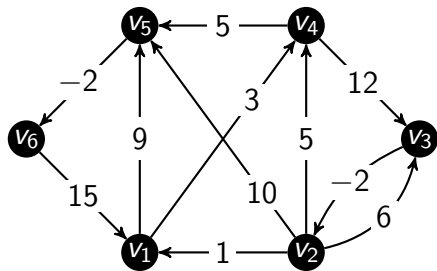
Digraf D ima neusmjerenu Eulerovu stazu jer pripadni povezani graf ima točno dva vrha neparnog stupnja.

d) Između svaka dva vrha postoji usmjereni put pa je D dipovezani digraf.

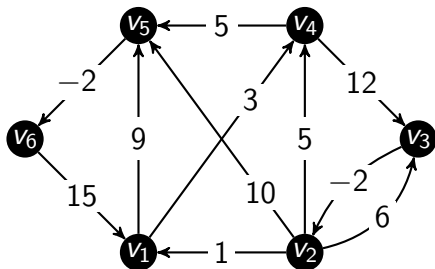
drugi zadatak

Zadatak 2

Pomoću Bellman-Fordovog algoritma pronađite najkraće putove od vrha v_1 do svih preostalih vrhova u zadanom težinskom digrafu.

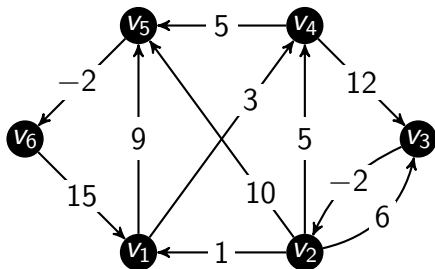


Rješenje



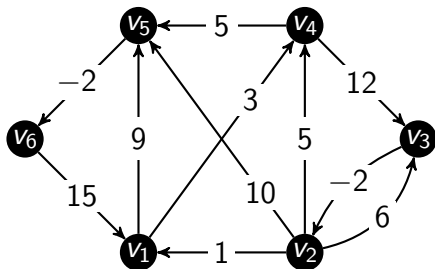
	0				
v_1					
v_2					
v_3					
v_4					
v_5					
v_6					

Rješenje



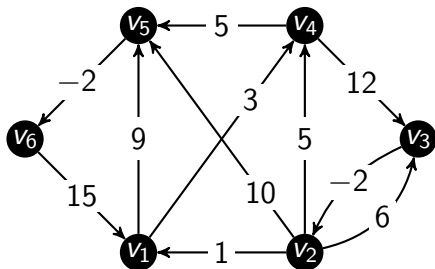
	0				
v_1	-, 0				
v_2					
v_3					
v_4					
v_5					
v_6					

Rješenje



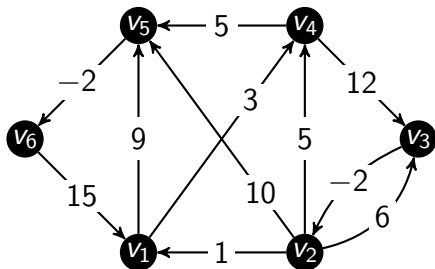
	0				
v_1	$-, 0$				
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



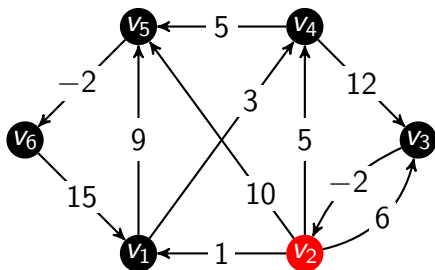
	0	1			
v_1	$-, 0$				
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



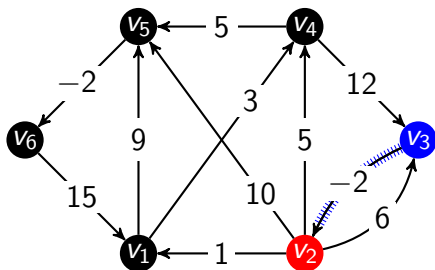
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje

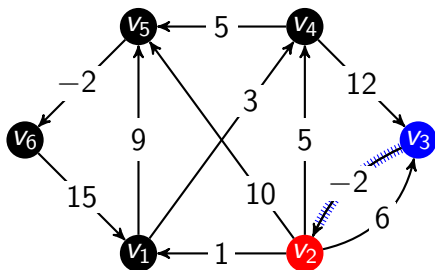


v_2

$v_3 v_2 \rightarrow$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje

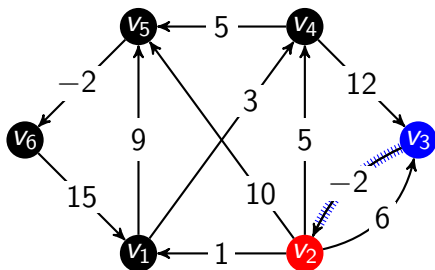


v_2

$$v_3 v_2 \rightarrow \infty + (-2) = \infty$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞				
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje

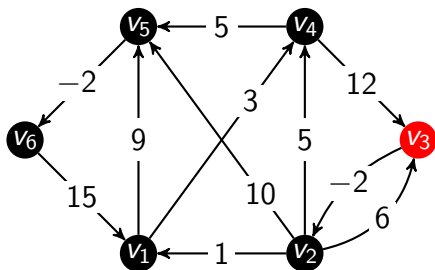


v_2

$$v_3 v_2 \rightarrow \infty + (-2) = \infty$$

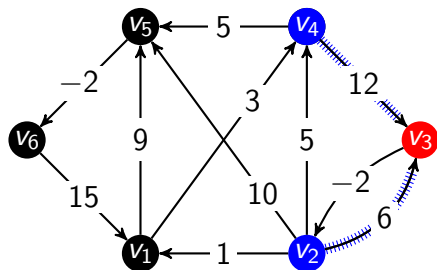
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



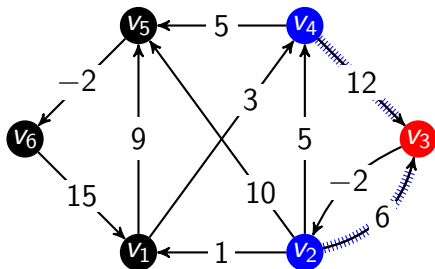
v_3

$v_2 v_3 \rightarrow$

$v_4 v_3 \rightarrow$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



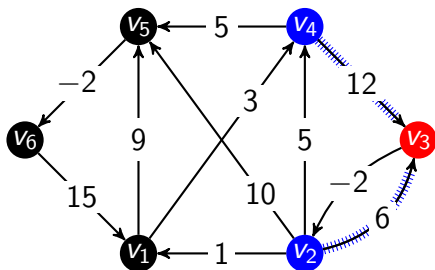
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



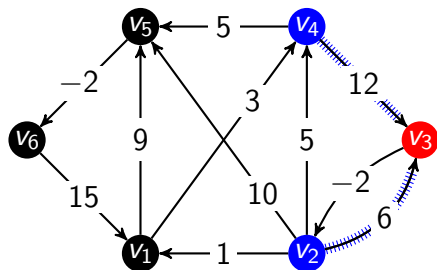
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow \infty + 12 = \infty$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞				
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



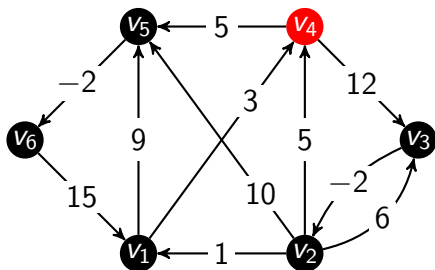
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow \infty + 12 = \infty$$

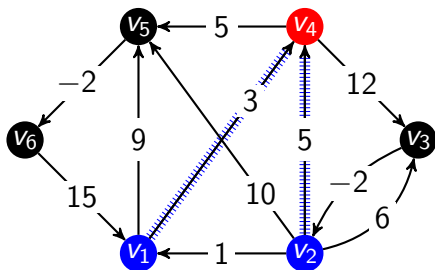
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



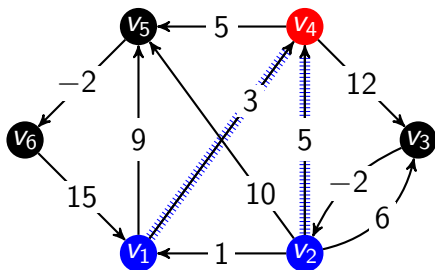
v_4

$v_1 v_4 \rightarrow$

$v_2 v_4 \rightarrow$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



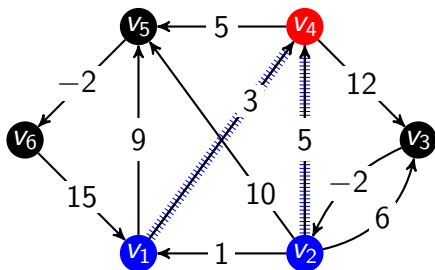
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



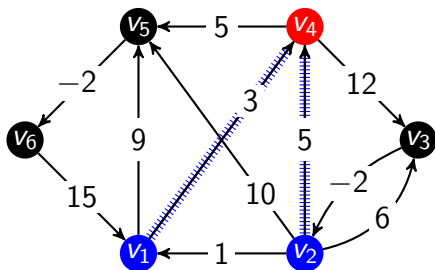
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞				
v_5	∞				
v_6	∞				

Rješenje



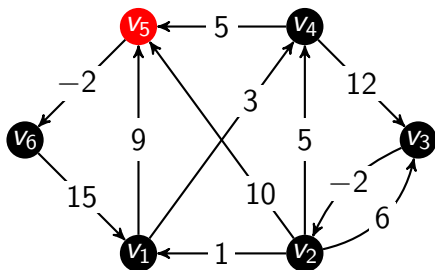
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

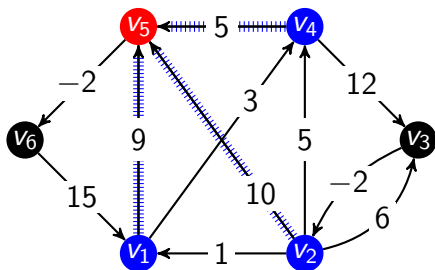
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



v_5

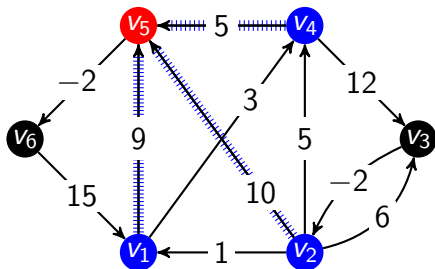
$v_1 v_5 \rightarrow$

$v_2 v_5 \rightarrow$

$v_4 v_5 \rightarrow$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



v_5

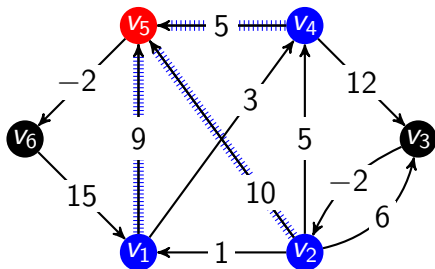
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow$$

$$v_4 v_5 \rightarrow$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



v_5

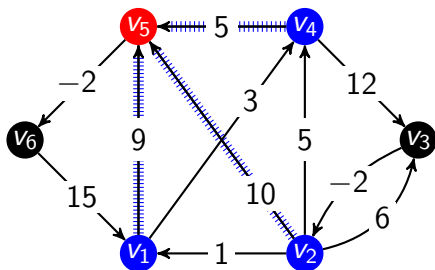
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



v_5

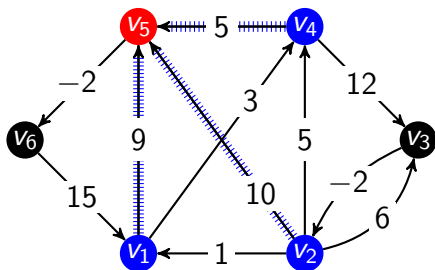
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow \infty + 5 = \infty$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞				
v_6	∞				

Rješenje



v_5

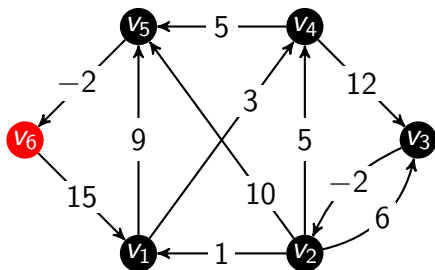
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow \infty + 5 = \infty$$

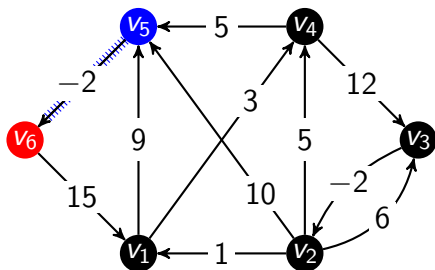
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞				

Rješenje



	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞				

Rješenje

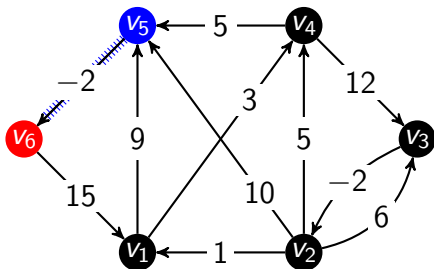


v_6

$v_5 v_6 \rightarrow$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞				

Rješenje

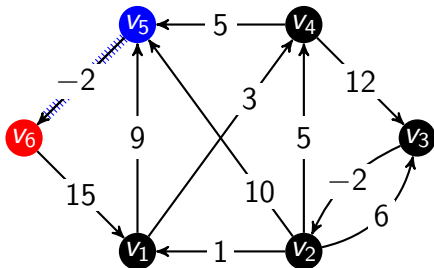


v_6

$$v_5 v_6 \rightarrow \infty + (-2) = \infty$$

	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞				

Rješenje

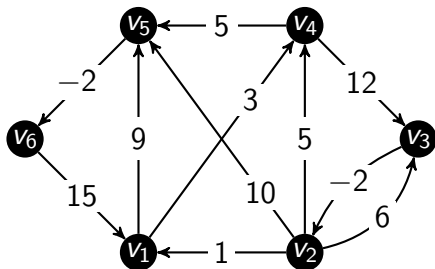


v_6

$$v_5 v_6 \rightarrow \infty + (-2) = \infty$$

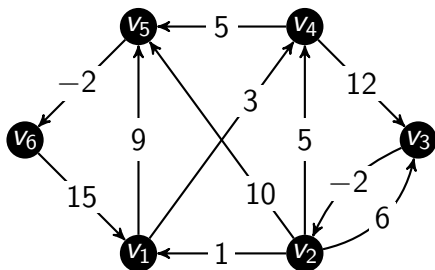
	0	1			
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



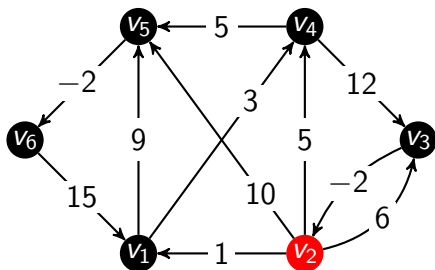
	0	1	2		
v_1	$-, 0$	$-, 0$			
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



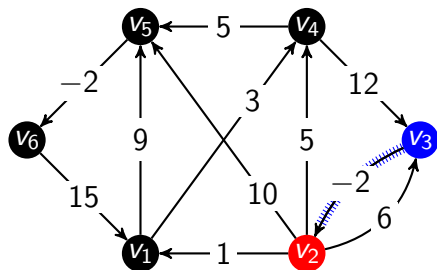
	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje

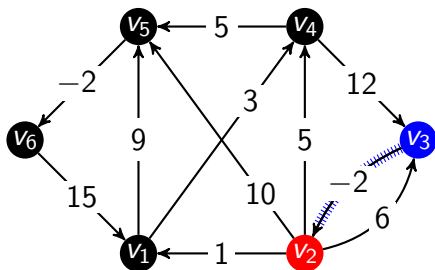


v_2

$v_3 v_2 \rightarrow$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje

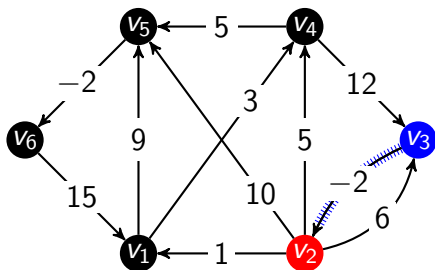


v_2

$$v_3 v_2 \rightarrow \infty + (-2) = \infty$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞			
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje

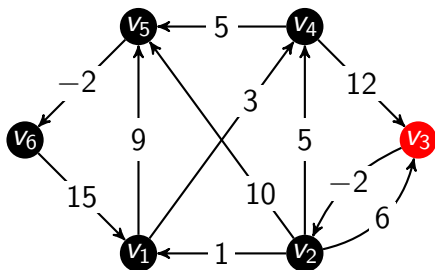


v_2

$$v_3 v_2 \rightarrow \infty + (-2) = \infty$$

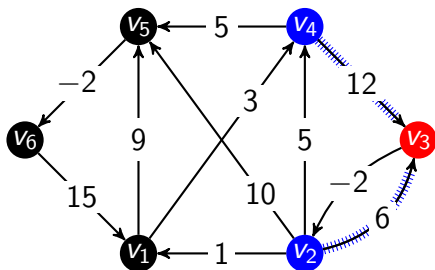
	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



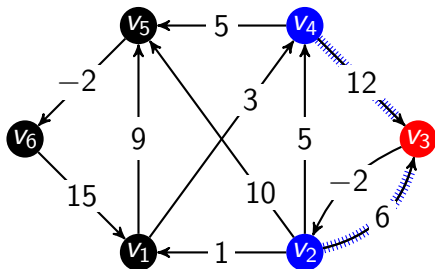
v_3

$v_2 v_3 \rightarrow$

$v_4 v_3 \rightarrow$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



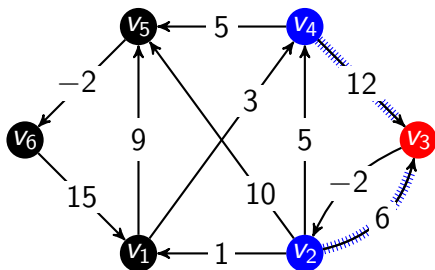
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



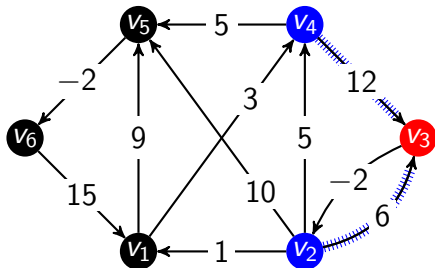
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞			
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



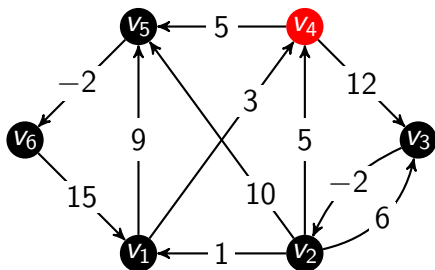
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

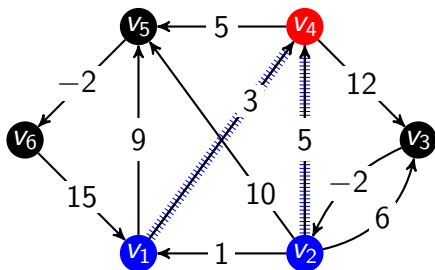
	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



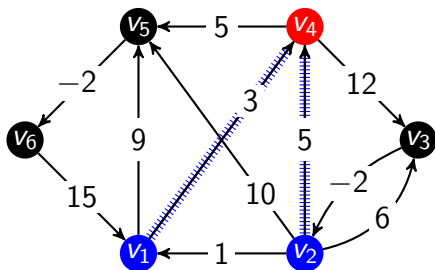
v_4

$v_1 v_4 \rightarrow$

$v_2 v_4 \rightarrow$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



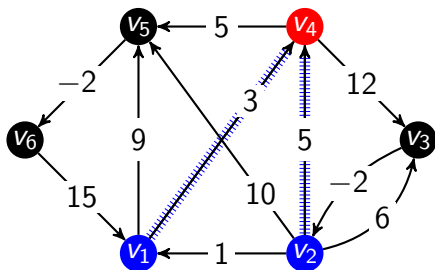
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



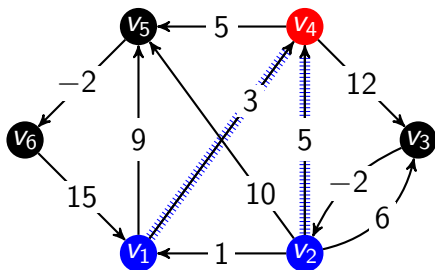
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$			
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



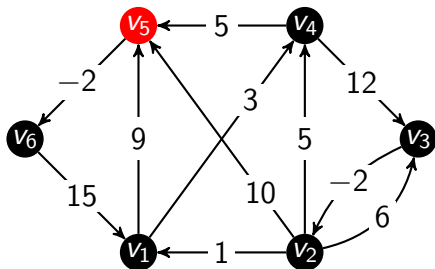
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

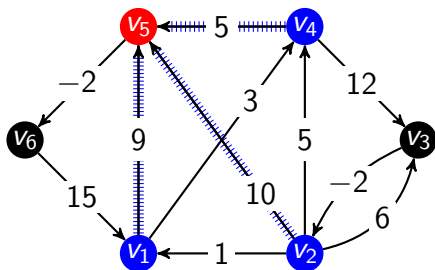
	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



v_5

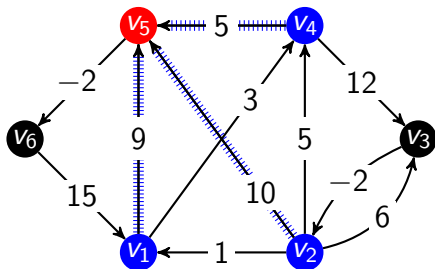
$v_1 v_5 \rightarrow$

$v_2 v_5 \rightarrow$

$v_4 v_5 \rightarrow$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



v_5

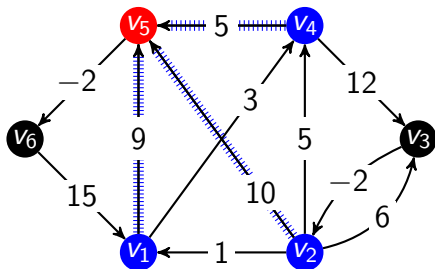
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow$$

$$v_4 v_5 \rightarrow$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



v_5

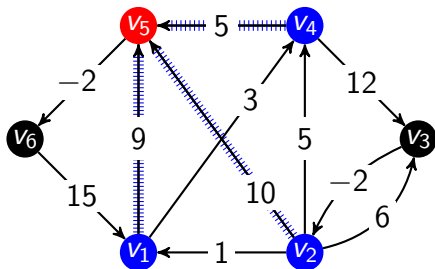
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow$$

	0	1	2		
v_1	-, 0	-, 0	-, 0		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



v_5

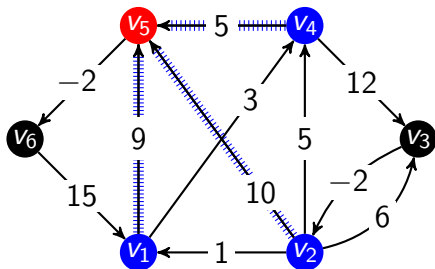
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

	0	1	2		
v_1	-, 0	-, 0	-, 0		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$			
v_6	∞	∞			

Rješenje



v_5

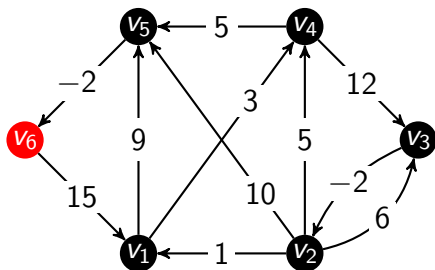
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

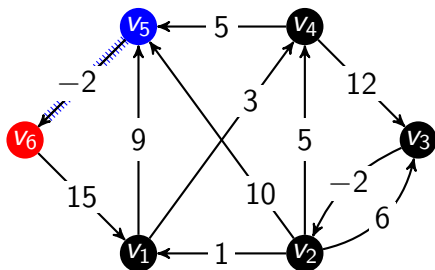
	0	1	2		
v_1	-, 0	-, 0	-, 0		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞			

Rješenje



	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞			

Rješenje

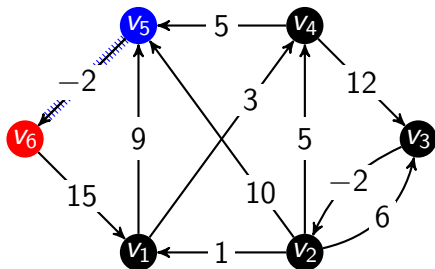


v_6

$v_5 v_6 \rightarrow$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞			

Rješenje

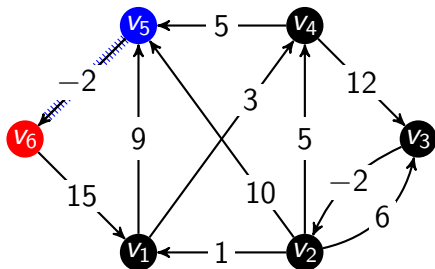


v_6

$$v_5 v_6 \rightarrow 9 + (-2) = 7$$

	0	1	2		
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞			

Rješenje

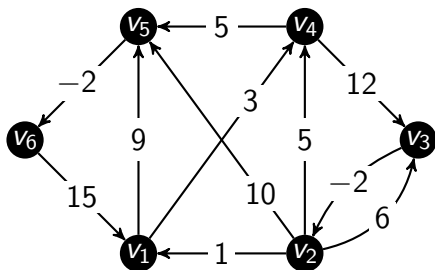


v_6

$$v_5 v_6 \rightarrow 9 + (-2) = 7$$

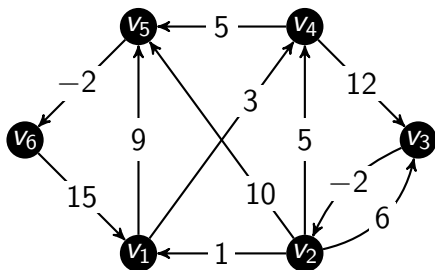
	0	1	2		
v_1	-, 0	-, 0	-, 0		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



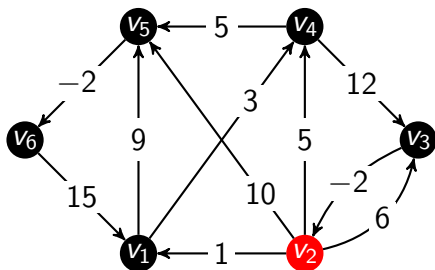
	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$		
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



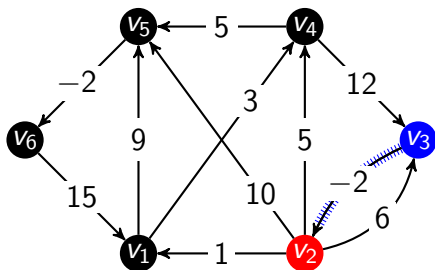
	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje

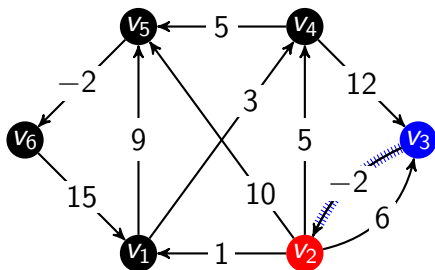


v_2

$v_3 v_2 \rightarrow$

	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje

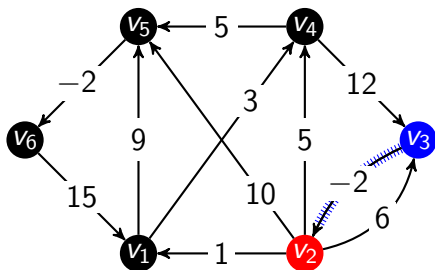


v_2

$$v_3 v_2 \rightarrow 15 + (-2) = 13$$

	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞		
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje

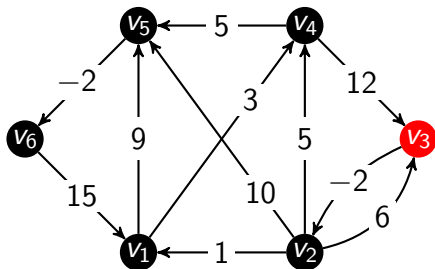


v_2

$$v_3 v_2 \rightarrow 15 + (-2) = 13$$

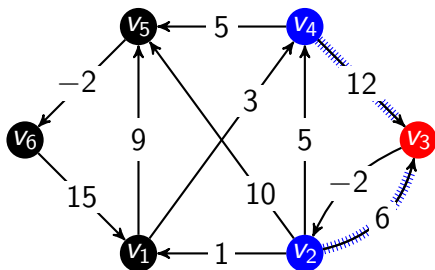
	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



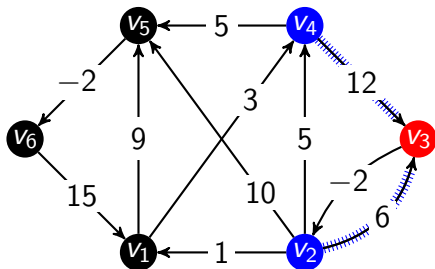
v_3

$v_2 v_3 \rightarrow$

$v_4 v_3 \rightarrow$

	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



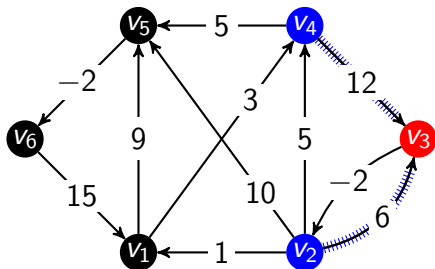
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow$$

	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



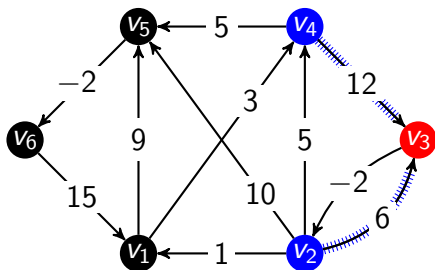
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$		
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



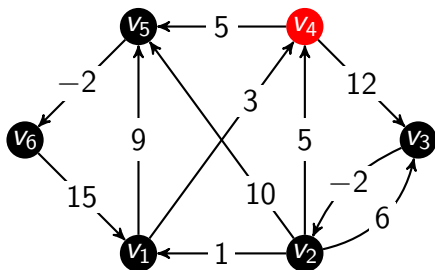
v_3

$$v_2 v_3 \rightarrow \infty + 6 = \infty$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

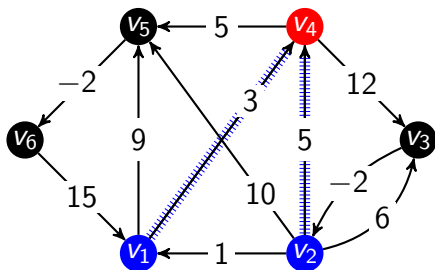
	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



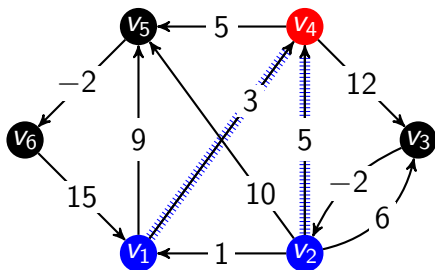
v_4

$v_1 v_4 \rightarrow$

$v_2 v_4 \rightarrow$

	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



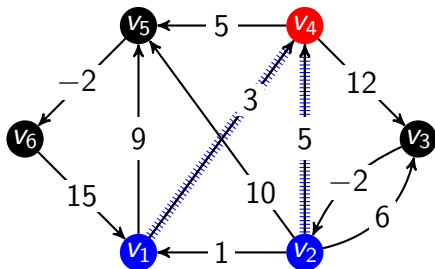
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow$$

	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



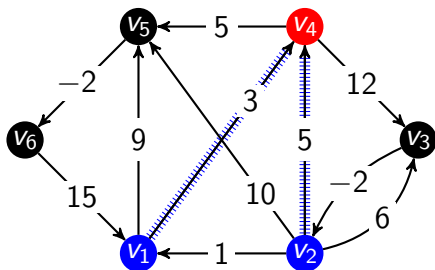
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$		
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



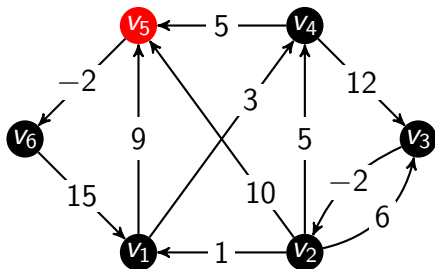
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow \infty + 5 = \infty$$

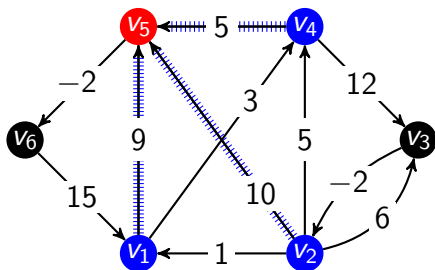
	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



v_5

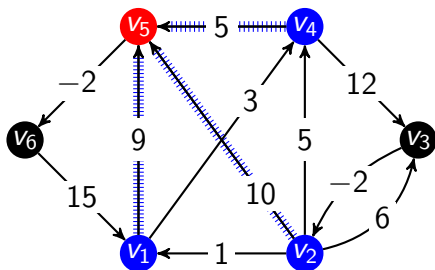
$v_1 v_5 \rightarrow$

$v_2 v_5 \rightarrow$

$v_4 v_5 \rightarrow$

	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



v_5

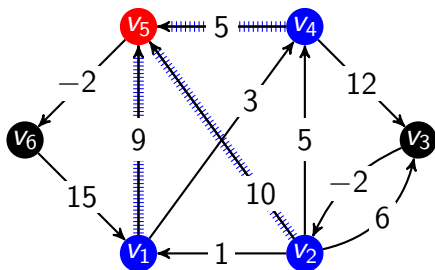
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow$$

$$v_4 v_5 \rightarrow$$

	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



v_5

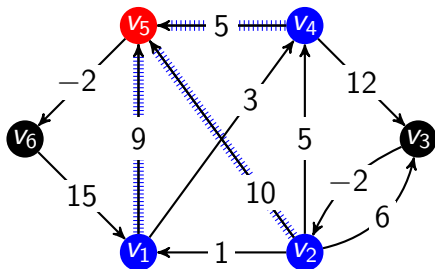
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow$$

	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



v_5

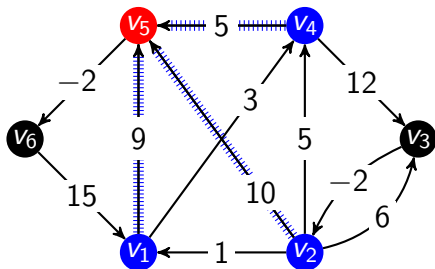
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$		
v_6	∞	∞	$v_5, 7$		

Rješenje



v_5

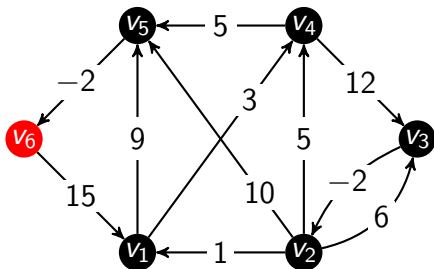
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow \infty + 10 = \infty$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

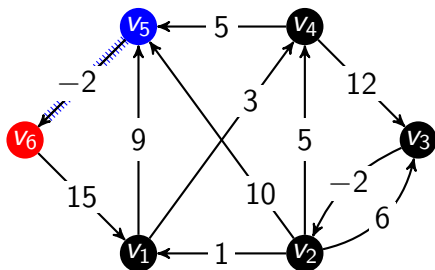
	0	1	2	3	
v_1	-, 0	-, 0	-, 0	-, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$		

Rješenje



	0	1	2	3	
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$		

Rješenje

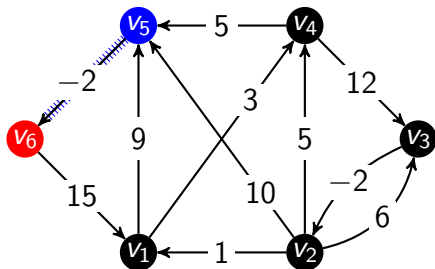


v_6

$v_5 v_6 \rightarrow$

	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$		

Rješenje

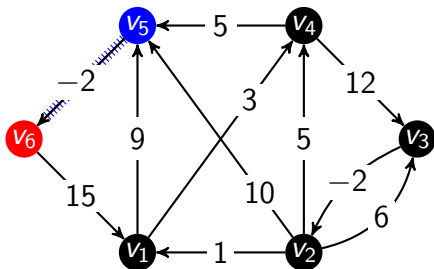


v_6

$$v_5 v_6 \rightarrow 8 + (-2) = 6$$

	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$		

Rješenje

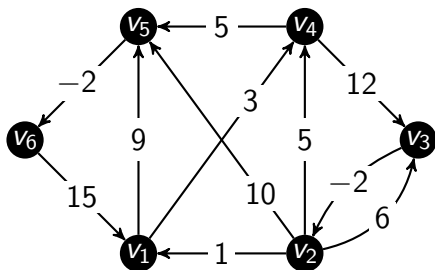


v_6

$$v_5 v_6 \rightarrow 8 + (-2) = 6$$

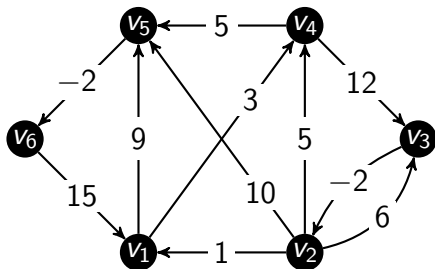
	0	1	2	3	
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



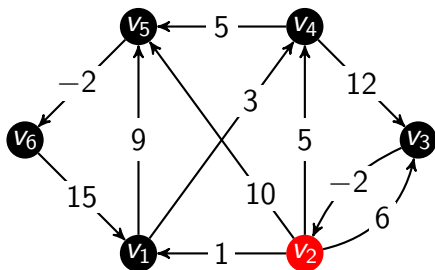
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



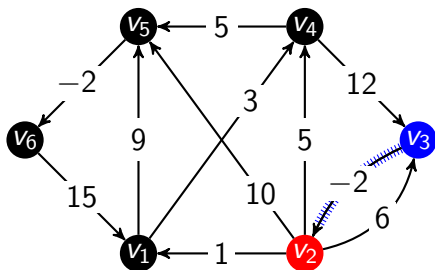
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

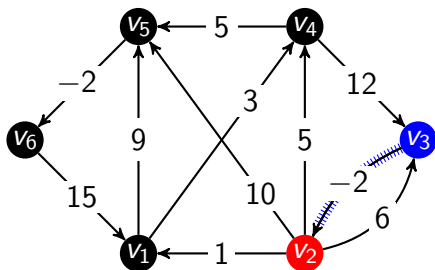


v_2

$v_3 v_2 \rightarrow$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

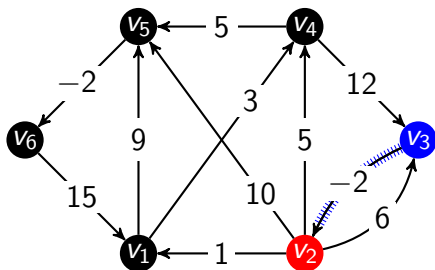


v_2

$$v_3 v_2 \rightarrow 15 + (-2) = 13$$

	0	1	2	3	4
v_1	-, 0	-, 0	-, 0	-, 0	-, 0
v_2	∞	∞	∞	$v_3, 13$	
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

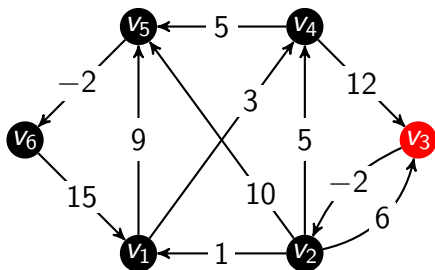


v_2

$$v_3 v_2 \rightarrow 15 + (-2) = 13$$

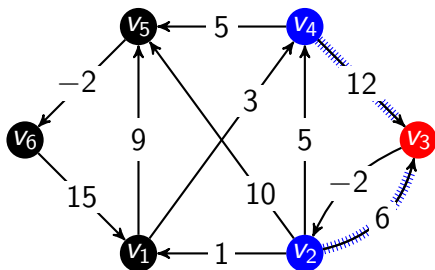
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



	0	1	2	3	4
v_1	$-, 0$	$-, 0$	$-, 0$	$-, 0$	$-, 0$
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



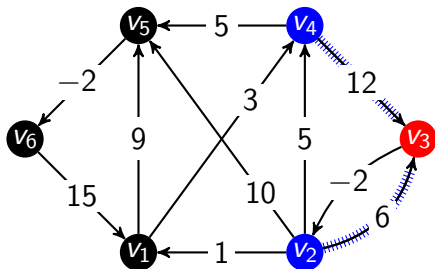
v_3

$v_2 v_3 \rightarrow$

$v_4 v_3 \rightarrow$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



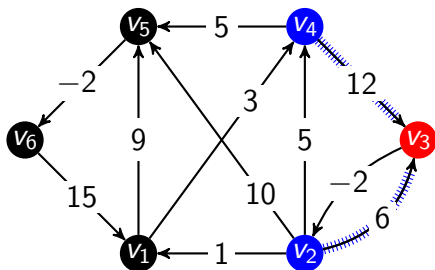
v_3

$$v_2 v_3 \rightarrow 13 + 6 = 19$$

$$v_4 v_3 \rightarrow$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



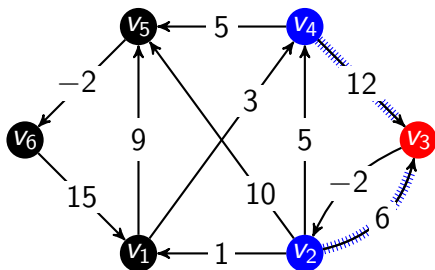
v_3

$$v_2 v_3 \rightarrow 13 + 6 = 19$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



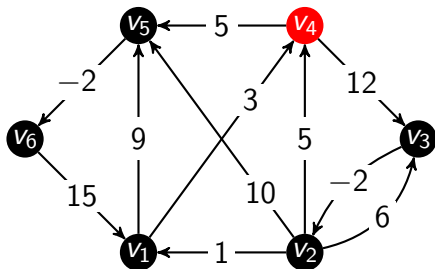
v_3

$$v_2 v_3 \rightarrow 13 + 6 = 19$$

$$v_4 v_3 \rightarrow 3 + 12 = 15$$

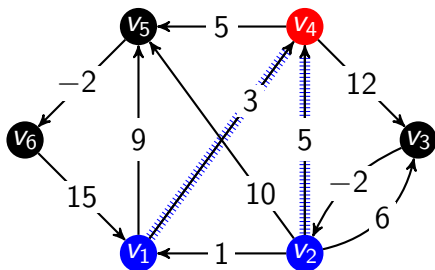
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



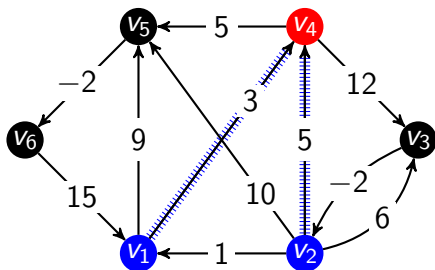
v_4

$v_1 v_4 \rightarrow$

$v_2 v_4 \rightarrow$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



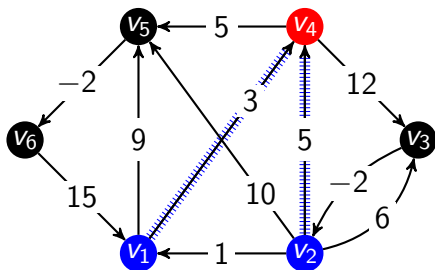
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



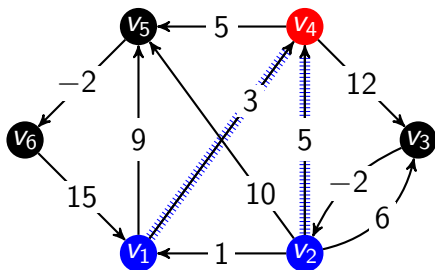
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow 13 + 5 = 18$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



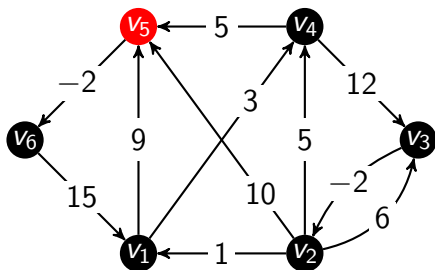
v_4

$$v_1 v_4 \rightarrow 0 + 3 = 3$$

$$v_2 v_4 \rightarrow 13 + 5 = 18$$

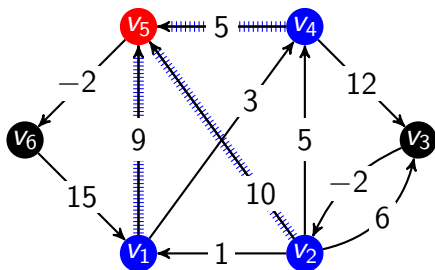
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



v_5

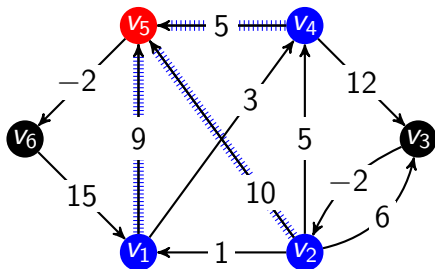
$v_1 v_5 \rightarrow$

$v_2 v_5 \rightarrow$

$v_4 v_5 \rightarrow$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



v_5

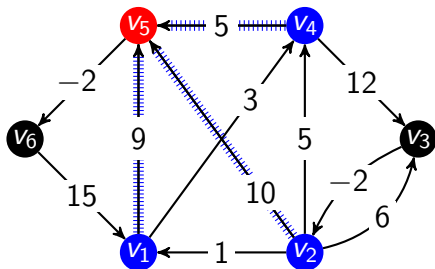
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow$$

$$v_4 v_5 \rightarrow$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



v_5

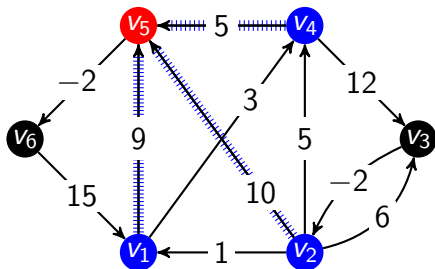
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow 13 + 10 = 23$$

$$v_4 v_5 \rightarrow$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



v_5

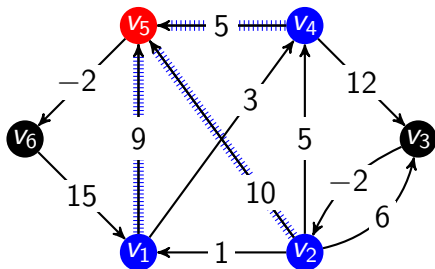
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow 13 + 10 = 23$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



v_5

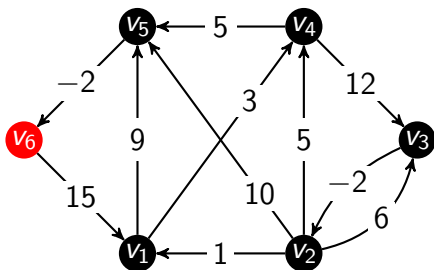
$$v_1 v_5 \rightarrow 0 + 9 = 9$$

$$v_2 v_5 \rightarrow 13 + 10 = 23$$

$$v_4 v_5 \rightarrow 3 + 5 = 8$$

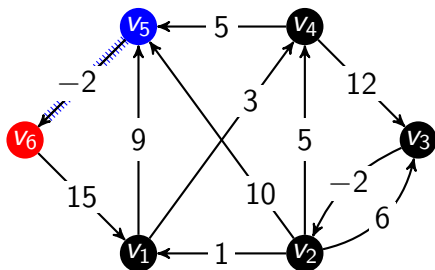
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje



	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

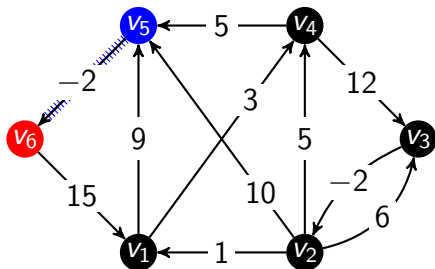


v_6

$v_5 v_6 \rightarrow$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

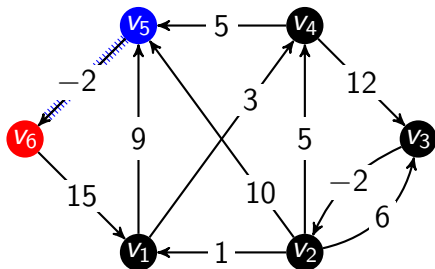


v_6

$$v_5 v_6 \rightarrow 8 + (-2) = 6$$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	

Rješenje

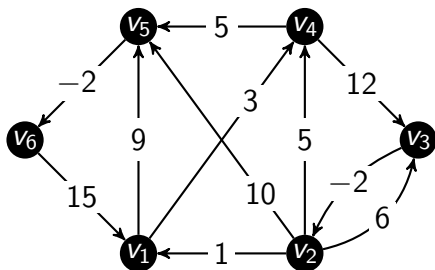


v_6

$$v_5 v_6 \rightarrow 8 + (-2) = 6$$

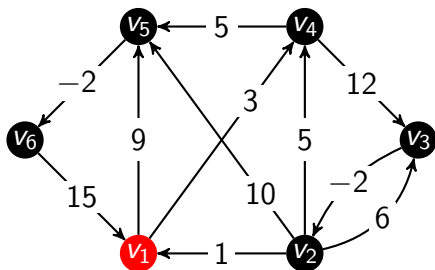
	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje



	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

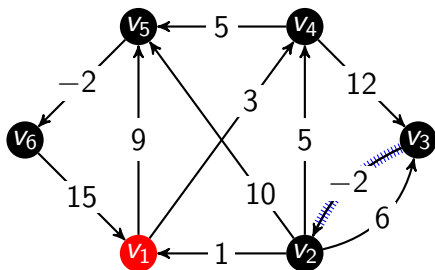
Rješenje



lukovi na najkraćim putovima

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje

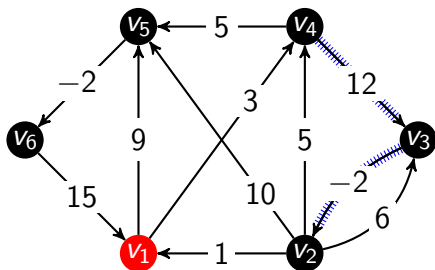


lukovi na najkraćim putovima

$v_3 v_2$,

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje

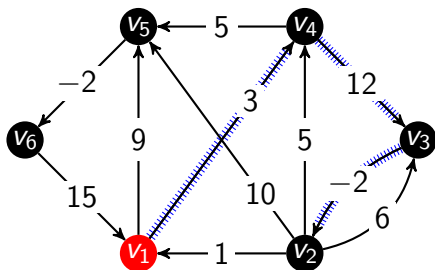


lukovi na najkraćim putovima

$v_3 v_2$, $v_4 v_3$,

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje

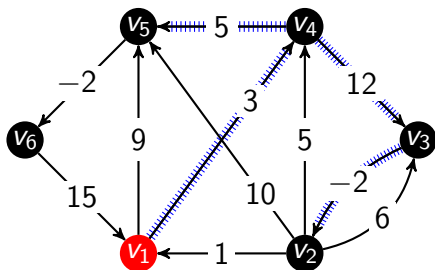


lukovi na najkraćim putovima

$v_3 v_2$, $v_4 v_3$, $v_1 v_4$,

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje

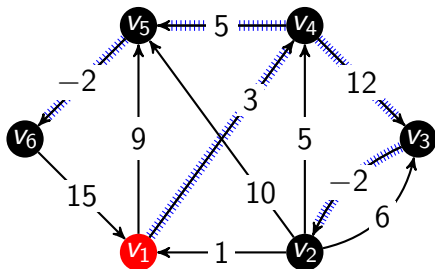


lukovi na najkraćim putovima

$v_3 v_2$, $v_4 v_3$, $v_1 v_4$, $v_4 v_5$,

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

Rješenje



lukovi na najkraćim putovima

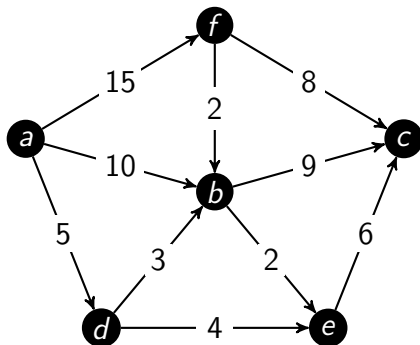
$v_3 v_2$, $v_4 v_3$, $v_1 v_4$, $v_4 v_5$, $v_5 v_6$

	0	1	2	3	4
v_1	—, 0	—, 0	—, 0	—, 0	—, 0
v_2	∞	∞	∞	$v_3, 13$	$v_3, 13$
v_3	∞	∞	$v_4, 15$	$v_4, 15$	$v_4, 15$
v_4	∞	$v_1, 3$	$v_1, 3$	$v_1, 3$	$v_1, 3$
v_5	∞	$v_1, 9$	$v_4, 8$	$v_4, 8$	$v_4, 8$
v_6	∞	∞	$v_5, 7$	$v_5, 6$	$v_5, 6$

treći zadatak

Zadatak 3

Pomoću Ford-Fulkersonovog algoritma pronađite maksimalni protok i minimalni (a, c) -rez u zadanoj transportnoj mreži.



Ford-Fulkersonov algoritam

Direktno označavanje

Ako je $a = (u, v)$, tada je direktno označavanje vrha v preko vrha u duž luka a moguće jedino ako je $c(a) > f(a)$. U tom slučaju vrh v dobiva oznaku (u^+, L_v) , gdje je

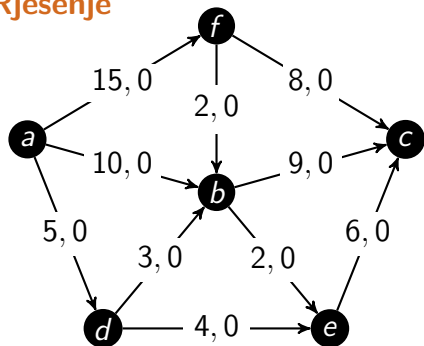
$$L_v = \min \{L_u, c(a) - f(a)\}.$$

Obrnuto označavanje

Ako je $a = (v, u)$, tada je obrnuto označavanje vrha v preko vrha u duž luka a moguće jedino ako je $f(a) > 0$. U tom slučaju v dobiva oznaku (u^-, L_v) , gdje je

$$L_v = \min \{L_u, f(a)\}.$$

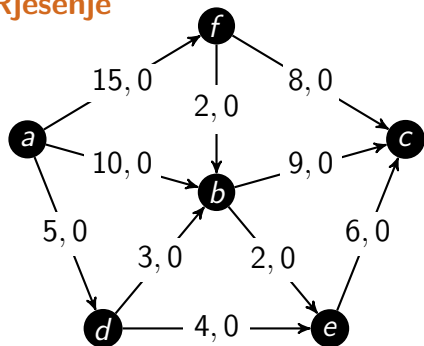
Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

Rješenje

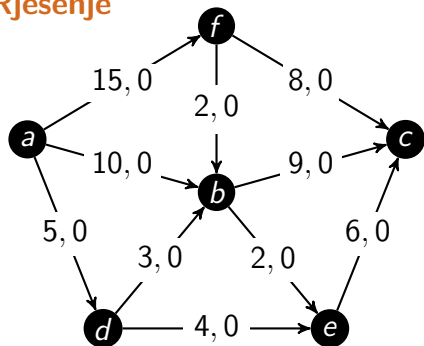


0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

Rješenje



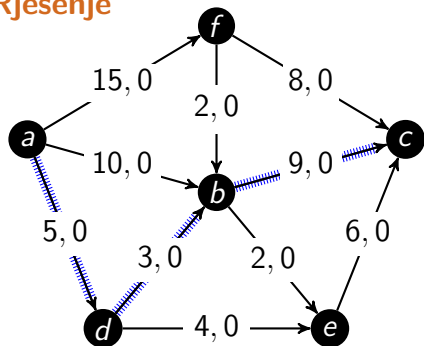
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put:

Rješenje



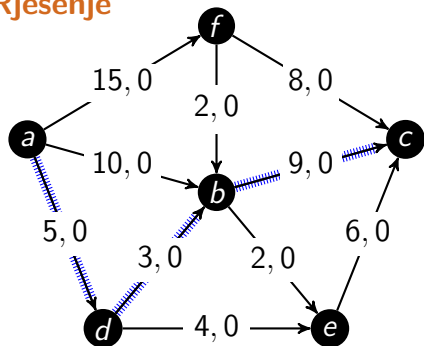
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je $\text{val } \mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

Rješenje



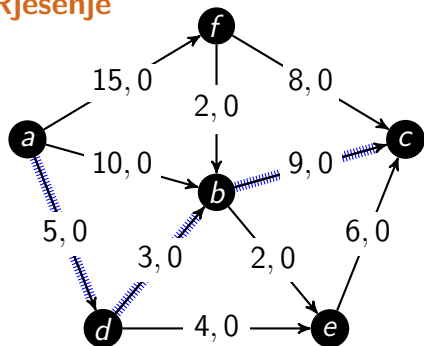
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put: $P = adbc$
 $a(-, \infty)$

Rješenje



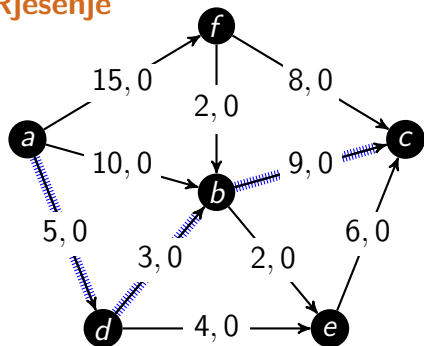
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put: $P = adbc$
 $a(-, \infty), d(a^+, 5)$

Rješenje



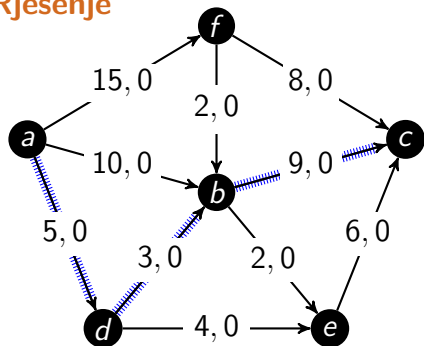
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put: $P = adbc$
 $a(-, \infty), d(a^+, 5), b(d^+, 3)$

Rješenje



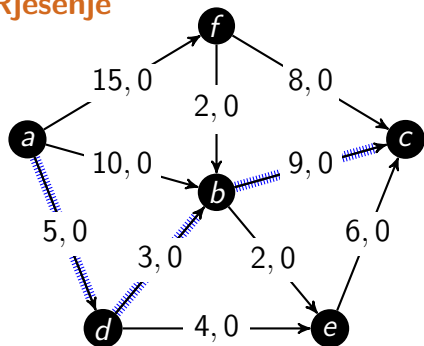
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

1. korak

\mathcal{F}_0 -rastući put: $P = adbc$
 $a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, 3)$

Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je
val $\mathcal{F}_0 = 0$.

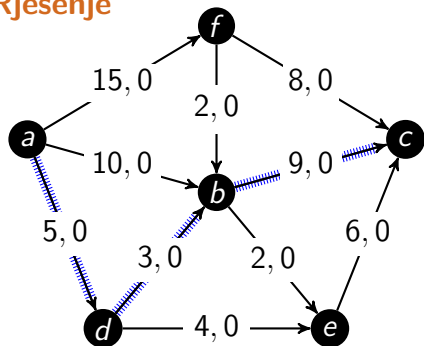
1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

Rješenje



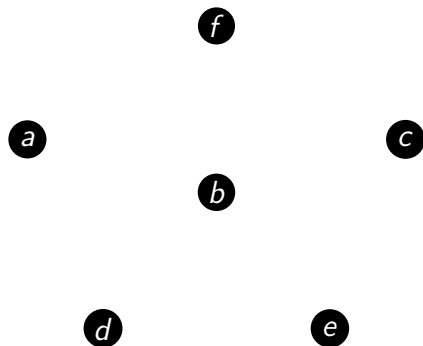
0. korak

Krećemo s protokom \mathcal{F}_0 za koji je val $\mathcal{F}_0 = 0$.

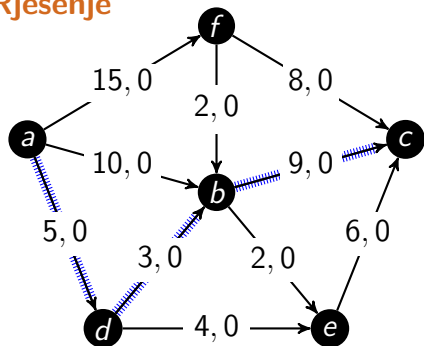
1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$

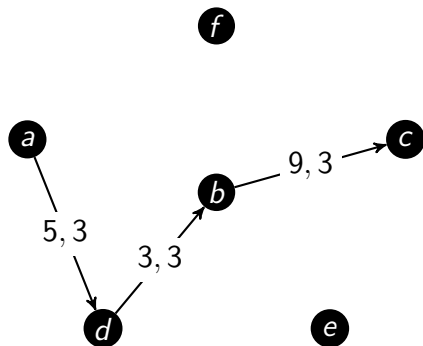


Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je val $\mathcal{F}_0 = 0$.



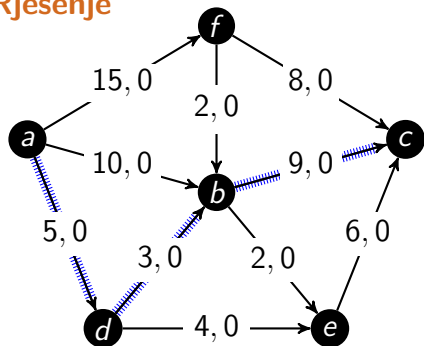
1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

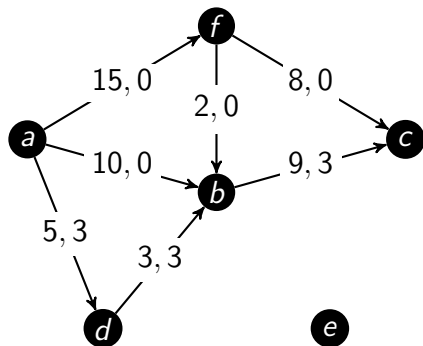
$c(b^+, \boxed{3})$

Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je val $\mathcal{F}_0 = 0$.

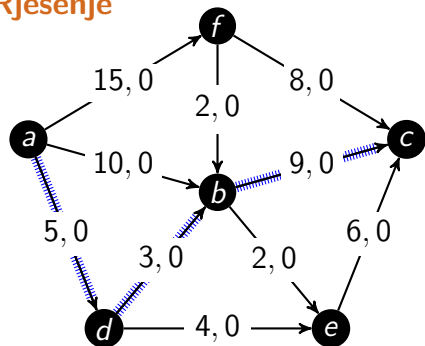


1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

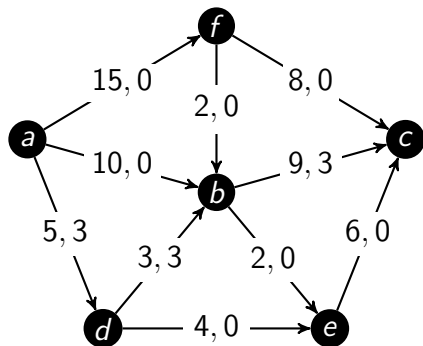
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$

Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je val $\mathcal{F}_0 = 0$.



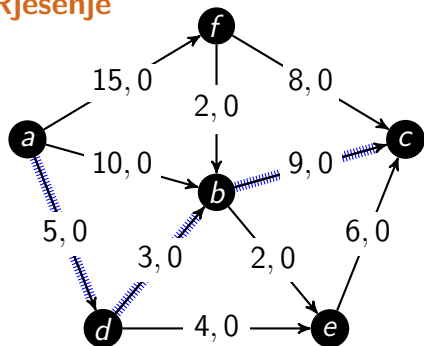
1. korak

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

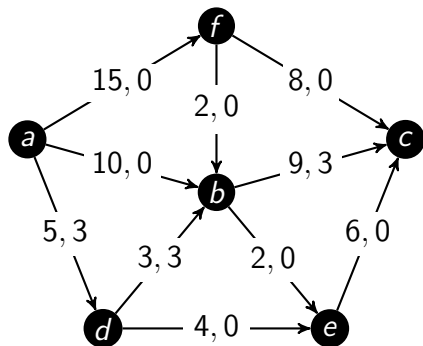
$c(b^+, \boxed{3})$

Rješenje



0. korak

Krećemo s protokom \mathcal{F}_0 za koji je $\text{val } \mathcal{F}_0 = 0$.

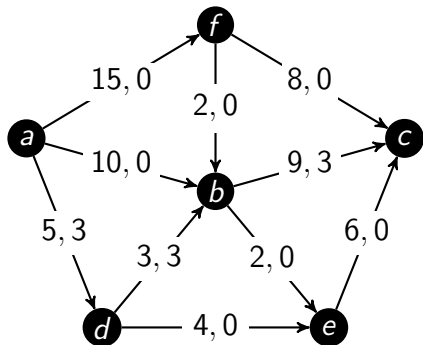


1. korak $\text{val } \mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

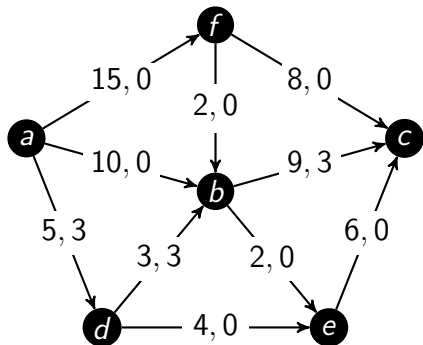


1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$



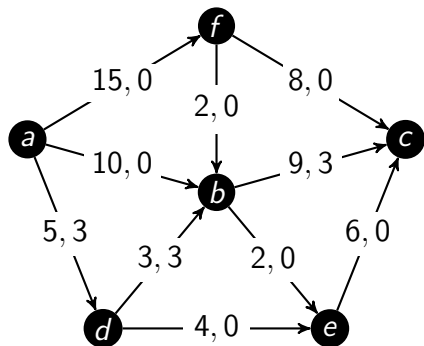
1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak



1. korak val $\mathcal{F}_1 = 3$

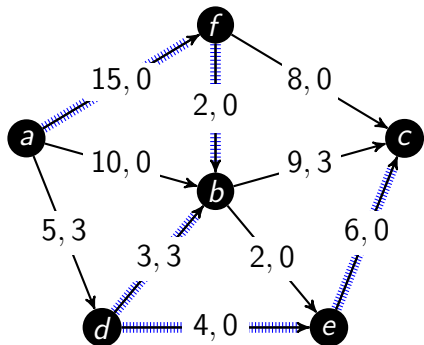
\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put:



1. korak val $\mathcal{F}_1 = 3$

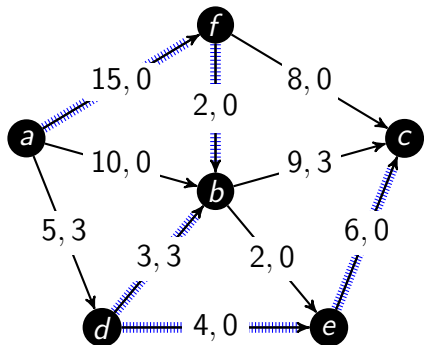
\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

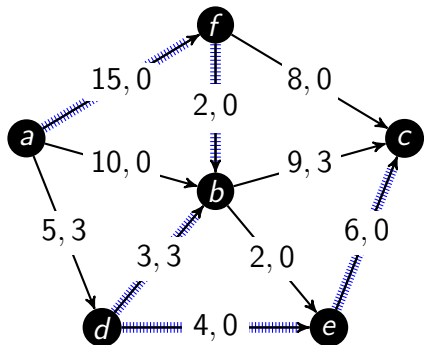
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

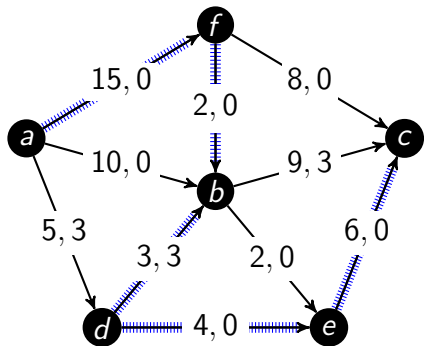
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

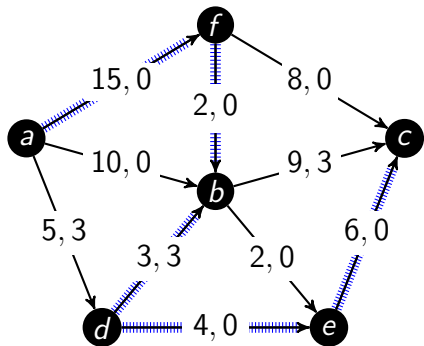
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

$c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,

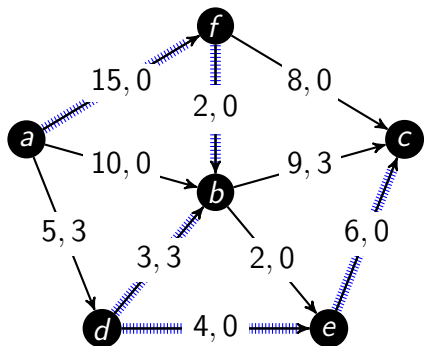
$c(b^+, 3)$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,

$d(b^-, 2)$



1. korak val $\mathcal{F}_1 = 3$

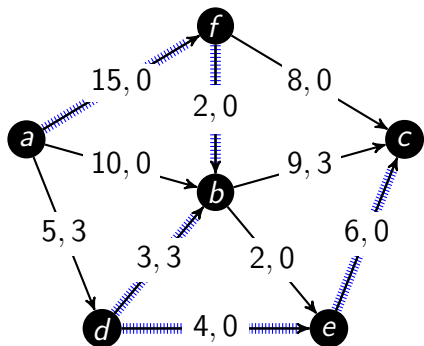
\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$



1. korak val $\mathcal{F}_1 = 3$

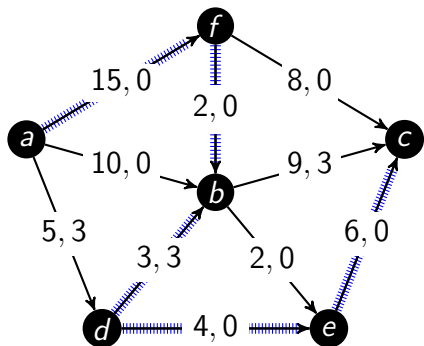
\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, 3)$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



1. korak val $\mathcal{F}_1 = 3$

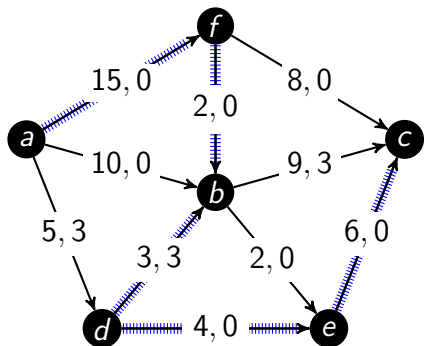
\mathcal{F}_0 -rastući put: $P = adbc$

$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$

2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

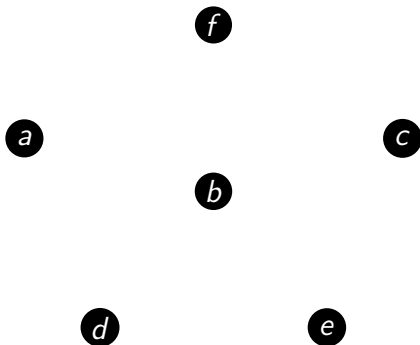
$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

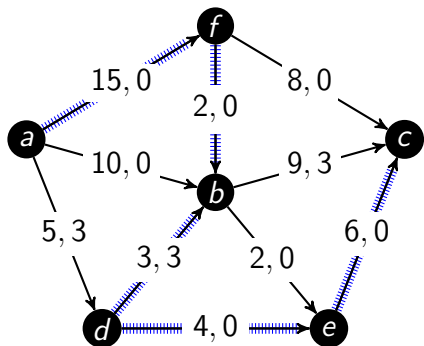
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$



2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

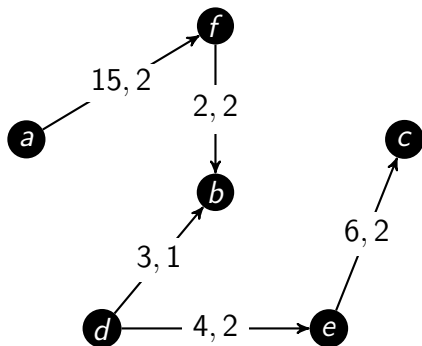
$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

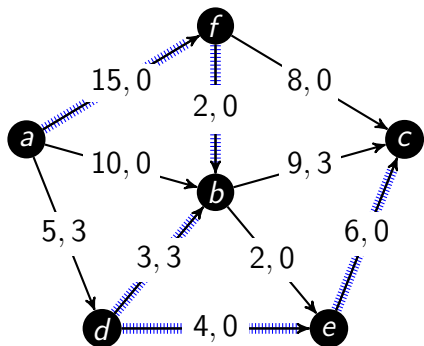
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$



2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

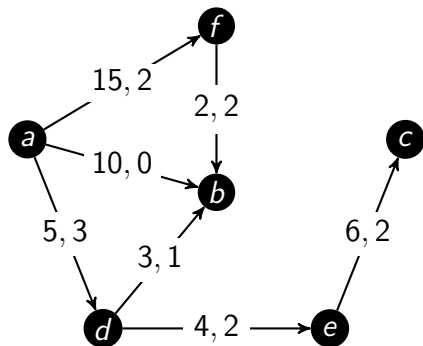
$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

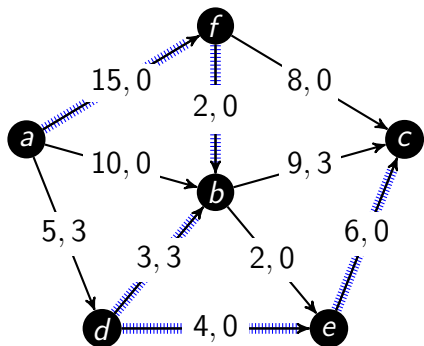
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$



2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

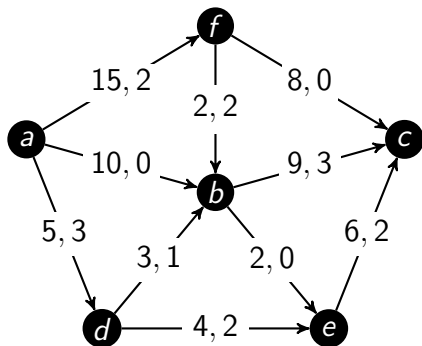
$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$



1. korak val $\mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

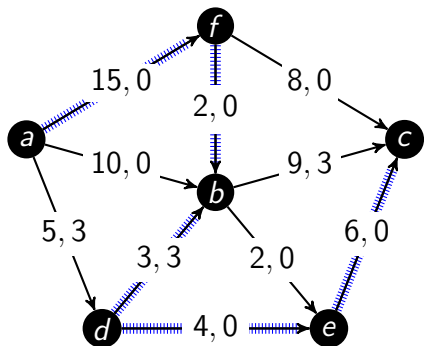
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$



2. korak

\mathcal{F}_1 -rastući put: $P = afbdec$

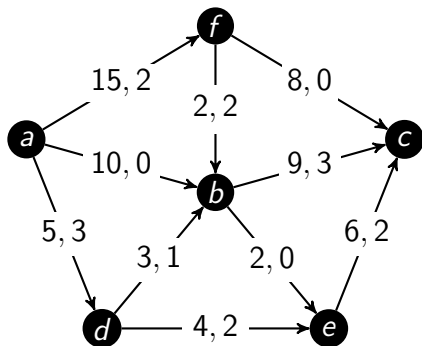
$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$



1. korak $\text{val } \mathcal{F}_1 = 3$

\mathcal{F}_0 -rastući put: $P = adbc$

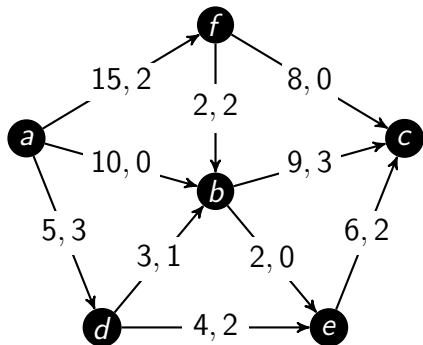
$a(-, \infty)$, $d(a^+, 5)$, $b(d^+, 3)$,
 $c(b^+, \boxed{3})$



2. korak $\text{val } \mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, \boxed{2})$

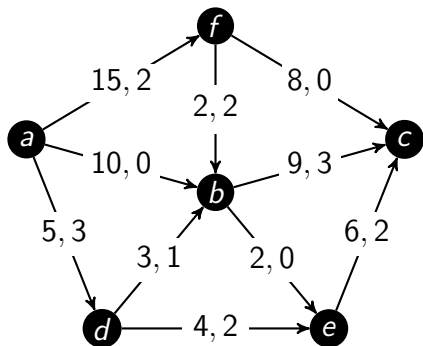


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$

$a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,

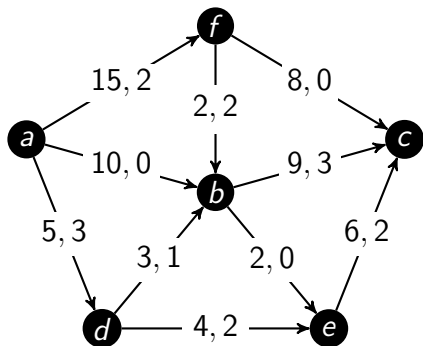
$d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

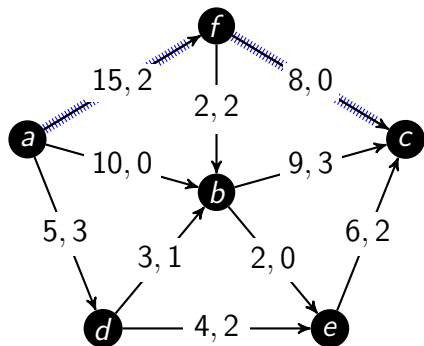


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

\mathcal{F}_2 -rastući put:

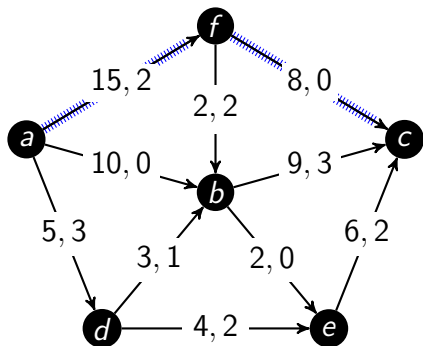


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

\mathcal{F}_2 -rastući put: $P = afc$

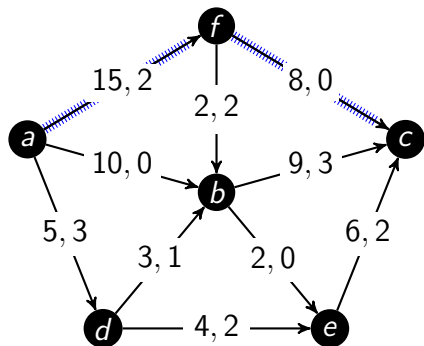


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$

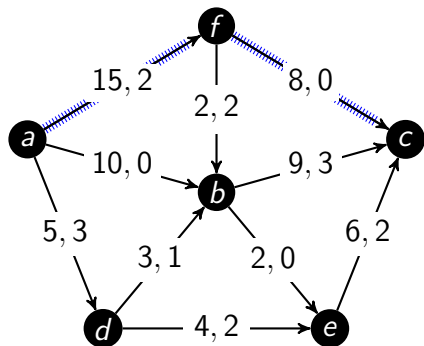


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$

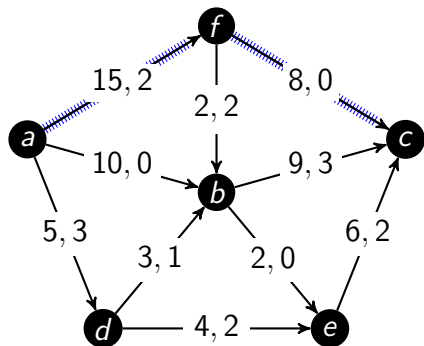


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$

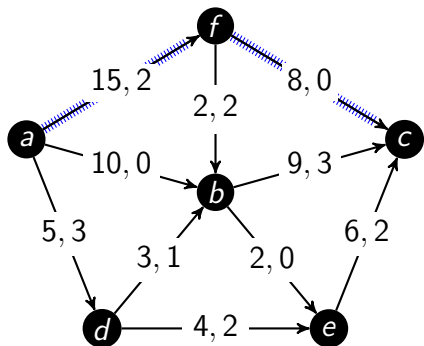


2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$

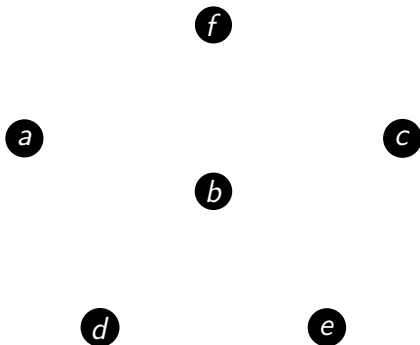
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



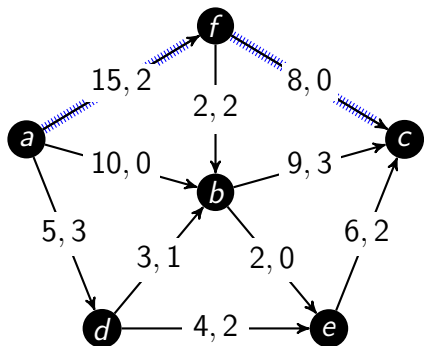
2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



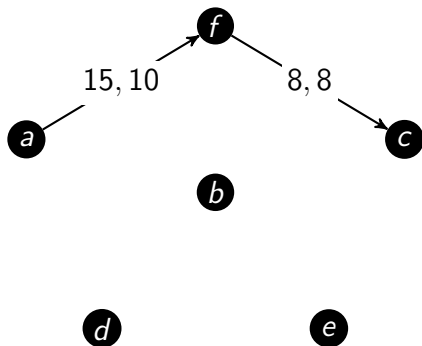
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



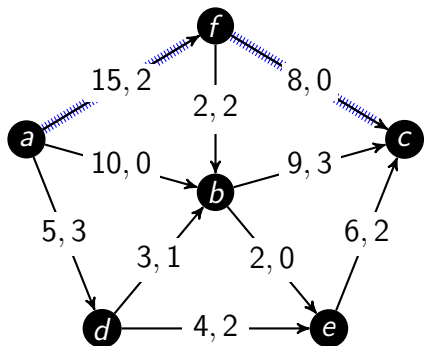
2. korak $\text{val } \mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



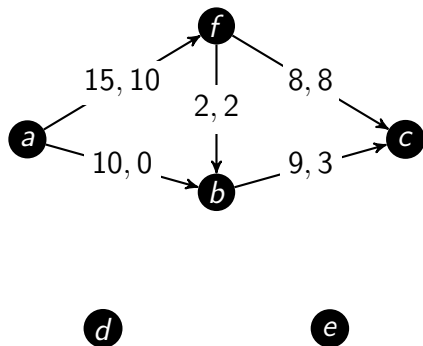
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



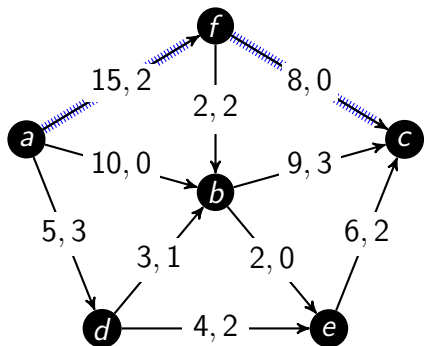
2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



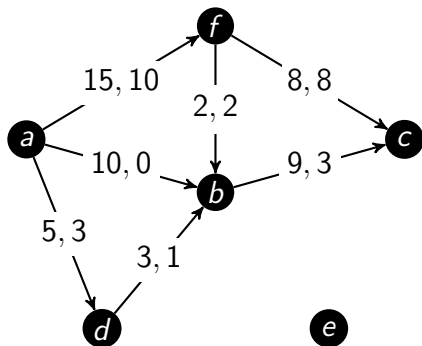
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



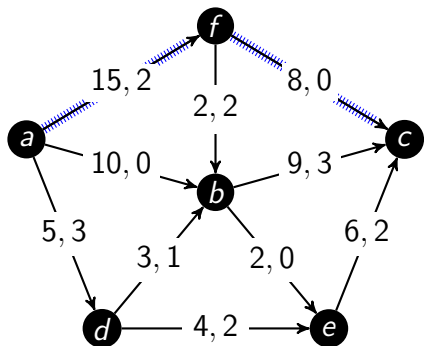
2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



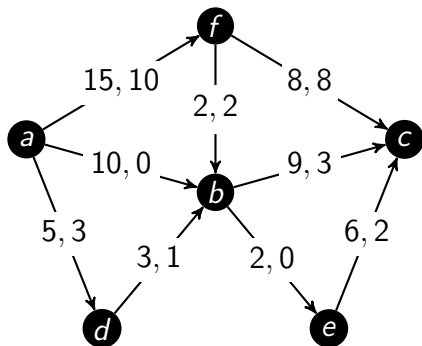
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



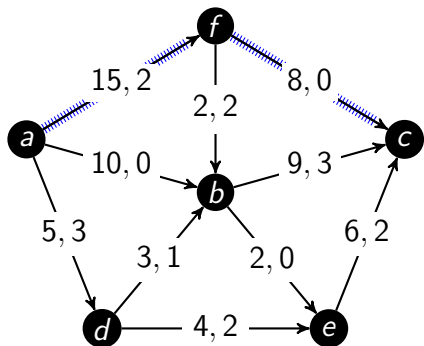
2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



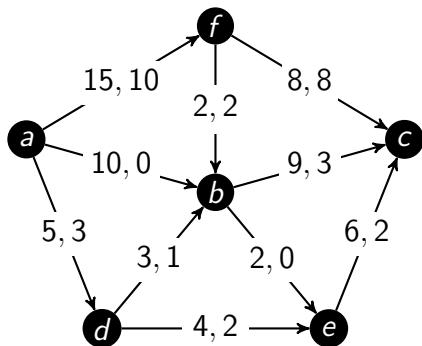
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



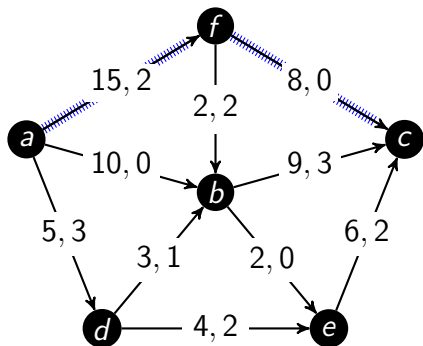
2. korak val $\mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



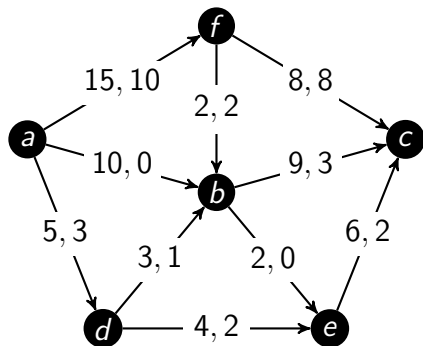
3. korak

\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



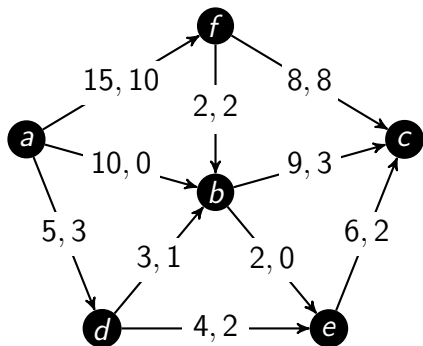
2. korak $\text{val } \mathcal{F}_2 = 5$

\mathcal{F}_1 -rastući put: $P = afbdec$
 $a(-, \infty)$, $f(a^+, 15)$, $b(f^+, 2)$,
 $d(b^-, 2)$, $e(d^+, 2)$, $c(e^+, 2)$



3. korak $\text{val } \mathcal{F}_3 = 13$

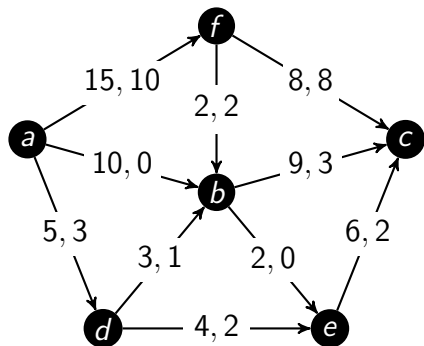
\mathcal{F}_2 -rastući put: $P = afc$
 $a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

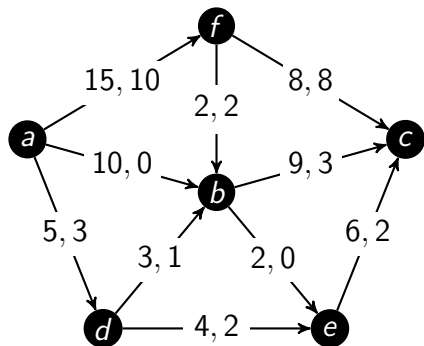


3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

4. korak



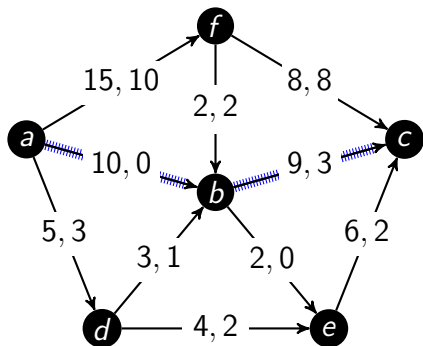
3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

4. korak

\mathcal{F}_3 -rastući put:



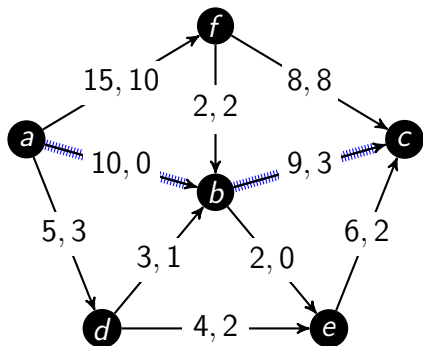
3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

4. korak

\mathcal{F}_3 -rastući put: $P = abc$



3. korak val $\mathcal{F}_3 = 13$

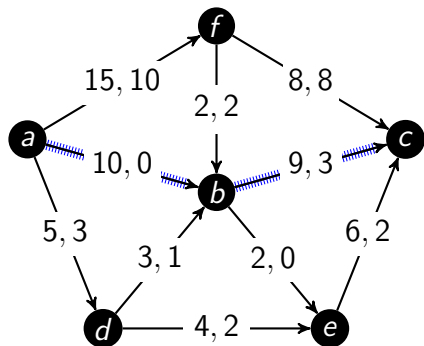
\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

4. korak

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$



3. korak val $\mathcal{F}_3 = 13$

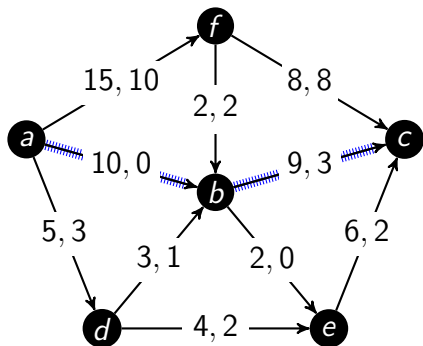
\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$

4. korak

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$



3. korak val $\mathcal{F}_3 = 13$

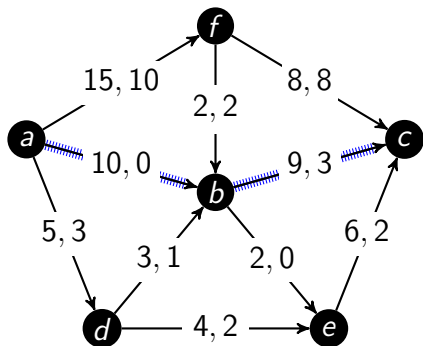
\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$

4. korak

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, 6)$



3. korak val $\mathcal{F}_3 = 13$

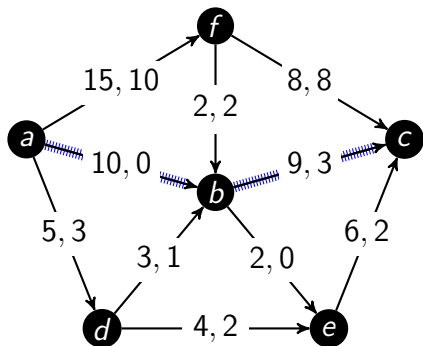
\mathcal{F}_2 -rastući put: $P = afc$

$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$

4. korak

\mathcal{F}_3 -rastući put: $P = abc$

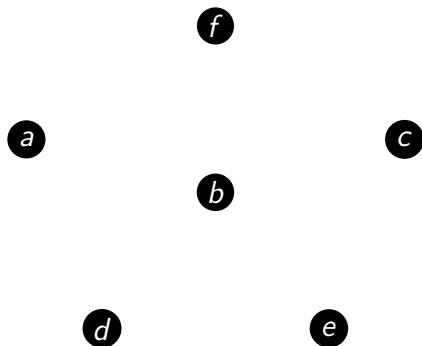
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

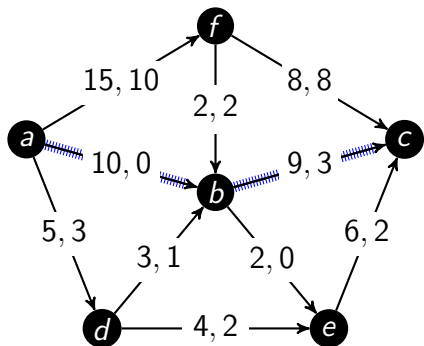
$a(-, \infty), f(a^+, 13), c(f^+, 8)$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

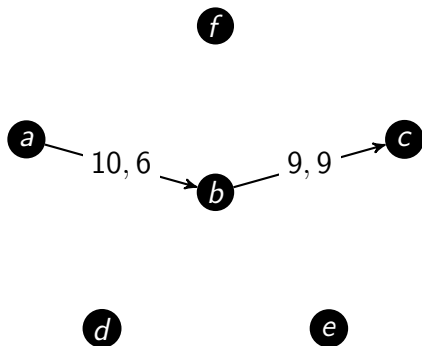
$a(-, \infty), b(a^+, 10), c(b^+, 6)$



3. korak $\text{val } \mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

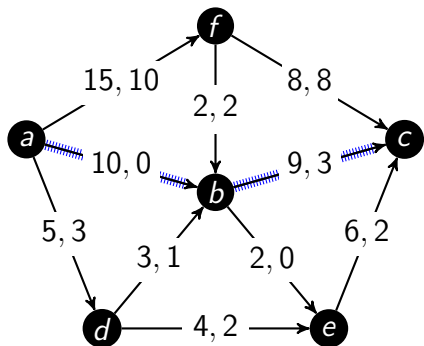
$a(-, \infty), f(a^+, 13), c(f^+, 8)$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

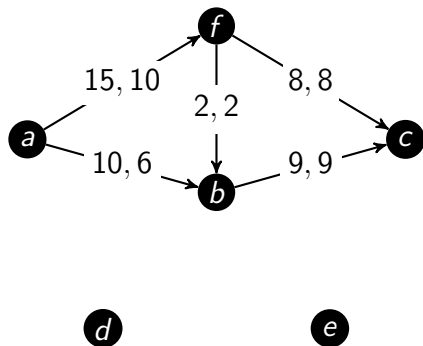
$a(-, \infty), b(a^+, 10), c(b^+, 6)$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

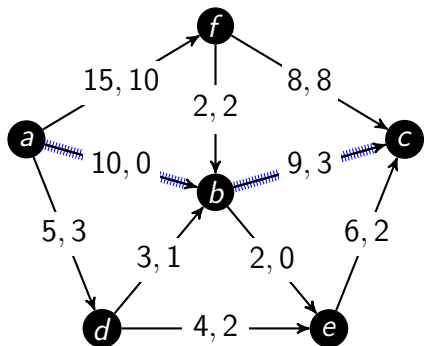
$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

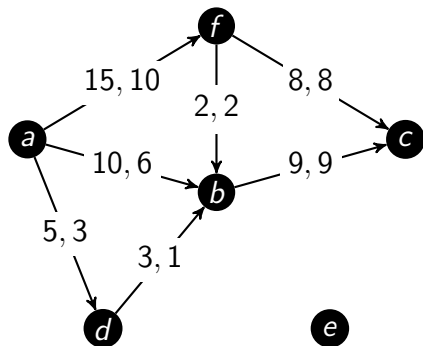
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, 6)$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

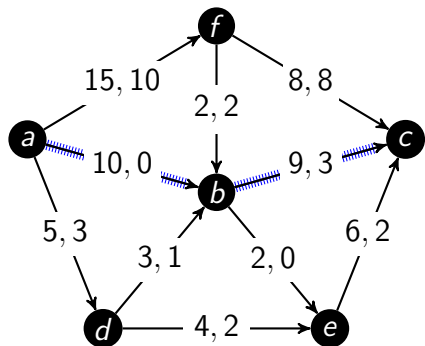
$a(-, \infty), f(a^+, 13), c(f^+, 8)$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

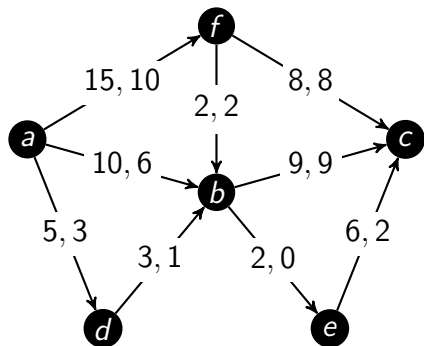
$a(-, \infty), b(a^+, 10), c(b^+, 6)$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

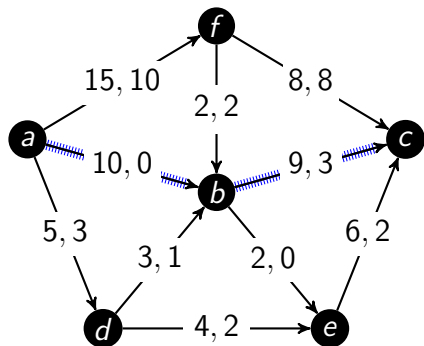
$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

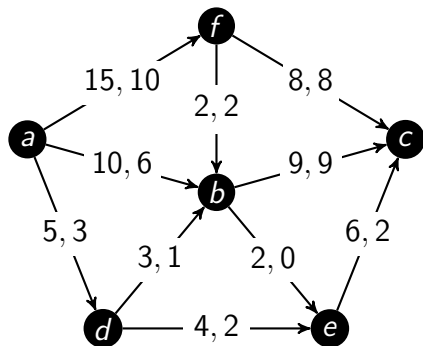
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, 6)$



3. korak val $\mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

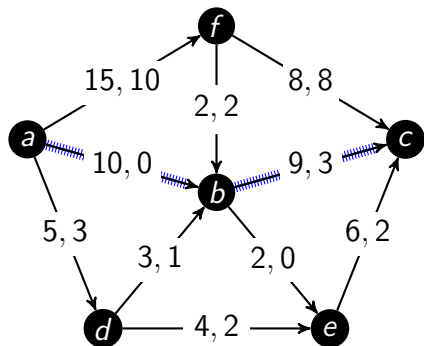
$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, \boxed{8})$



4. korak

\mathcal{F}_3 -rastući put: $P = abc$

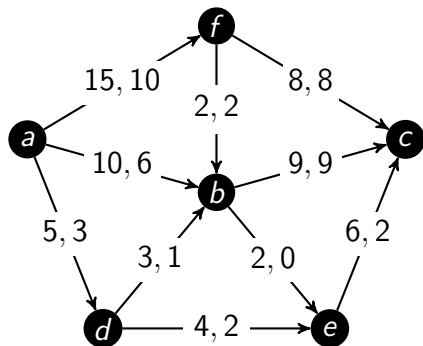
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



3. korak $\text{val } \mathcal{F}_3 = 13$

\mathcal{F}_2 -rastući put: $P = afc$

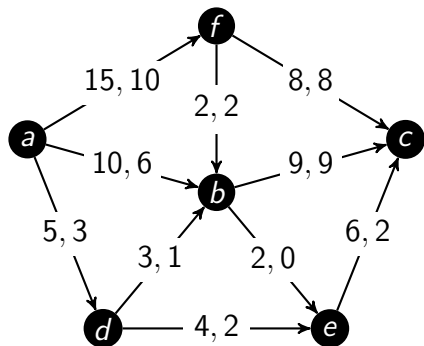
$a(-, \infty)$, $f(a^+, 13)$, $c(f^+, 8)$



4. korak $\text{val } \mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

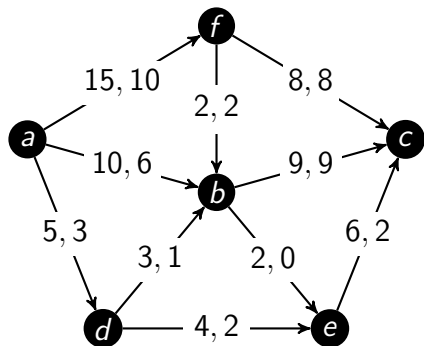
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, 6)$



4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

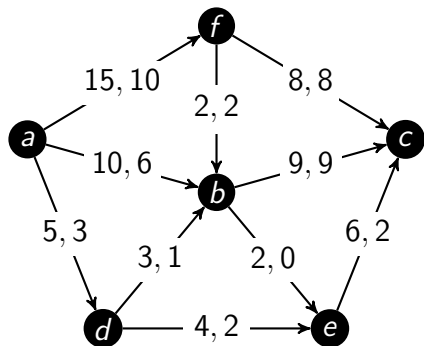


4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak



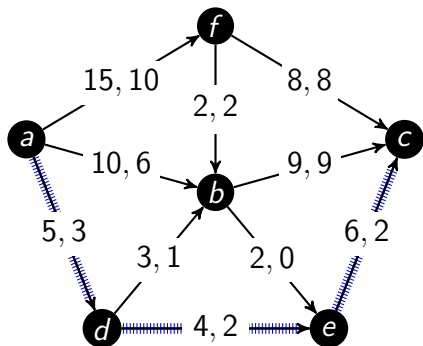
4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put:



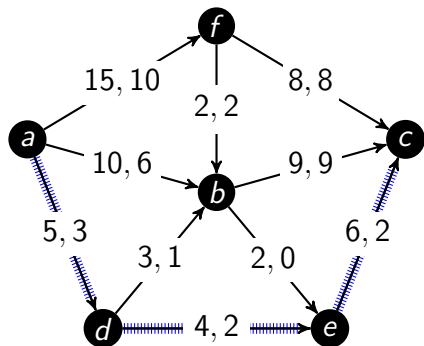
4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$



4. korak val $\mathcal{F}_4 = 19$

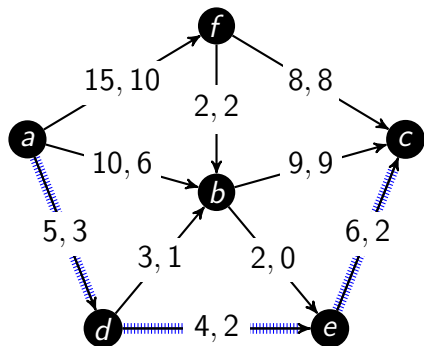
\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$



4. korak val $\mathcal{F}_4 = 19$

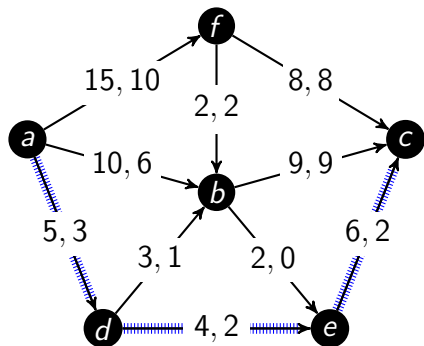
\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$



4. korak val $\mathcal{F}_4 = 19$

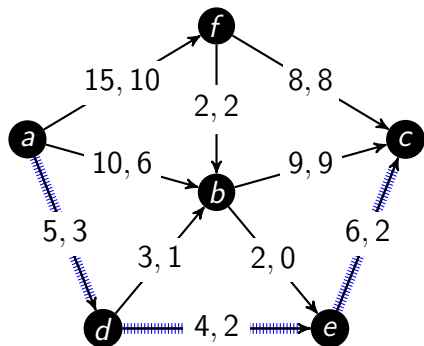
\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$



4. korak val $\mathcal{F}_4 = 19$

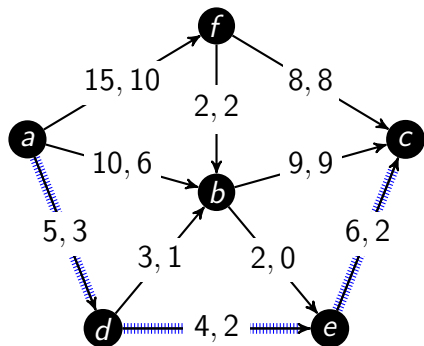
\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, 2)$



4. korak val $\mathcal{F}_4 = 19$

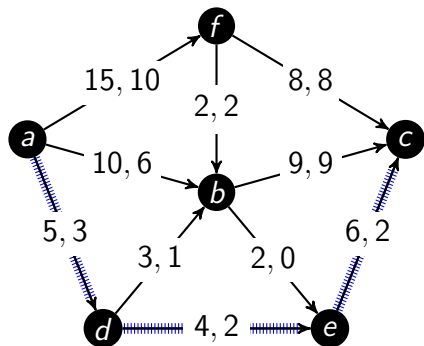
\mathcal{F}_3 -rastući put: $P = abc$

$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$

5. korak

\mathcal{F}_4 -rastući put: $P = adec$

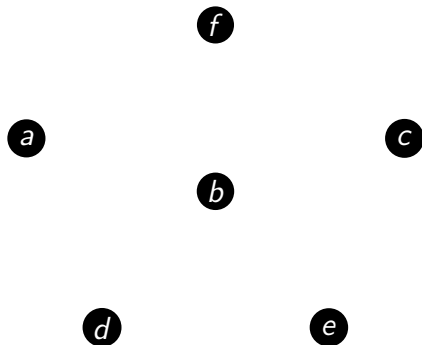
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

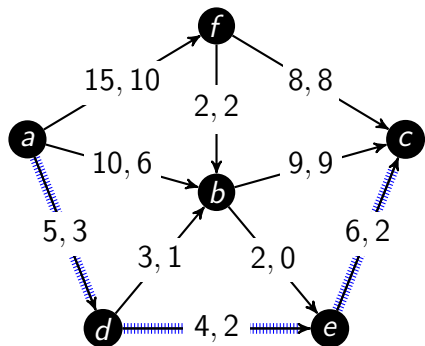
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak

\mathcal{F}_4 -rastući put: $P = adec$

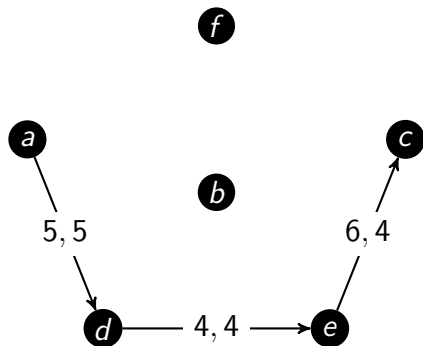
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

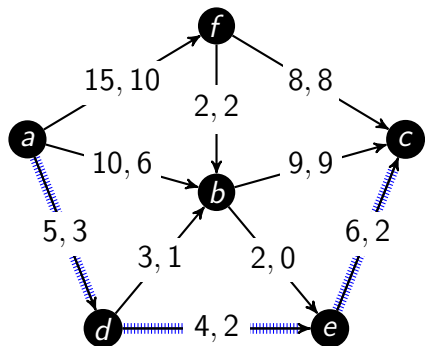
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak

\mathcal{F}_4 -rastući put: $P = adec$

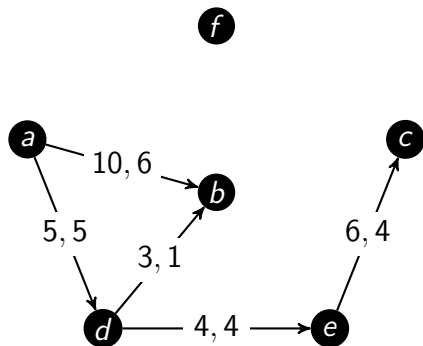
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

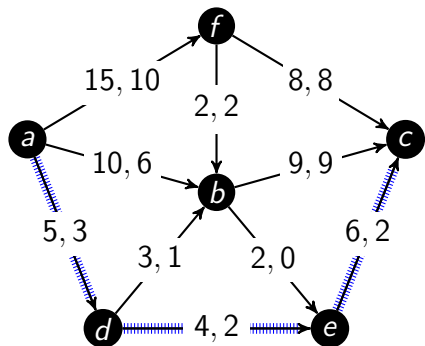
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak

\mathcal{F}_4 -rastući put: $P = adec$

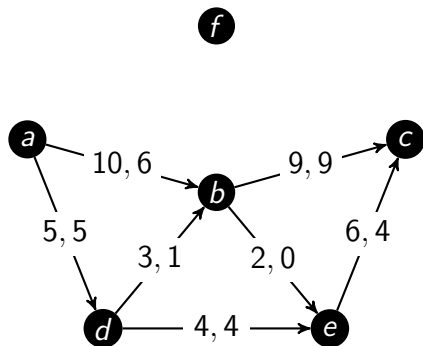
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak val $\mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

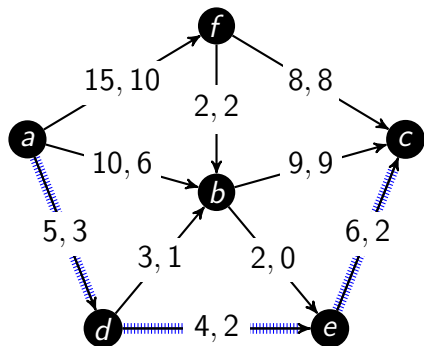
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak

\mathcal{F}_4 -rastući put: $P = adec$

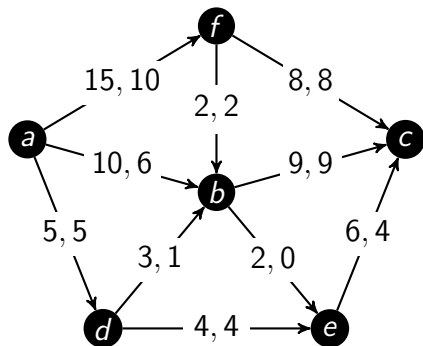
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak $\text{val } \mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

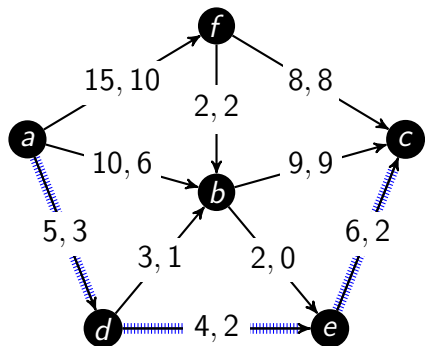
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak

\mathcal{F}_4 -rastući put: $P = adec$

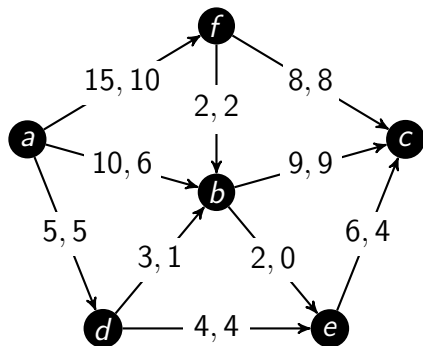
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$



4. korak $\text{val } \mathcal{F}_4 = 19$

\mathcal{F}_3 -rastući put: $P = abc$

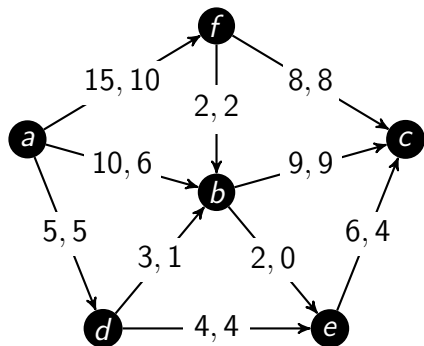
$a(-, \infty)$, $b(a^+, 10)$, $c(b^+, \boxed{6})$



5. korak $\text{val } \mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,
 $c(e^+, \boxed{2})$

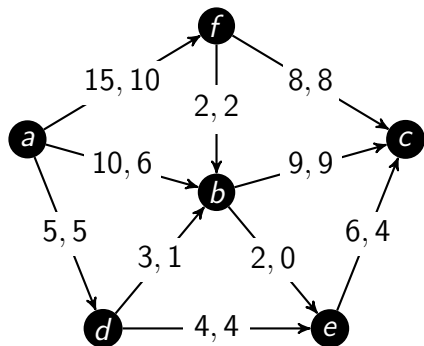


5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$



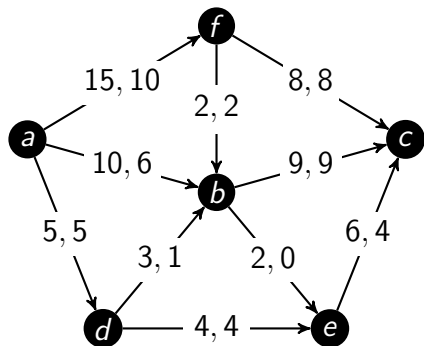
5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak



5. korak val $\mathcal{F}_5 = 21$

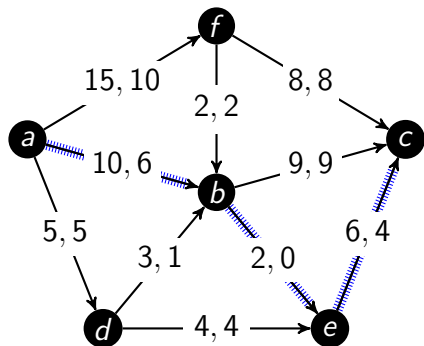
\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put:



5. korak val $\mathcal{F}_5 = 21$

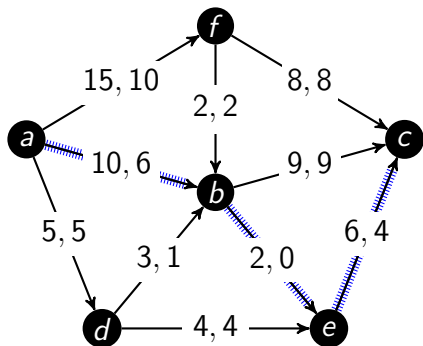
\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$



5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = ade c$

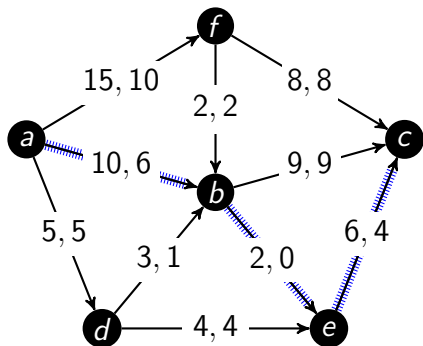
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$



5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

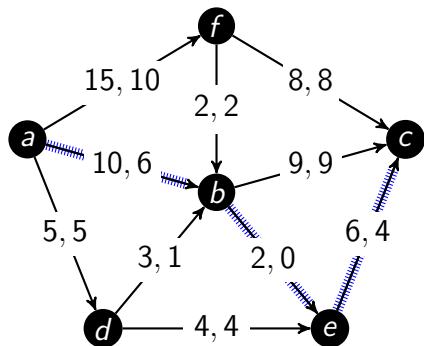
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$



5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

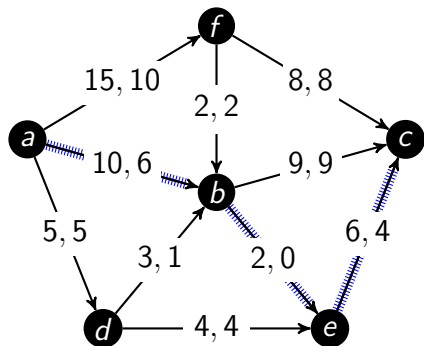
$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$



5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

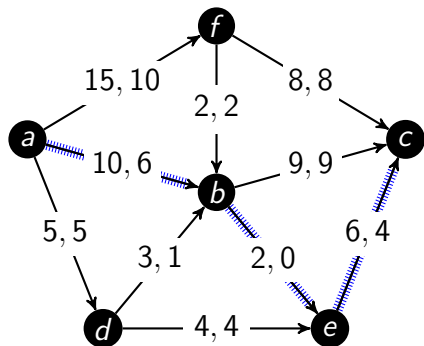
$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$



5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

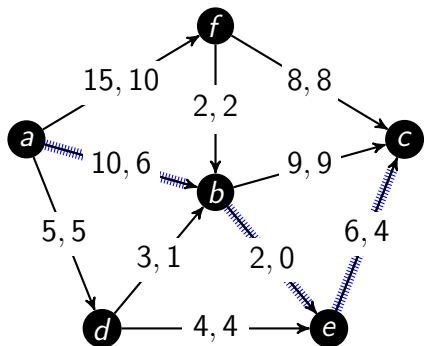
$c(e^+, 2)$

6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

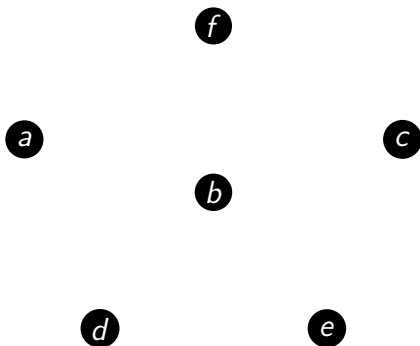


5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

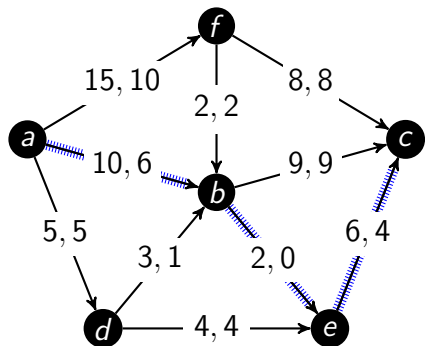


6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

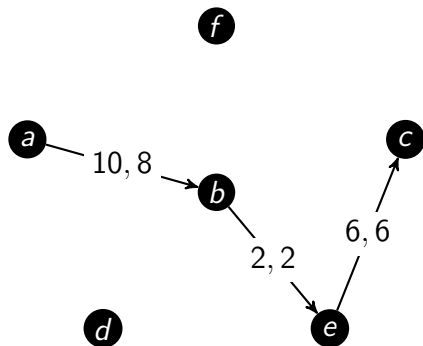


5. korak $\text{val } \mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

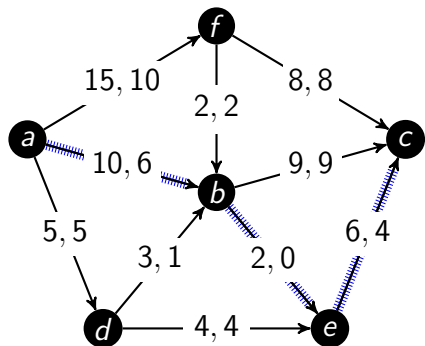


6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

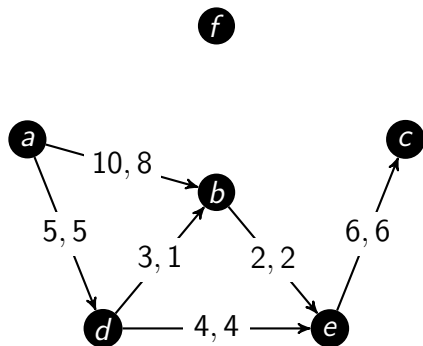


5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

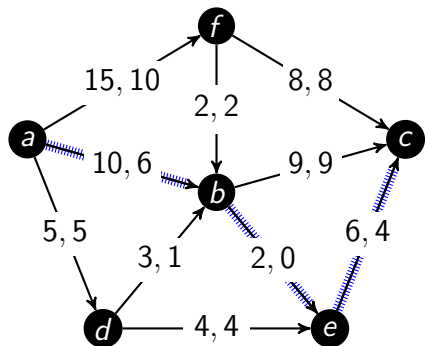


6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

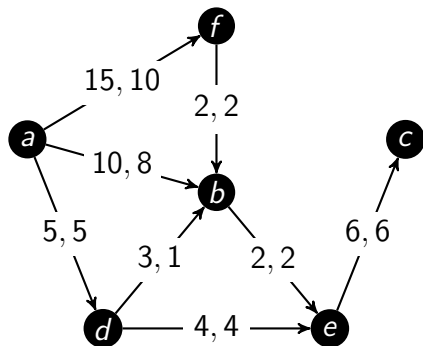


5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

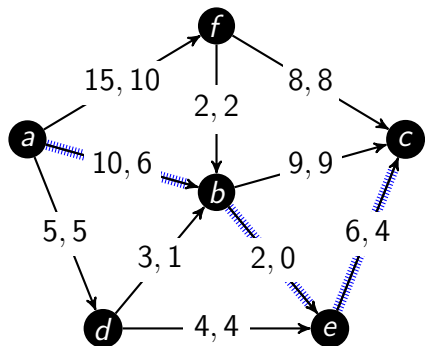


6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

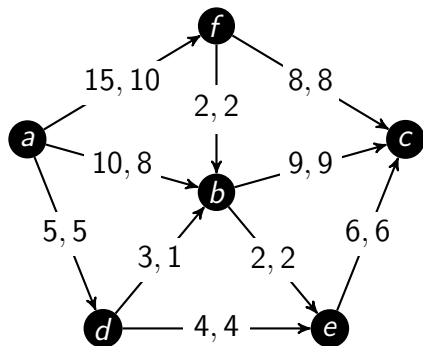


5. korak val $\mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, \boxed{2})$

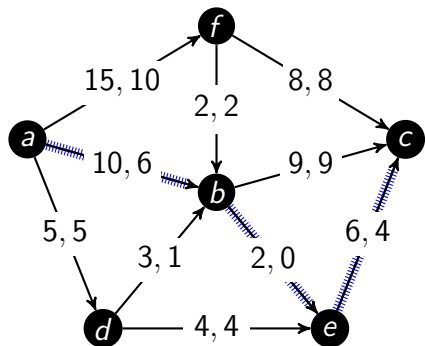


6. korak

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, \boxed{2})$

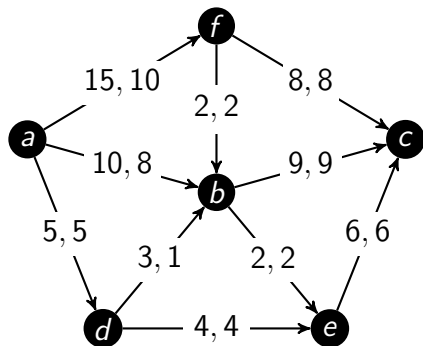


5. korak $\text{val } \mathcal{F}_5 = 21$

\mathcal{F}_4 -rastući put: $P = adec$

$a(-, \infty)$, $d(a^+, 2)$, $e(d^+, 2)$,

$c(e^+, 2)$

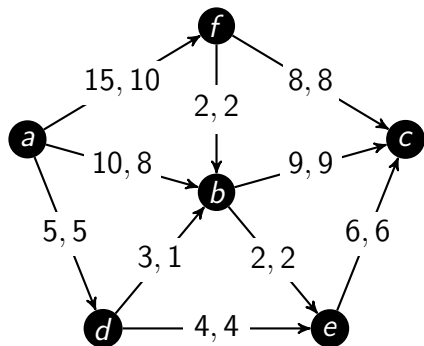


6. korak $\text{val } \mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

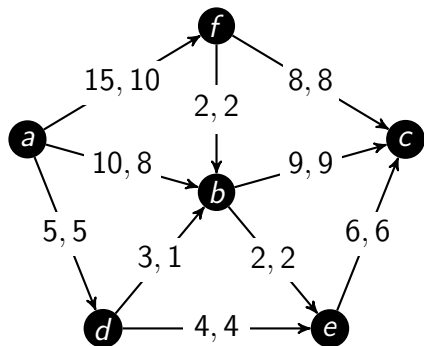


6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$



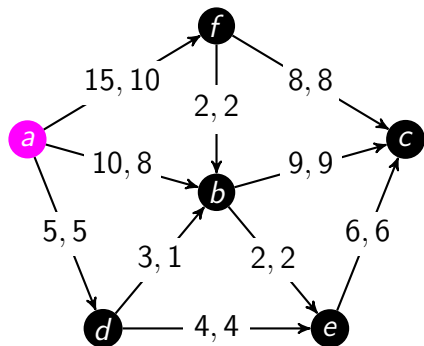
7. korak

6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$



7. korak

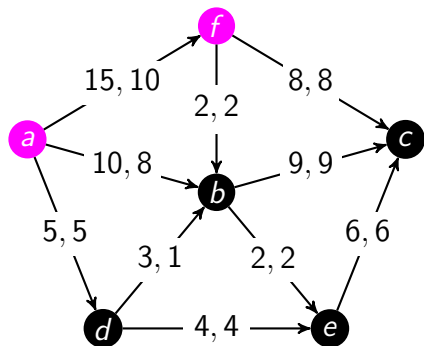
$a(-, \infty)$

6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, \boxed{2})$



6. korak val $\mathcal{F}_6 = 23$

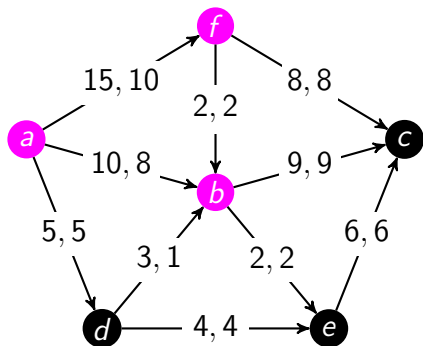
\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, \boxed{2})$

7. korak

$a(-, \infty)$, $f(a^+, 5)$



6. korak val $\mathcal{F}_6 = 23$

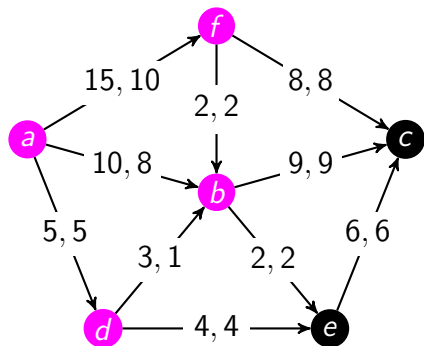
\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, \boxed{2})$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

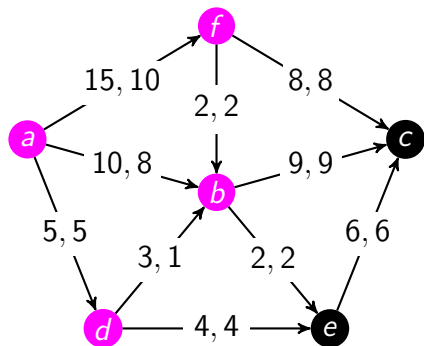
$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$



6. korak $\text{val } \mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

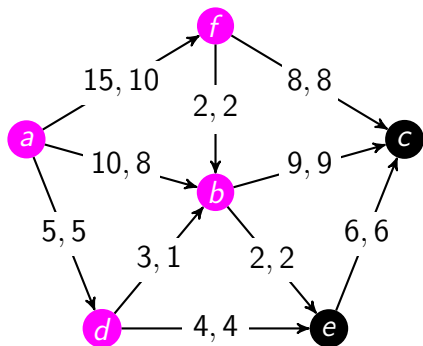
$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

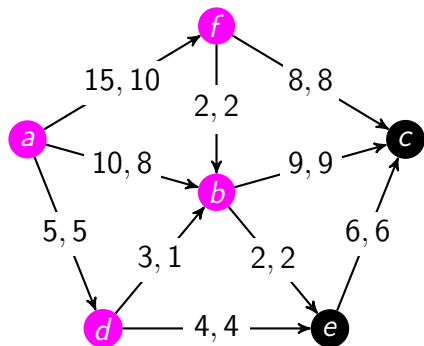
$c(e^+, \boxed{2})$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

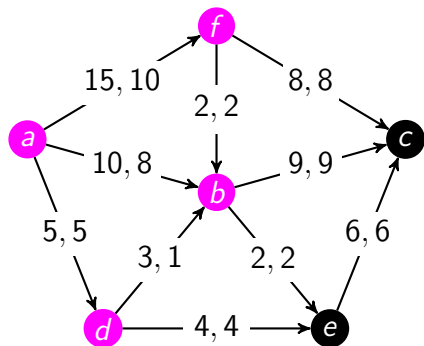
7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

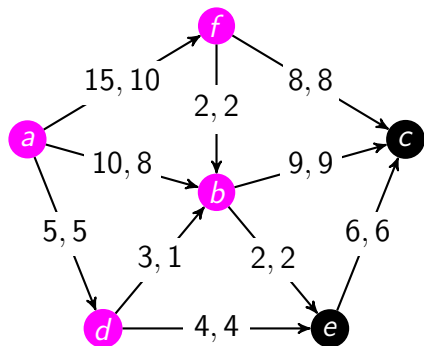
$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

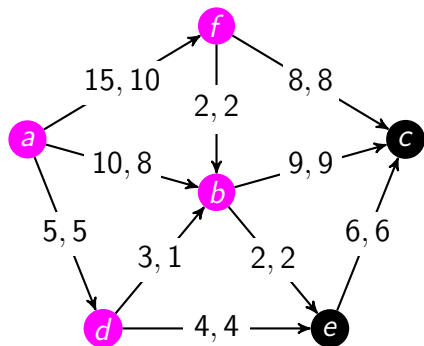
$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

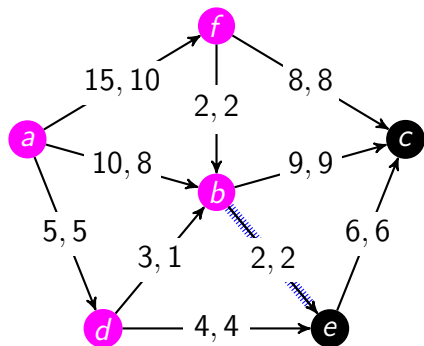
$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) =$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

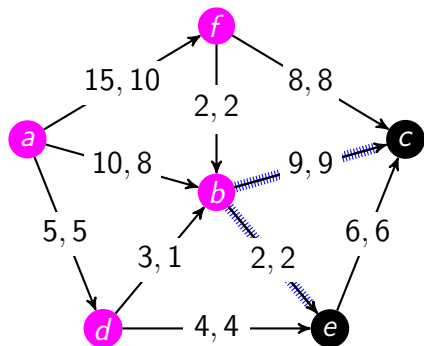
$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

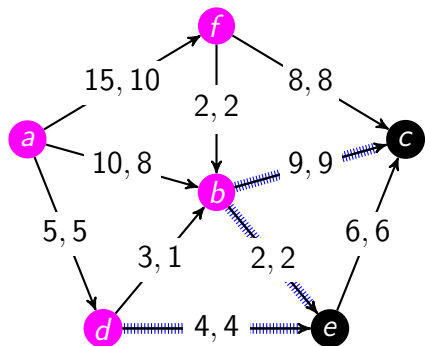
$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

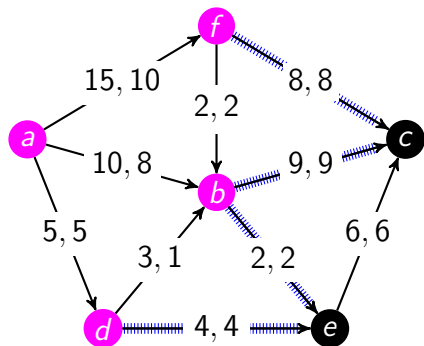
$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

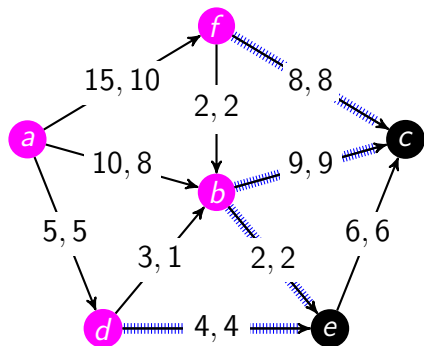
$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

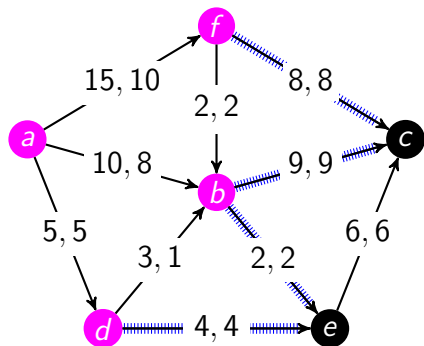
- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) =$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

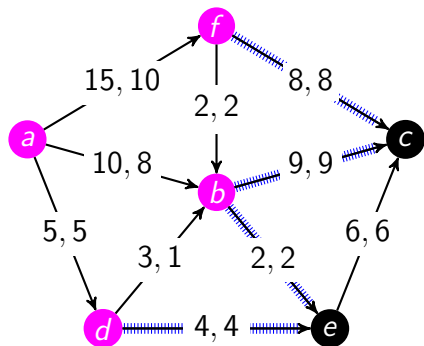
- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) = 2$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

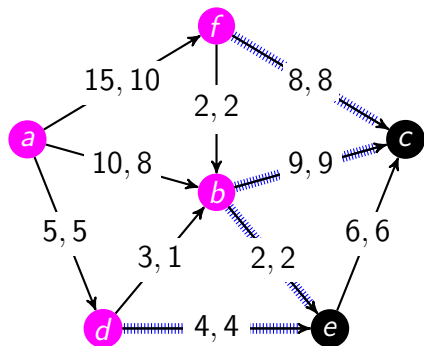
- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) = 2 + 9$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

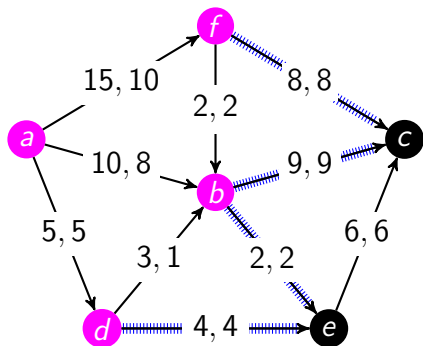
- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) = 2 + 9 + 4$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

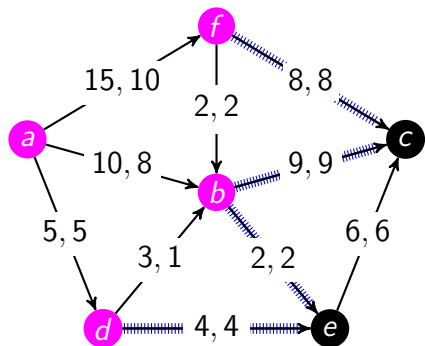
- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) = 2 + 9 + 4 + 8$



6. korak val $\mathcal{F}_6 = 23$

\mathcal{F}_5 -rastući put: $P = abec$

$a(-, \infty)$, $b(a^+, 4)$, $e(b^+, 2)$,

$c(e^+, 2)$

7. korak

$a(-, \infty)$, $f(a^+, 5)$, $b(a^+, 2)$,

$d(b^-, 1)$

- neoznačeni vrhovi: e, c
- Vrh c (ponor) nije dobio oznaku pa je \mathcal{F}_6 maksimalni protok.

minimalni (a, c) -rez

$S = \{a, b, d, f\}$ $T = \{e, c\}$

$\text{cap}(S, T) = c_{be} + c_{bc} + c_{de} + c_{fc}$

$\text{cap}(S, T) = 2 + 9 + 4 + 8 = 23$

čtvrti zadatak

Karakterizacija tranzitivnih turnira

Sljedeće tvrdnje su ekvivalentne:

- (i) Turnir T ima jedinstveni usmjereni Hamiltonov put.
- (ii) Turnir T je tranzitivan.
- (iii) Svaki vrh u u T ima drukčiji uspjeh od preostalih vrhova.

Karakterizacija dipovezanog turnira

Turnir je dipovezan akko sadrži usmjereni Hamiltonov ciklus.

Teorem (Rédei, 1934.)

Svaki turnir sadrži neparni broj usmjerenih Hamiltonovih putova.

Zadatak 4

Na šahovskom turniru sudjelovalo je pet igrača. Konačni rezultati su predstavljeni tablicom u kojoj prvi element svakog stupca predstavlja pojedinog igrača, a ispod njega su navedeni igrači koje je on pobijedio.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

- Prikažite navedeni turnir pomoću digrafa (svatko je igrao sa svakim jednu partiju).
- Pronađite matricu susjedstva T tog turnira i napravite rang listu pomoću matrice $T + T^2$.
- Pronađite usmjereni Hamiltonov put u zadanom turniru. Je li on jedinstven? Je li turnir tranzitivan? Je li turnir dipovezan?

Rješenje

a)

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

a)

(D)

(E)

(C)

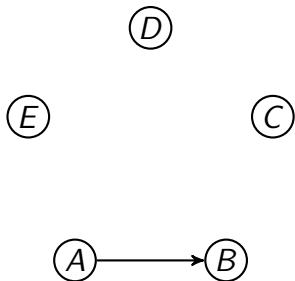
(A)

(B)

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

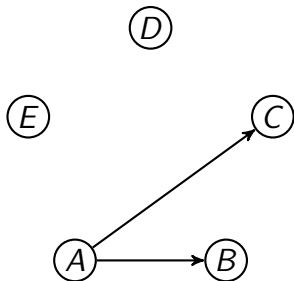
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

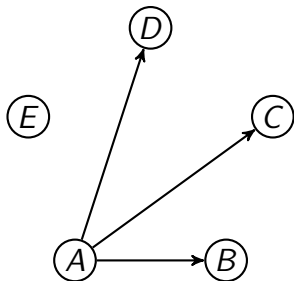
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

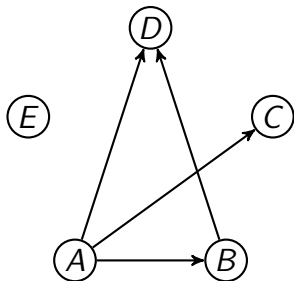
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

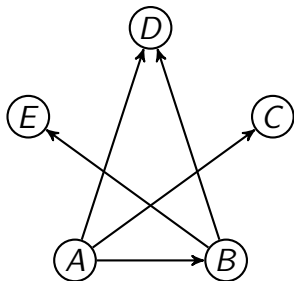
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

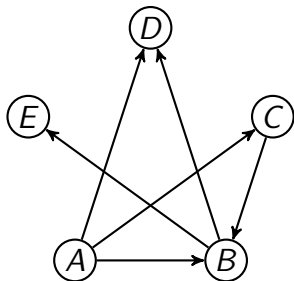
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

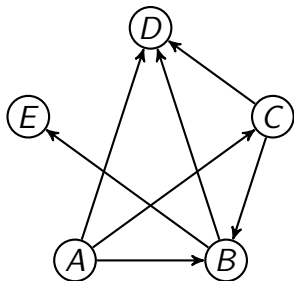
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

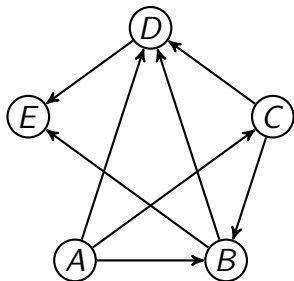
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

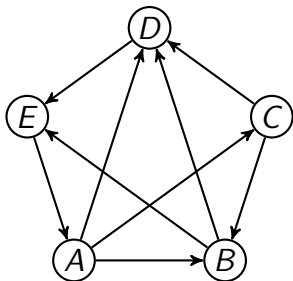
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

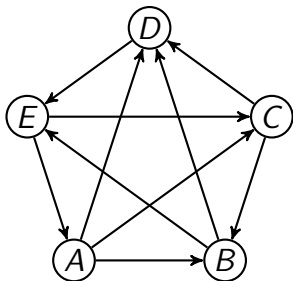
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

Rješenje

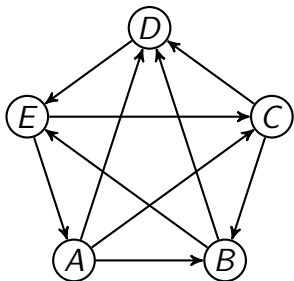
a)



<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>B</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>A</i>
<i>C</i>	<i>E</i>	<i>D</i>		<i>C</i>
<i>D</i>				

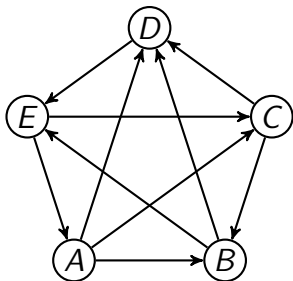
Rješenje

a) b)



Rješenje

a)

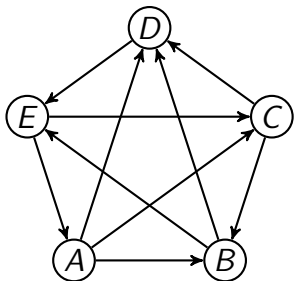


b)

$$T = \left[\begin{array}{c} \\ \\ \\ \\ \end{array} \right]$$

Rješenje

a)

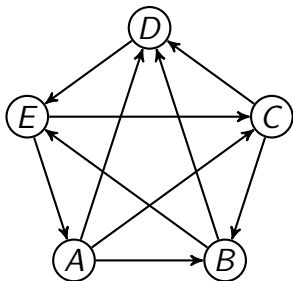


b)

$$T = \begin{bmatrix} A \\ B \\ C \\ D \\ E \end{bmatrix}$$

Rješenje

a)

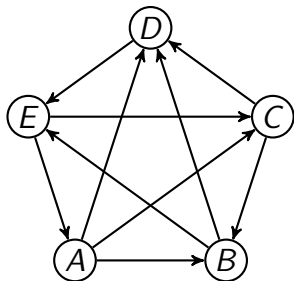


b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix} \end{matrix}$$

Rješenje

a)

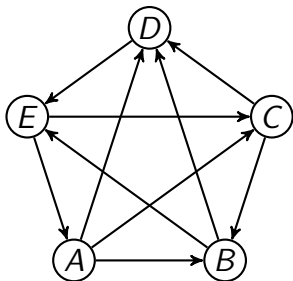


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} & & & & \\ 1 & 1 & 1 & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

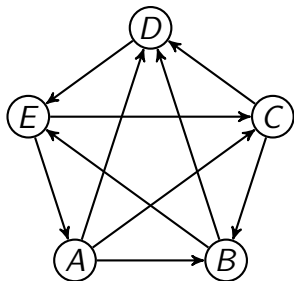


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{matrix}$$

Rješenje

a)

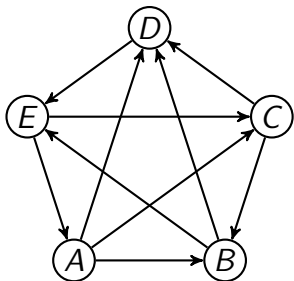


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ & & & 1 & 1 \\ & & & & \\ & & & & \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

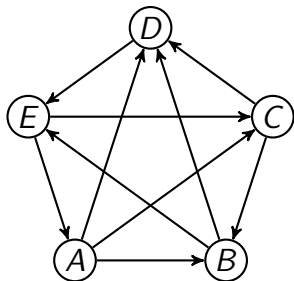


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ & & & & \\ & & & & \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

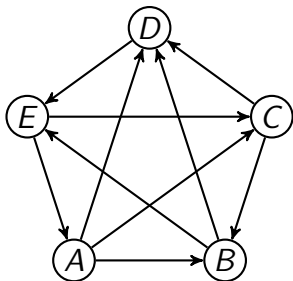


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & & & 1 & \\ & 1 & & & \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

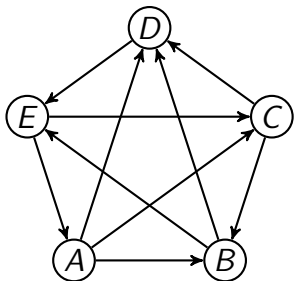


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ & & & & \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

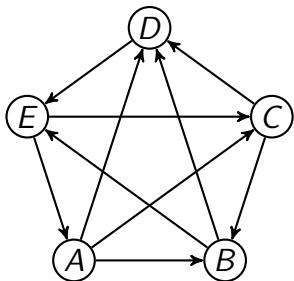


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ & & & & 1 \\ & & & & \end{bmatrix} \end{matrix}$$

Rješenje

a)

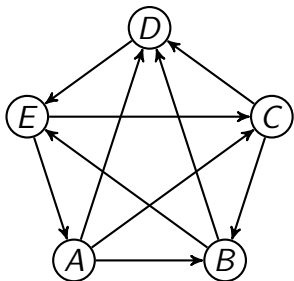


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ \end{bmatrix} \end{matrix}$$

Rješenje

a)

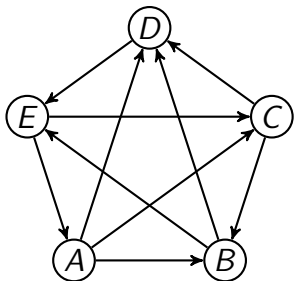


b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & & 1 & & \end{bmatrix} \end{matrix}$$

Rješenje

a)



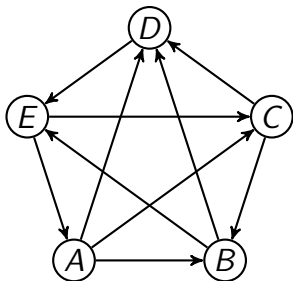
b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

Rješenje

uspjesi vrhova

a)



b)

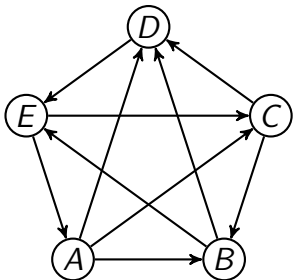
$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

Rješenje

uspjesi vrhova

$$s(A) = 3$$

a)



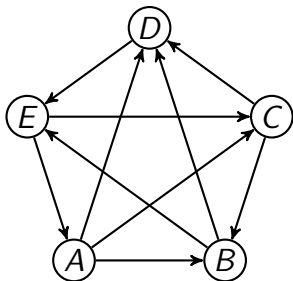
b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

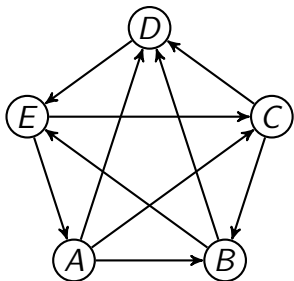
$$s(A) = 3$$

$$s(B) = 2$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

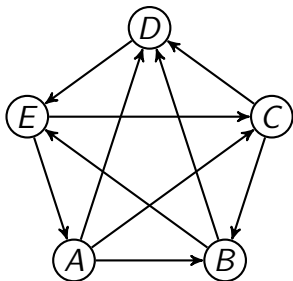
$$s(B) = 2$$

$$s(C) = 2$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

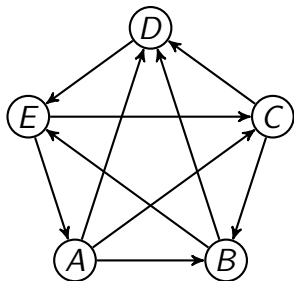
$$s(C) = 2$$

$$s(D) = 1$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

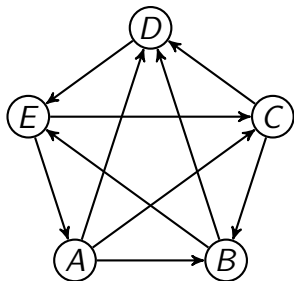
$$s(D) = 1$$

$$s(E) = 2$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

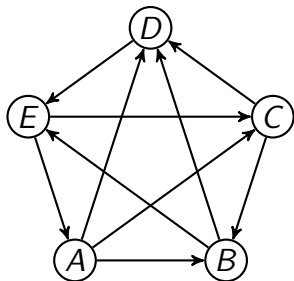
$$s(E) = 2$$

$$T^2 = \begin{bmatrix} & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \end{bmatrix}$$

b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

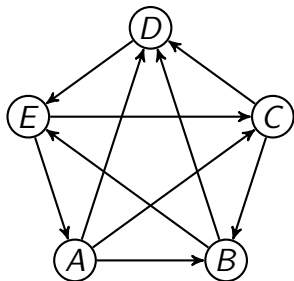
$$s(D) = 1$$

$$s(E) = 2$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

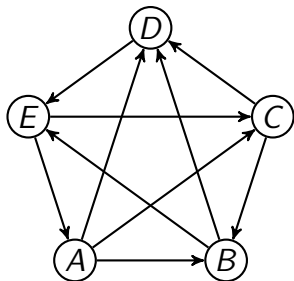
$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix}$$

b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

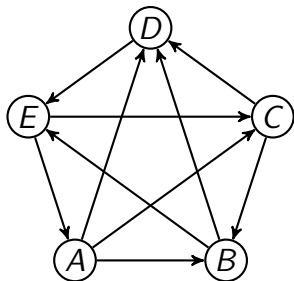
$$s(D) = 1$$

$$s(E) = 2$$

Rješenje

uspjesi vrhova

a)



$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix}$$

b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

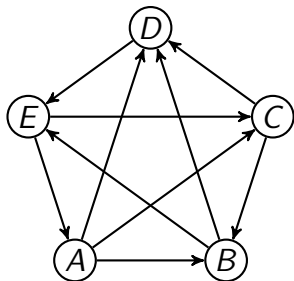
$$s(D) = 1$$

$$s(E) = 2$$

Rješenje

uspjesi vrhova

a)



$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

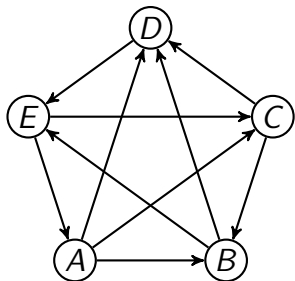
$$s(D) = 1$$

$$s(E) = 2$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

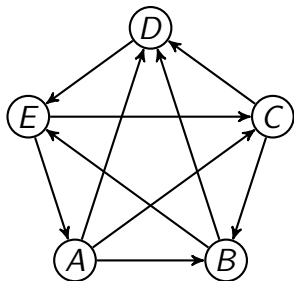
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

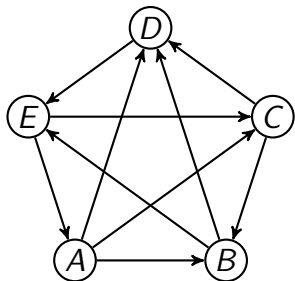
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ & & & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

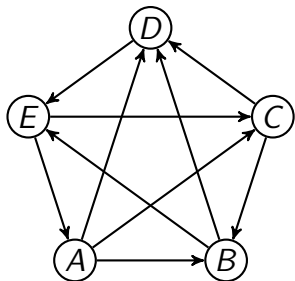
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

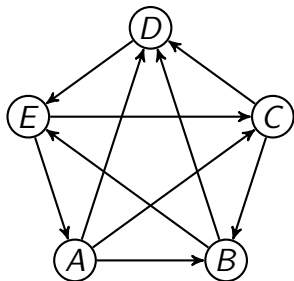
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ & & & & \\ & & & & \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

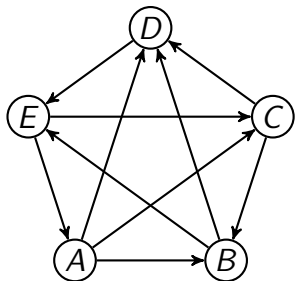
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

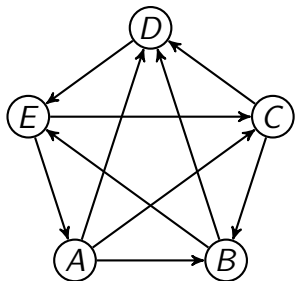
$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

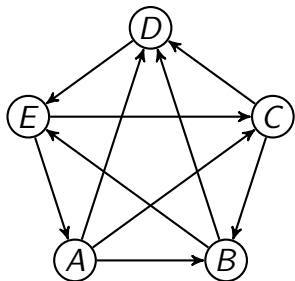
$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

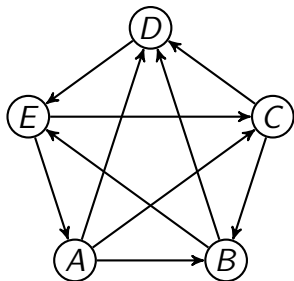
$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

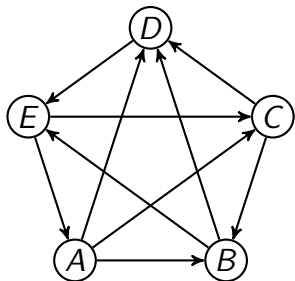
$$\text{snaga}(B) = 5$$

$$\text{snaga}(C) = 5$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

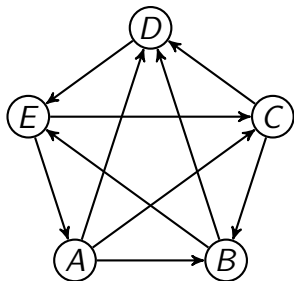
$$\text{snaga}(C) = 5$$

$$\text{snaga}(D) = 3$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & \begin{matrix} A & B & C & D & E \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

$$\text{snaga}(C) = 5$$

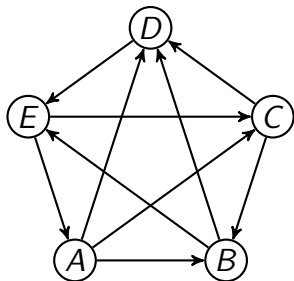
$$\text{snaga}(D) = 3$$

$$\text{snaga}(E) = 7$$

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

$$\text{snaga}(C) = 5$$

$$\text{snaga}(D) = 3$$

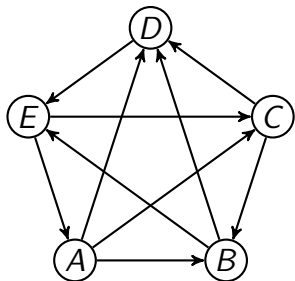
$$\text{snaga}(E) = 7$$

Rang lista

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

$$\text{snaga}(C) = 5$$

$$\text{snaga}(D) = 3$$

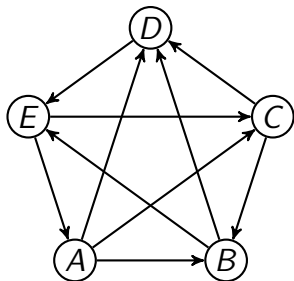
$$\text{snaga}(E) = 7$$

Rang lista A, E, C, B, D

Rješenje

uspjesi vrhova

a)



b)

$$T = \begin{matrix} & A & B & C & D & E \\ \begin{matrix} A \\ B \\ C \\ D \\ E \end{matrix} & \begin{bmatrix} 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \end{matrix}$$

$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

$$T^2 = \begin{bmatrix} 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 2 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 2 & 1 & 2 & 0 \end{bmatrix}$$

$$T + T^2 = \begin{bmatrix} 0 & 2 & 1 & 3 & 2 \\ 1 & 0 & 1 & 1 & 2 \\ 0 & 1 & 0 & 2 & 2 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 2 & 2 & 2 & 0 \end{bmatrix}$$

$$\text{snaga}(A) = 8$$

$$\text{snaga}(B) = 5$$

$$\text{snaga}(C) = 5$$

$$\text{snaga}(D) = 3$$

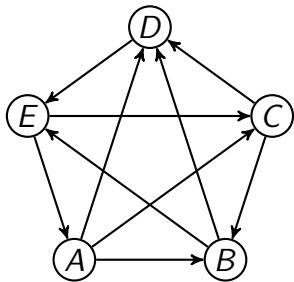
$$\text{snaga}(E) = 7$$

Rang lista

A, E, C, B, D

dijele treće mjesto

uspjesi vrhova



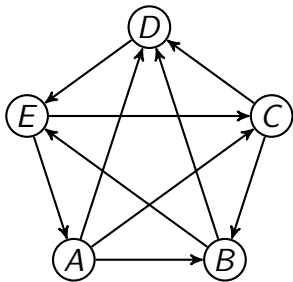
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

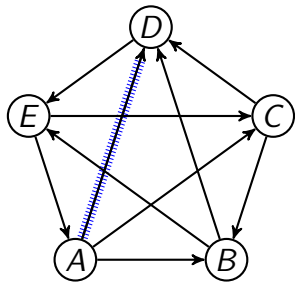
$$s(D) = 1$$

$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put:

uspjesi vrhova



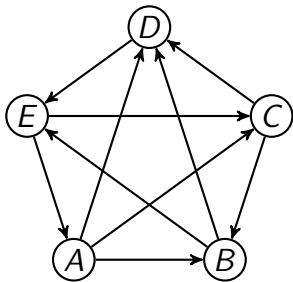
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

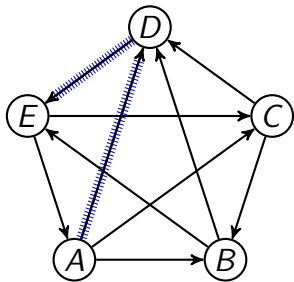
$$s(D) = 1$$

$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: AD

uspjesi vrhova



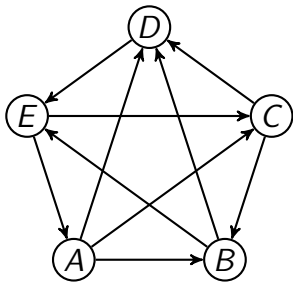
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

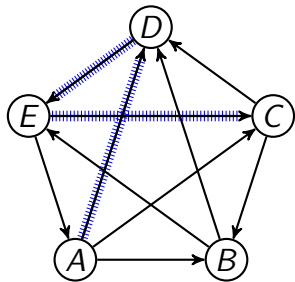
$$s(D) = 1$$

$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: ADE

uspjesi vrhova



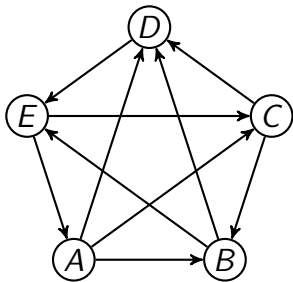
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

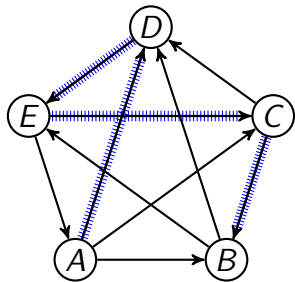
$$s(D) = 1$$

$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: *ADEC*

uspjesi vrhova



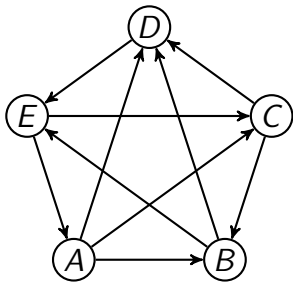
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

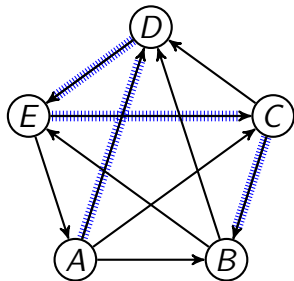
$$s(D) = 1$$

$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: *ADECB*

uspjesi vrhova



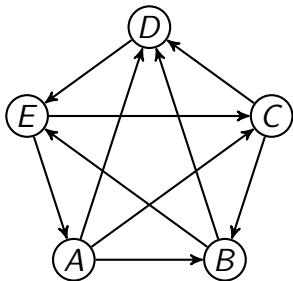
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

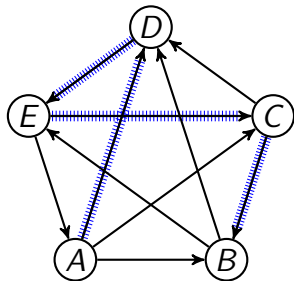
$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: *ADECB*

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe.

uspjesi vrhova



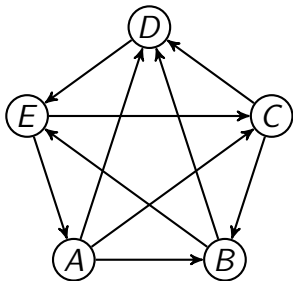
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

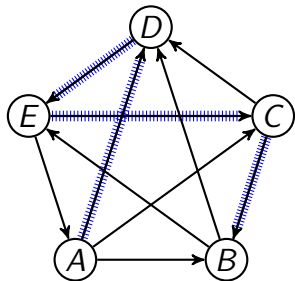
$$s(E) = 2$$



c) Jedan usmjereni Hamiltonov put: *ADECB*

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

uspjesi vrhova



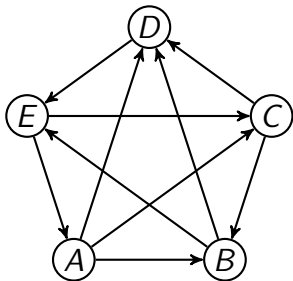
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

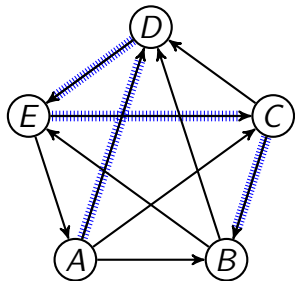


c) Jedan usmjereni Hamiltonov put: *ADECB*

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus

uspjesi vrhova



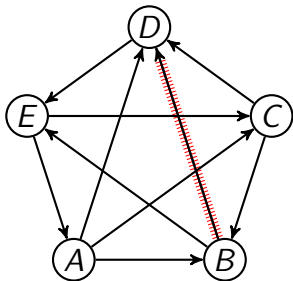
$$s(A) = 3$$

$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

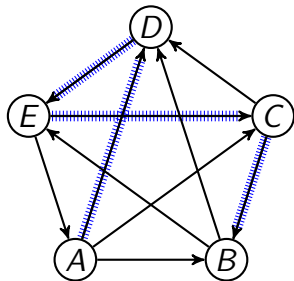


c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus BD

uspjesi vrhova



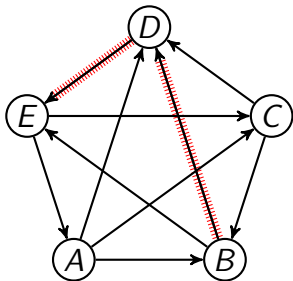
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$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

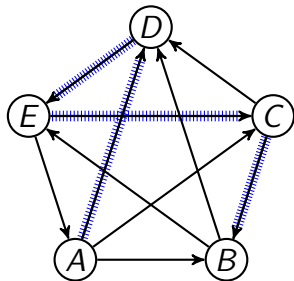


c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus BDE

uspjesi vrhova



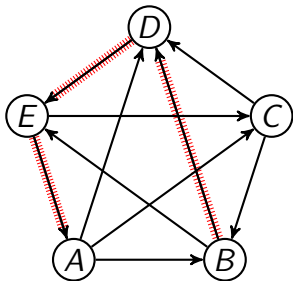
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$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

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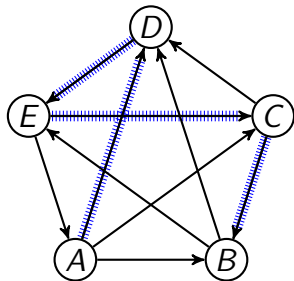


c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus $BDEA$

uspjesi vrhova



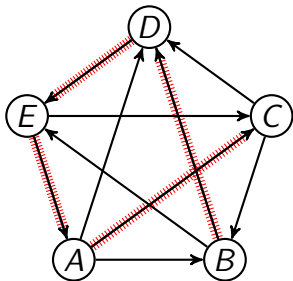
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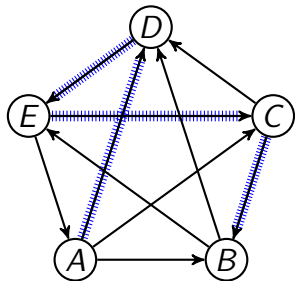


c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus $BDEAC$

uspjesi vrhova



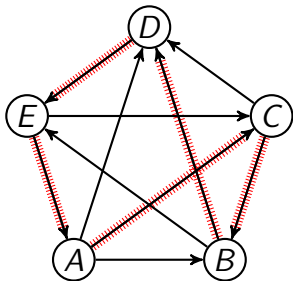
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$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$

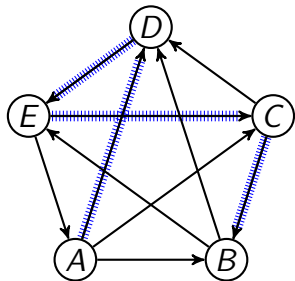


c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus $BDEACB$.

uspjesi vrhova



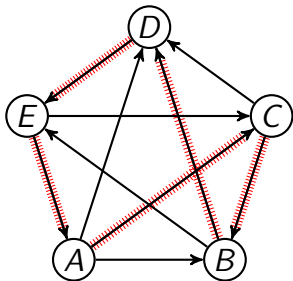
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$$s(B) = 2$$

$$s(C) = 2$$

$$s(D) = 1$$

$$s(E) = 2$$



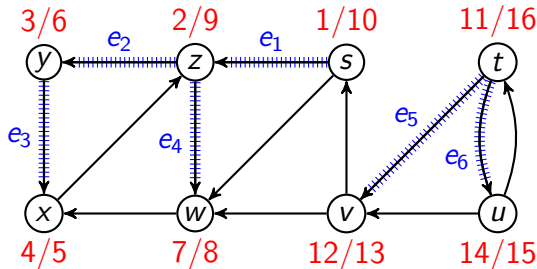
c) Jedan usmjereni Hamiltonov put: $ADECB$

Usmjereni Hamiltonov put u zadanom turniru nije jedinstven jer nemaju svi vrhovi međusobno različite uspjehe. Iz istog razloga turnir nije niti tranzitivan.

Turnir je dipovezan jer sadrži usmjereni Hamiltonov ciklus $BDEACB$.

Napomena Ako turnir nije dipovezan, promjenom orijentacije samo jednog brida postaje dipovezan.

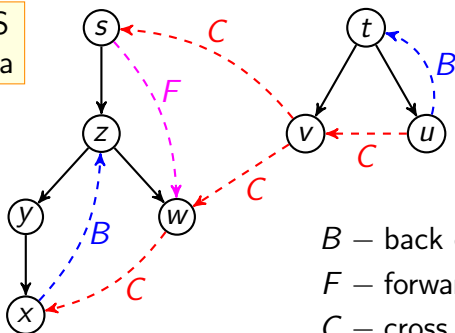
DFS algoritam na usmjerenom grafu



DFS algoritam na digrafu

	π	d	f
s	—	1	10
t	—	11	16
x	y	4	5
y	z	3	6
u	t	14	15
v	t	12	13
w	z	7	8
z	s	2	9

DFS
šuma



B – back edge (uzlazni luk)

F – forward edge (silazni luk)

C – cross edge (prijelazni luk)

Klasifikacija lukova

Neka je $G = (V, E)$ usmjereni graf i $G_\pi = (V, E_\pi)$ šuma dobivena primjenom DFS algoritma na digraf G .

$$E_\pi = \left\{ (\pi(v), v) : v \in V, \pi(v) \neq \text{NIL} \right\}$$

Ako u šumi G_π postoji usmjereni (u, v) -put, tada kažemo da je vrh v **potomak** vrha u , odnosno vrh u je **predak** vrha v . Kažemo da su vrhovi u i v u **rodbinskoj vezi** ako u šumi G_π postoji usmjereni (u, v) -put ili usmjereni (v, u) -put.

S obzirom na šumu G_π klasificiramo lukove (usmjerene bridove) digrafa G na sljedeći način:

- **Luk stabla** (engl. *tree edge*) je svaki luk $(u, v) \in E$ za koji vrijedi $(u, v) \in E_\pi$.
- **Uzlazni luk** (engl. *back edge*) je svaki luk $(u, v) \in E \setminus E_\pi$ pri čemu je vrh u potomak vrha v u šumi G_π . Petlje su po dogovoru uzlazni lukovi.
- **Silazni luk** (engl. *forward edge*) je svaki luk $(u, v) \in E \setminus E_\pi$ pri čemu je vrh u predak vrha v u šumi G_π .
- Svi ostali lukovi digrafa G zovu se **prijelazni lukovi** (engl. *cross edges*). Takvi lukovi imaju oba krajnja vrha u različitim komponentama povezanosti od G_π ili u istoj komponenti povezanosti ukoliko vrhovi nisu u rodbinskoj vezi.

U neusmjerenom grafu G brid $\{u, v\}$ klasificiramo kao luk (u, v) ili kao luk (v, u) ovisno o tome na koji je poredak tijekom izvođenja DFS algoritam prvo naišao.

Propozicija

Ako DFS algoritam primijenimo na neusmjereni graf G , tada svaki brid grafa G ili pripada DFS šumi ili je uzlazni brid. Drugim riječima, u neusmjerenom grafu nema silaznih niti prijelaznih bridova.

DFS algoritam se može modificirati tako da klasificira lukove čim naiđe na njih. Naime, svaki luk (u, v) može se klasificirati na temelju boje vrha v koju on ima u trenutku kada je luk (u, v) prvi put istraživao.

- Ako je vrh v bijele boje, luk (u, v) je luk stabla.
- Ako je vrh v sive boje, luk (u, v) je uzlazni luk.
- Ako je vrh v crne boje, luk (u, v) je silazni luk ili prijelazni luk.
 - ▶ Ako je $d(u) < d(v)$, tada je (u, v) silazni luk.
 - ▶ Ako je $d(u) > d(v)$, tada je (u, v) prijelazni luk.

Nadalje, vrijedi:

- Luk (u, v) je luk stabla ili silazni luk ako i samo ako je

$$d(u) < d(v) < f(v) < f(u).$$

- Luk (u, v) je uzlazni luk ako i samo ako je

$$d(v) < d(u) < f(u) < f(v).$$

- Luk (u, v) je prijelazni luk ako i samo ako je

$$d(v) < f(v) < d(u) < f(u).$$

Propozicija

Digraf G je aciklički ako i samo ako DFS algoritam na digrafu G ne daje uzlazne lukove.

Dakle, ako je G aciklički digraf, tada za svaki njegov luk (u, v) vrijedi $f(v) < f(u)$. To nam daje sljedeći algoritam za topološko sortiranje koji je baziran na DFS algoritmu.

Algoritam za topološko sortiranje

ULAZ: Aciklički digraf G

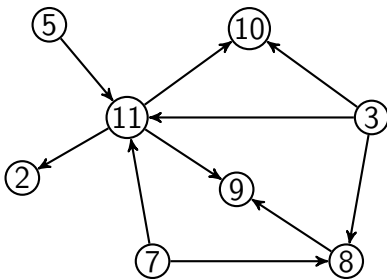
IZLAZ: Lista L topološki sortiranih vrhova digrafa G

- 1: Neka je L prazna lista.
- 2: Pozovi DFS algoritam na digrafu G .
- 3: Svaki put kada se tijekom izvođenja DFS algoritma odredi $f(v)$ za neki vrh v , stavi vrh v na početak liste L .
- 4: Nakon što DFS algoritam završi, vrati listu L .

peti zadatak

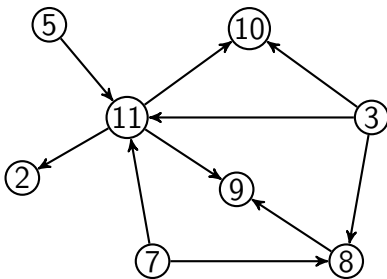
Zadatak 5

Pomoću DFS algoritma provjerite je li zadani digraf aciklički i
pronađite jedan kanonski poredak njegovih vrhova.



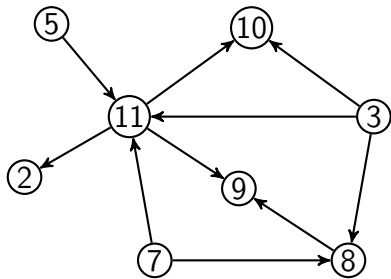
Zadatak 5

Pomoću DFS algoritma provjerite je li zadani digraf aciklički i pronađite jedan kanonski poredak njegovih vrhova.



Rješenje

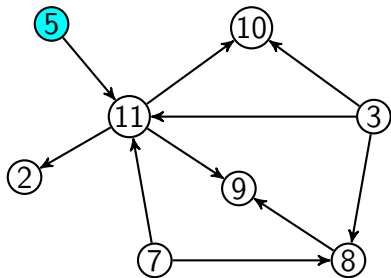
Digraf je aciklički ako s obzirom na dobivenu DFS šumu nema uzlaznih lukova.



DFS
šuma

	π	d	f
2			
3			
5			
7			
8			
9			
10			
11			

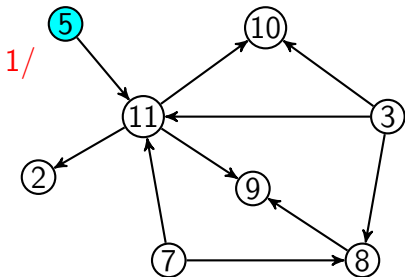
lista L



DFS
šuma

	π	d	f
2			
3			
5			
7			
8			
9			
10			
11			

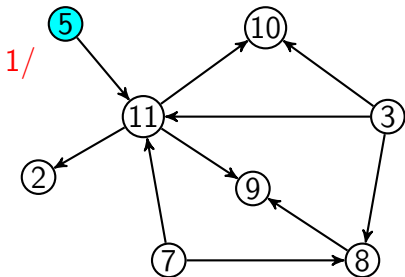
lista L



DFS
šuma

	π	d	f
2			
3			
5			
7			
8			
9			
10			
11			

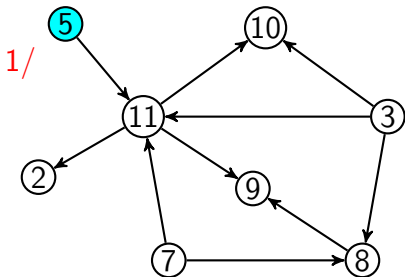
lista L



DFS
šuma

	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11			

lista L

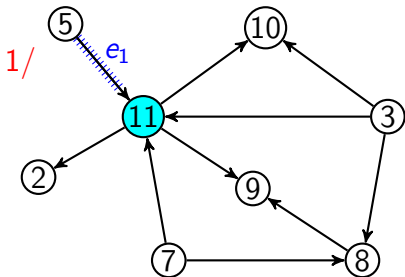


DFS
šuma

⑤

	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11			

lista L

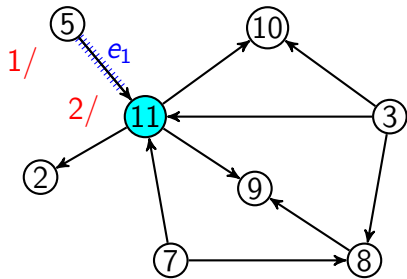


DFS
šuma

⑤

	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11			

lista L

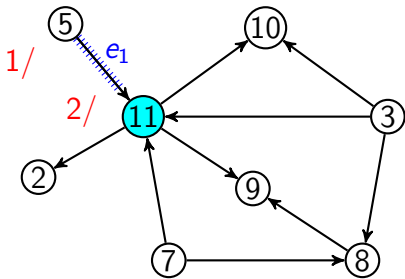


DFS
šuma

⑤

	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11			

lista L

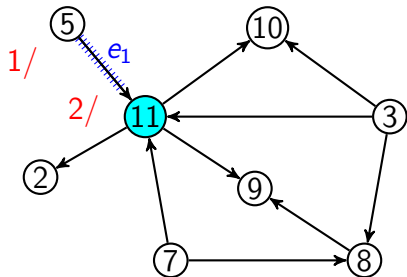


DFS
šuma

⑤

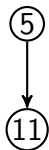
lista L

	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11	5	2	

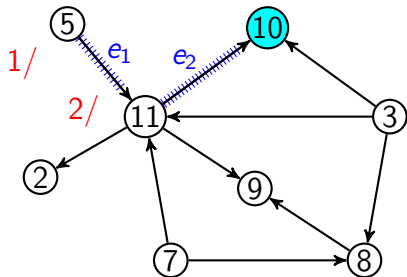


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11	5	2	

DFS
šuma



lista L

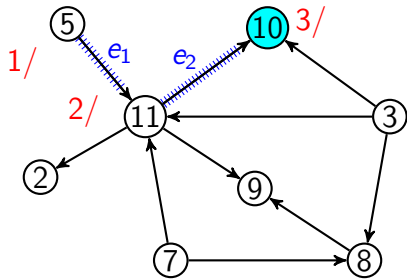


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11	5	2	

DFS
šuma



lista L

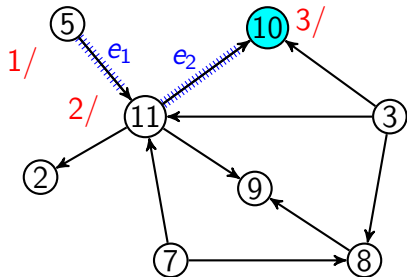


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10			
11	5	2	

DFS
šuma



lista L

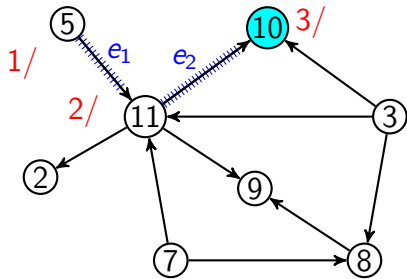


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	
11	5	2	

DFS
šuma

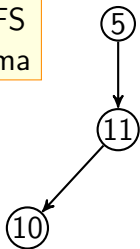


lista L

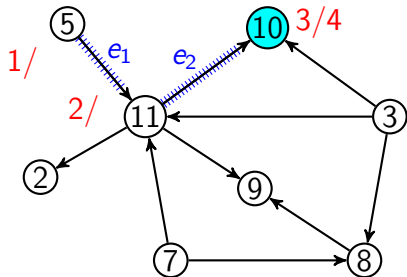


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	
11	5	2	

DFS
šuma

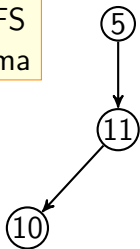


lista L

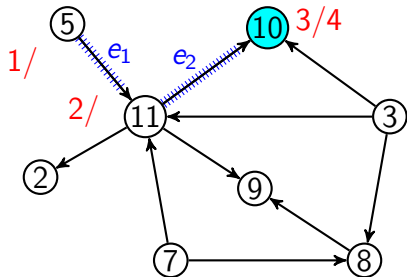


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	
11	5	2	

DFS
šuma

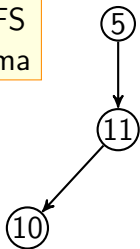


lista L

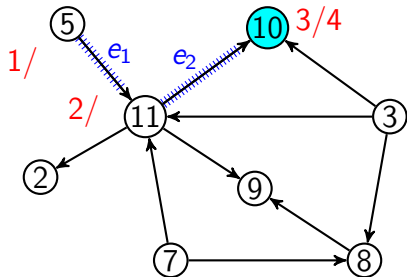


	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma

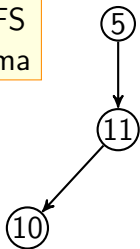


lista L



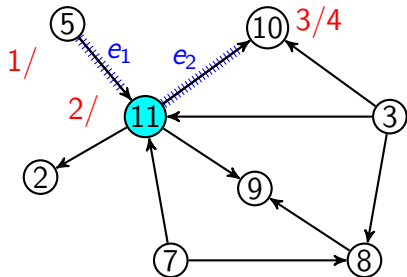
	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



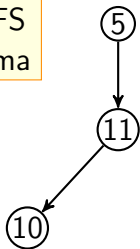
lista L

10



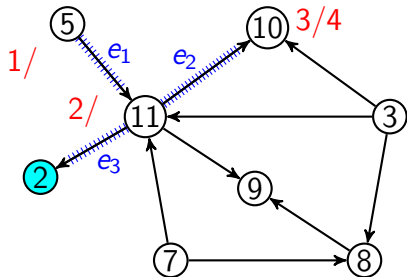
	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



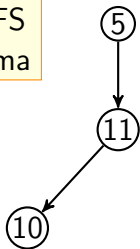
lista L

10



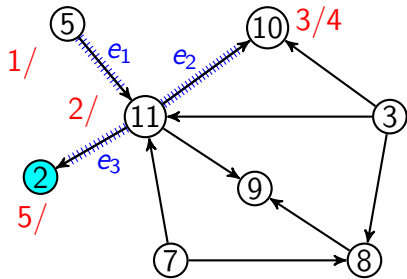
	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



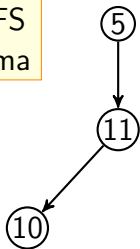
lista L

10



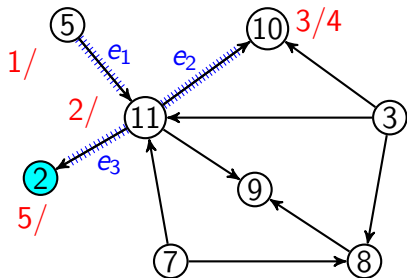
	π	d	f
2			
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



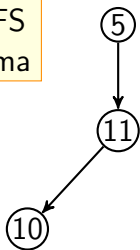
lista L

10



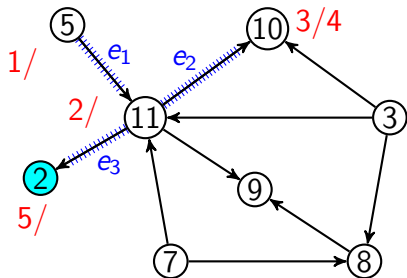
	π	d	f
2	11	5	
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



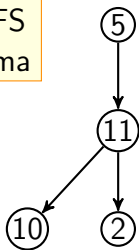
lista L

10



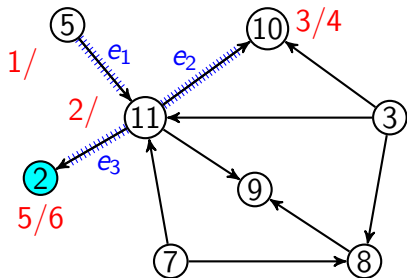
	π	d	f
2	11	5	
3			
5	—	1	
7			
8			
9			
10	11	3	4
11	5	2	

DFS
šuma



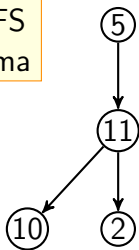
lista L

10



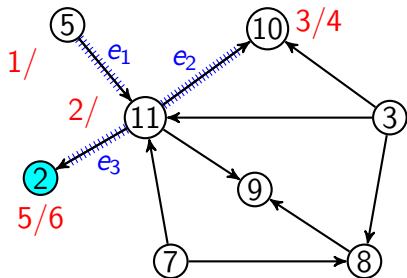
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DFS
šuma



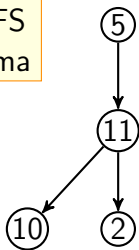
lista L

10



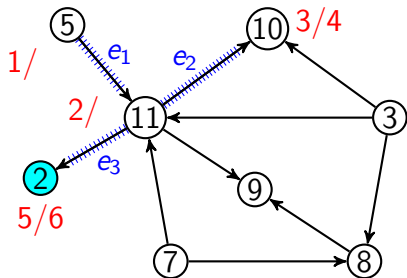
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DFS
šuma



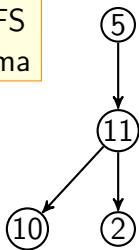
lista L

10



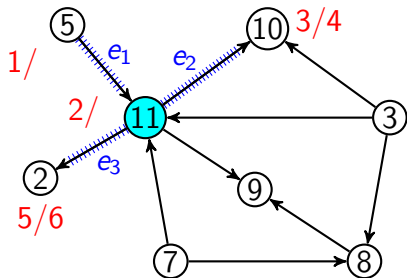
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DFS
šuma



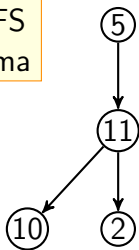
lista L

2, 10



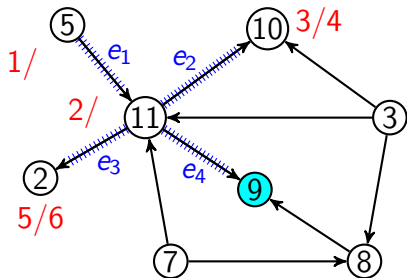
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DFS
šuma



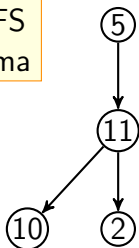
lista L

2, 10



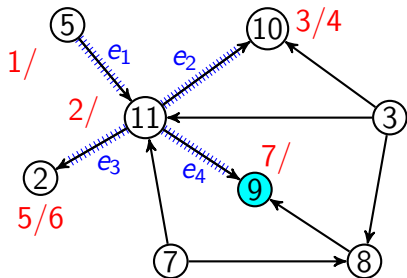
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DFS
šuma



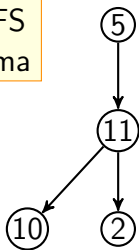
lista L

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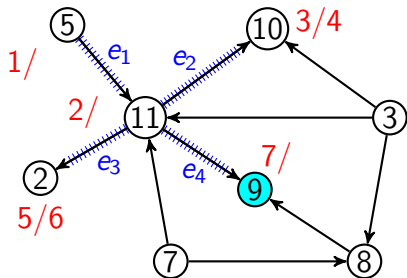
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DFS
šuma



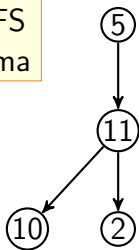
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2, 10



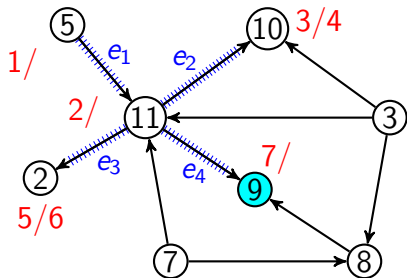
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DFS
šuma



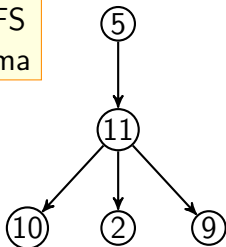
lista L

2, 10



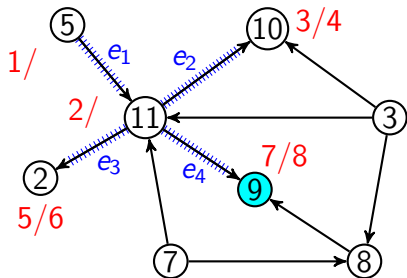
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DFS
šuma



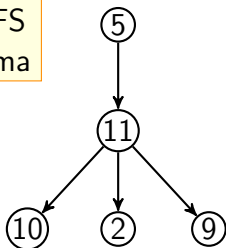
lista L

2, 10



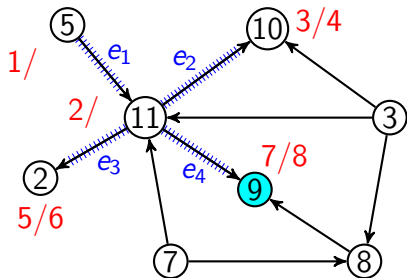
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DFS
šuma



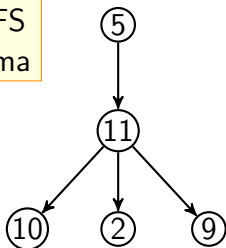
lista L

2, 10



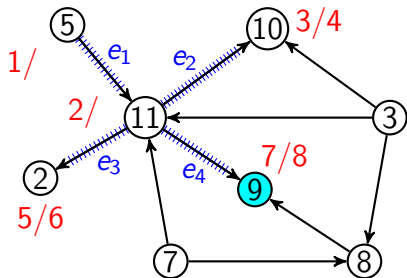
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DFS
šuma



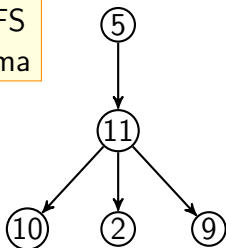
lista L

2, 10



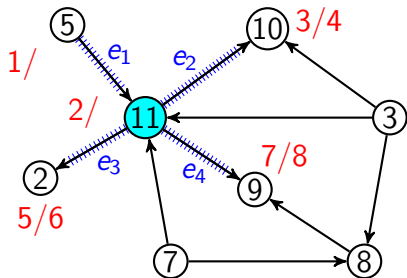
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DFS
šuma



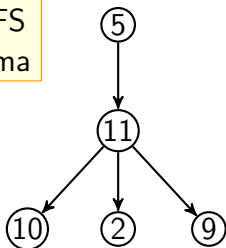
lista L

9, 2, 10



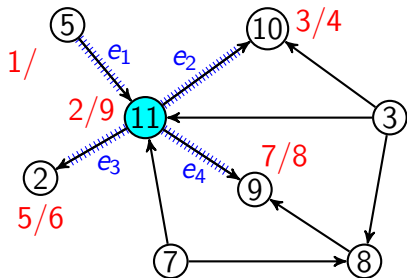
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DFS
šuma



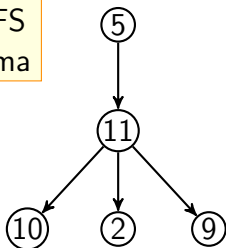
lista L

9, 2, 10



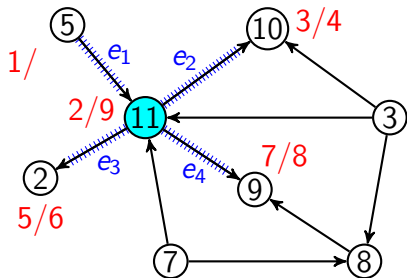
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7			
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DFS
šuma



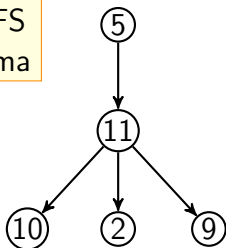
lista L

9, 2, 10



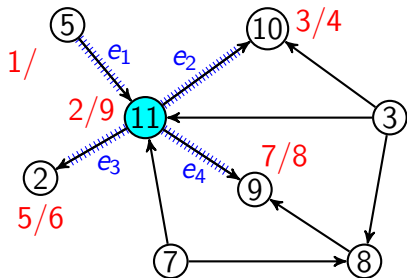
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DFS
šuma



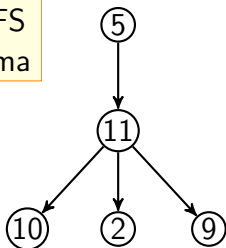
lista L

9, 2, 10



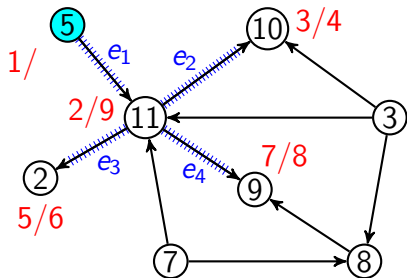
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DFS
šuma



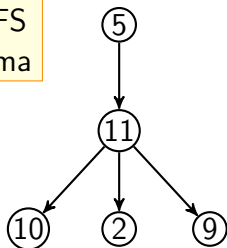
lista L

11, 9, 2, 10



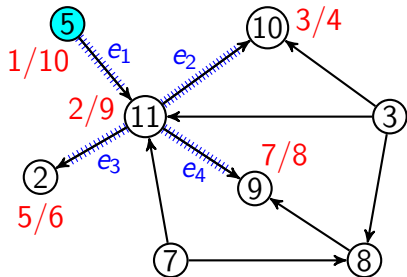
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DFS
šuma



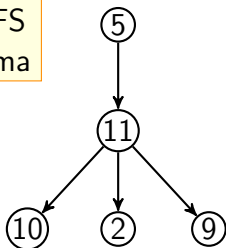
lista L

11, 9, 2, 10



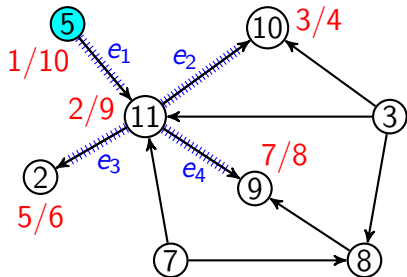
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DFS
šuma



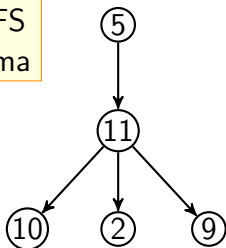
lista L

11, 9, 2, 10



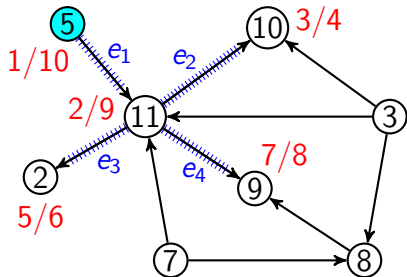
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DFS
šuma



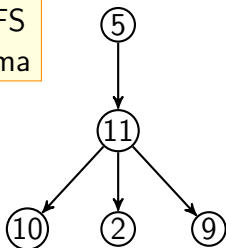
lista L

11, 9, 2, 10



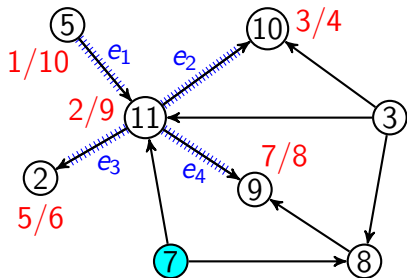
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DFS
šuma



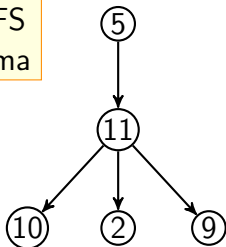
lista L

5, 11, 9, 2, 10



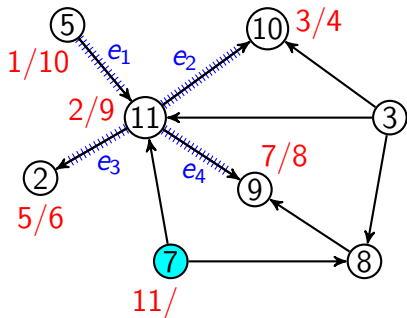
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DFS
šuma



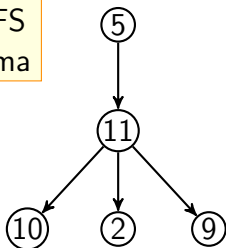
lista L

5, 11, 9, 2, 10



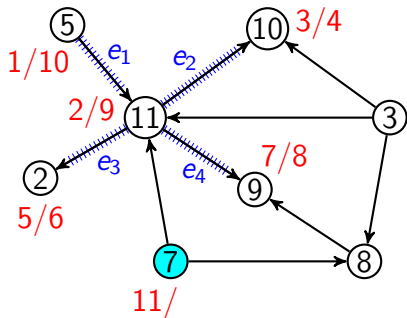
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DFS
šuma



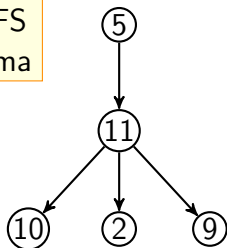
lista L

5, 11, 9, 2, 10



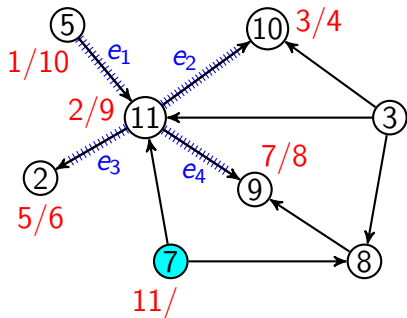
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DFS
šuma



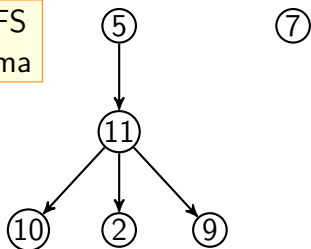
lista L

5, 11, 9, 2, 10



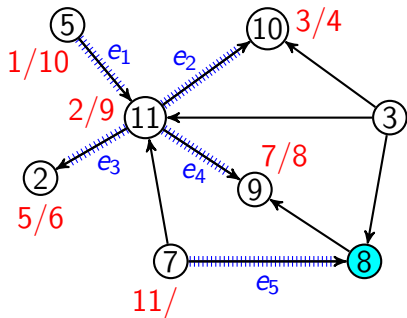
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DFS
šuma



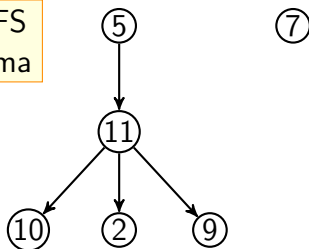
lista L

5, 11, 9, 2, 10



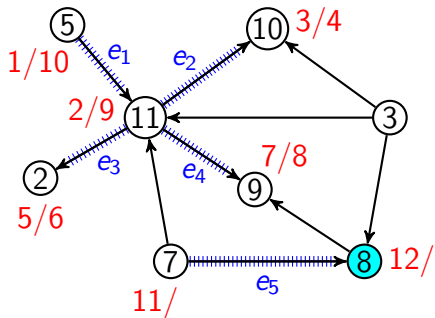
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DFS
šuma



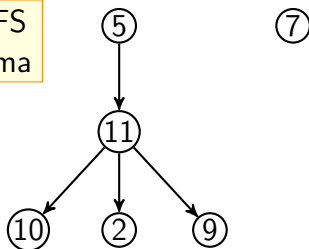
lista L

5, 11, 9, 2, 10



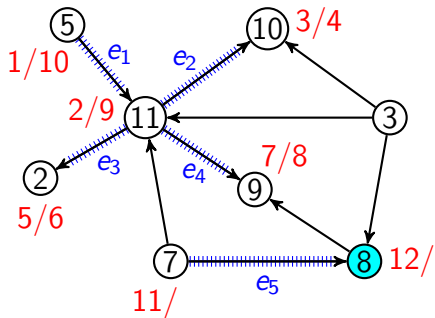
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DFS
šuma



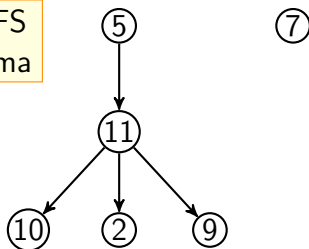
lista L

5, 11, 9, 2, 10



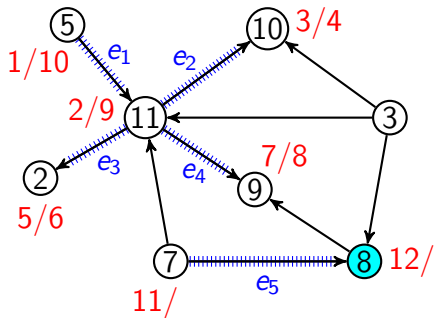
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DFS
šuma



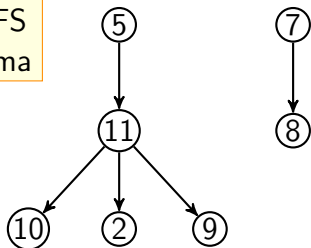
lista L

5, 11, 9, 2, 10



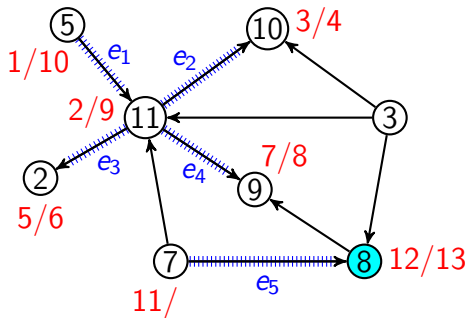
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DFS
šuma



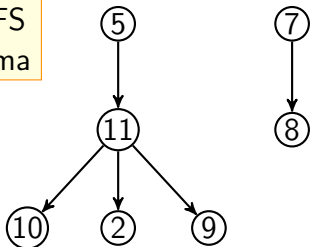
lista L

5, 11, 9, 2, 10



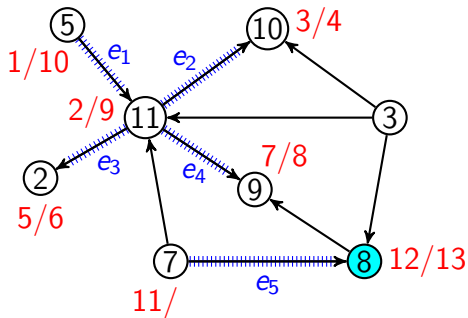
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DFS
šuma



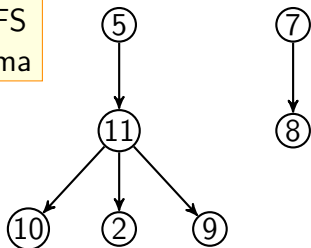
lista L

5, 11, 9, 2, 10



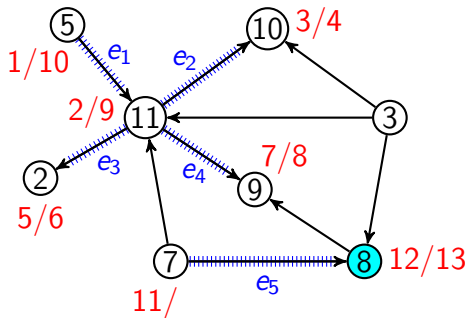
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DFS
šuma



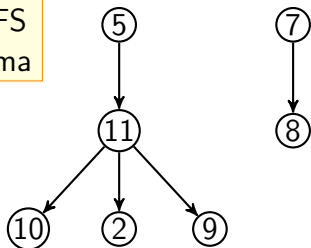
lista L

5, 11, 9, 2, 10



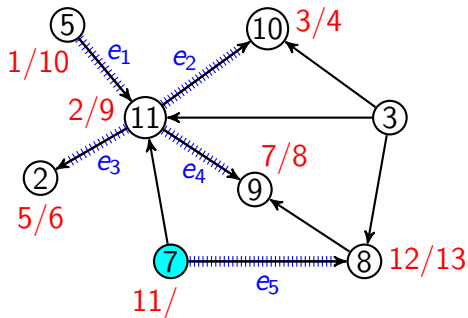
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DFS
šuma



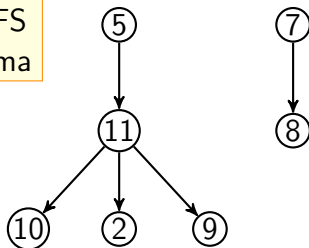
lista L

8, 5, 11, 9, 2, 10



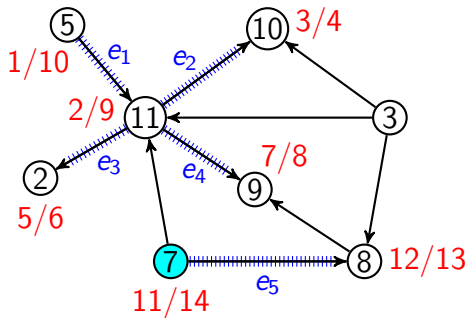
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DFS
šuma



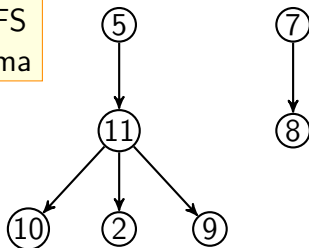
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8, 5, 11, 9, 2, 10



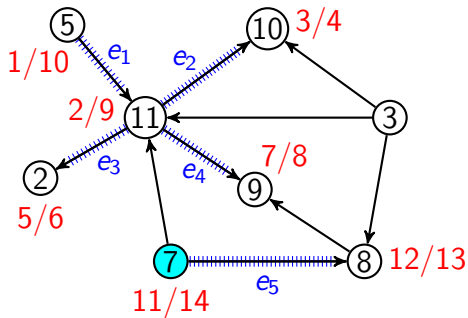
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DFS
šuma



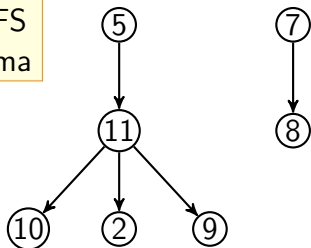
lista L

8, 5, 11, 9, 2, 10



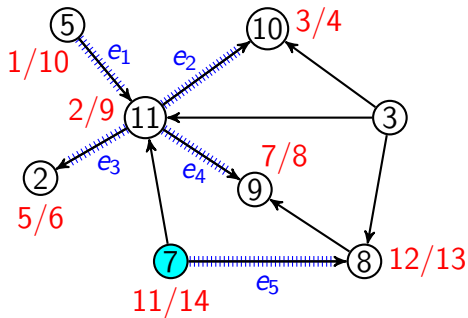
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2	11	5	6
3			
5	—	1	10
7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma



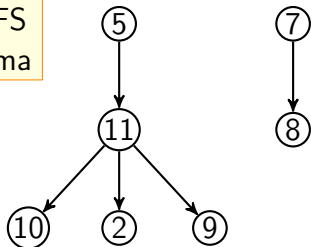
lista L

8, 5, 11, 9, 2, 10



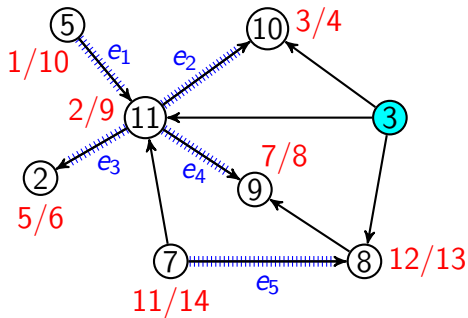
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3			
5	—	1	10
7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma



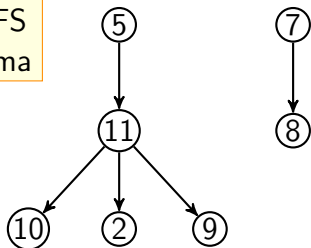
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7, 8, 5, 11, 9, 2, 10



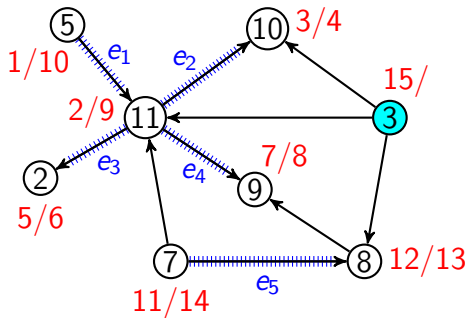
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3			
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DFS
šuma



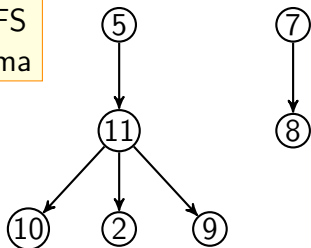
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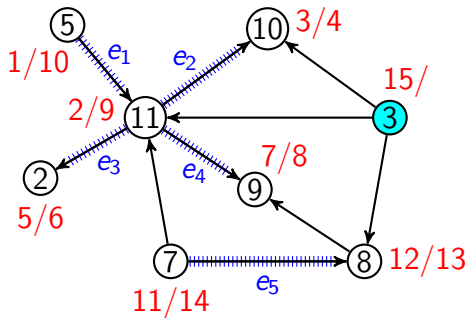
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11	5	2	9

DFS
šuma



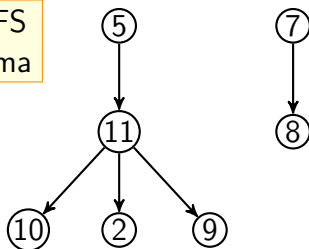
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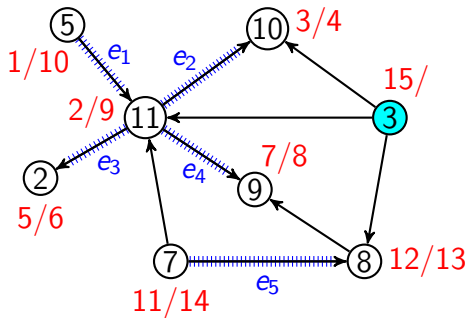
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DFS
šuma



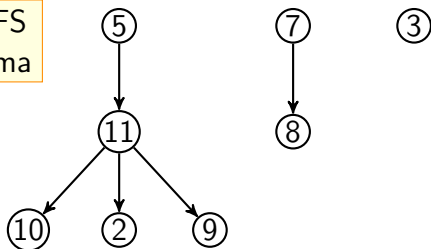
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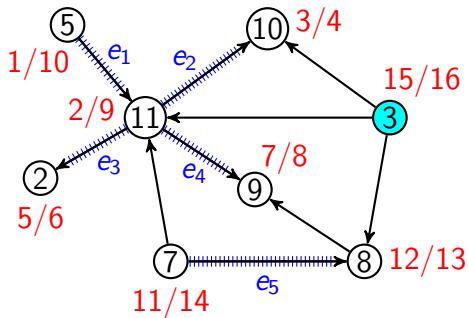
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10	11	3	4
11	5	2	9

DFS
šuma



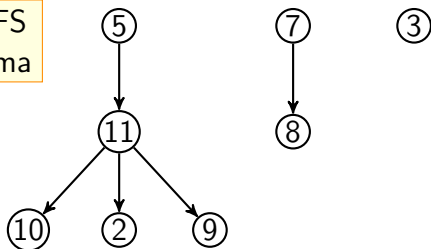
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7, 8, 5, 11, 9, 2, 10



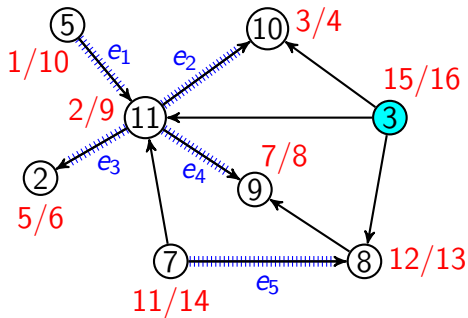
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9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma



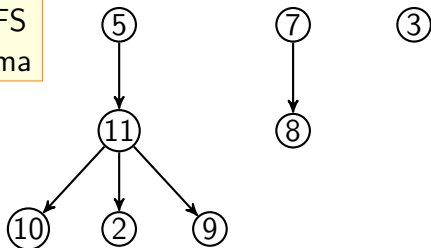
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7, 8, 5, 11, 9, 2, 10



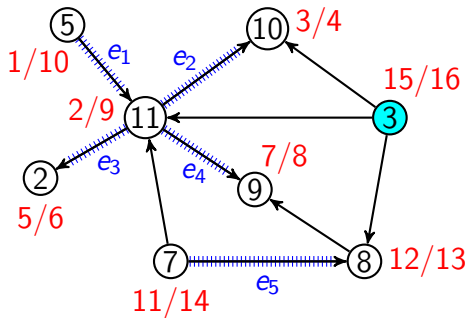
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7	—	11	14
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9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma



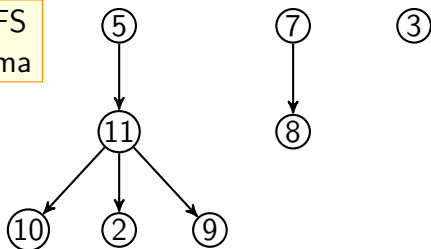
lista L

7, 8, 5, 11, 9, 2, 10

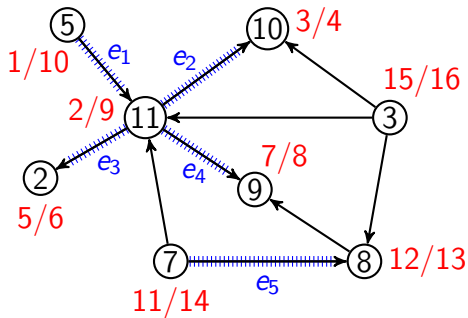


	π	d	f
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3	—	15	16
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7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

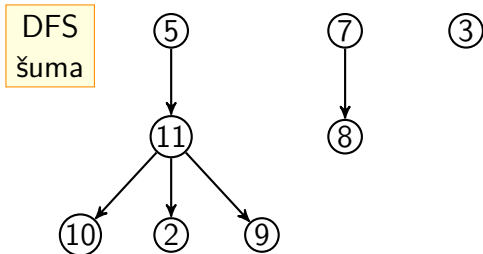
DFS
šuma



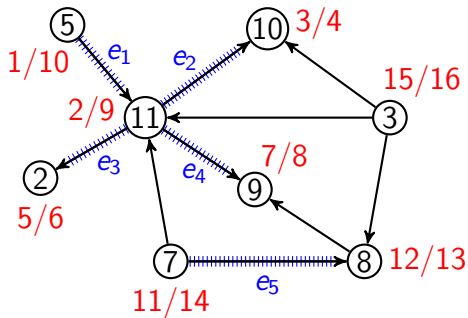
lista L 3, 7, 8, 5, 11, 9, 2, 10



	π	d	f
2	11	5	6
3	—	15	16
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7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

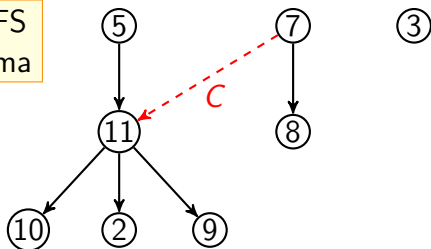


lista L 3, 7, 8, 5, 11, 9, 2, 10

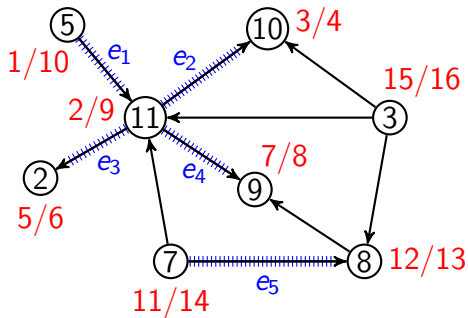


	π	d	f
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3	—	15	16
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8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma

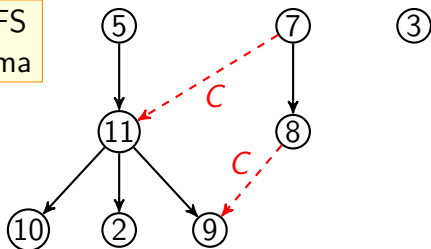


lista L 3, 7, 8, 5, 11, 9, 2, 10

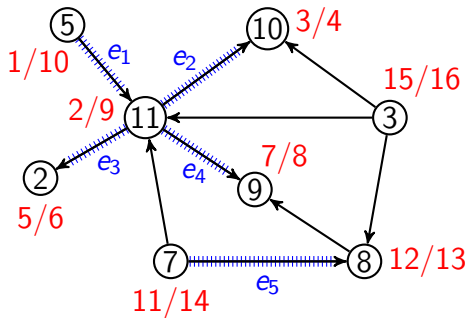


	π	d	f
2	11	5	6
3	—	15	16
5	—	1	10
7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma

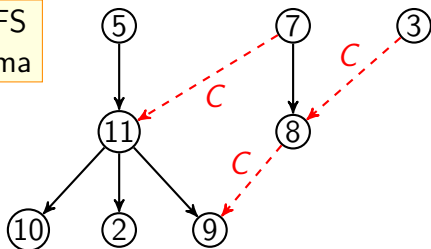


lista L 3, 7, 8, 5, 11, 9, 2, 10

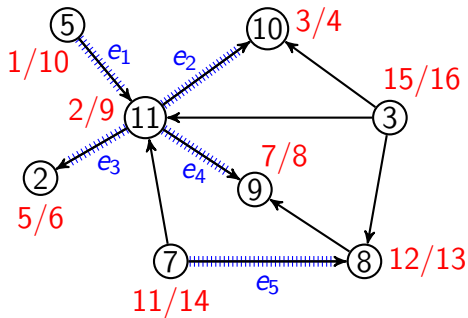


	π	d	f
2	11	5	6
3	—	15	16
5	—	1	10
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8	7	12	13
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11	5	2	9

DFS
šuma

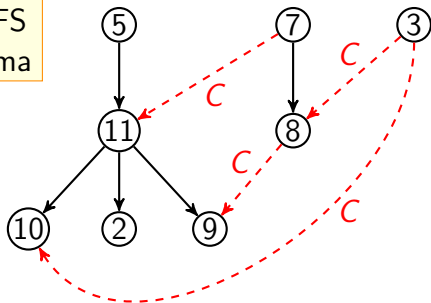


lista L 3, 7, 8, 5, 11, 9, 2, 10

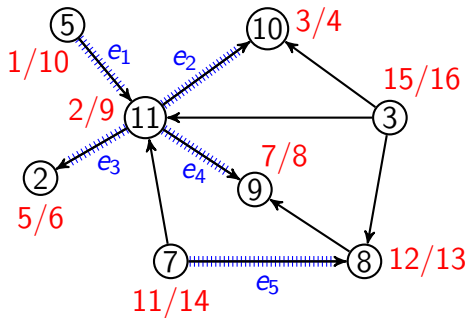


	π	d	f
2	11	5	6
3	—	15	16
5	—	1	10
7	—	11	14
8	7	12	13
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10	11	3	4
11	5	2	9

DFS
šuma

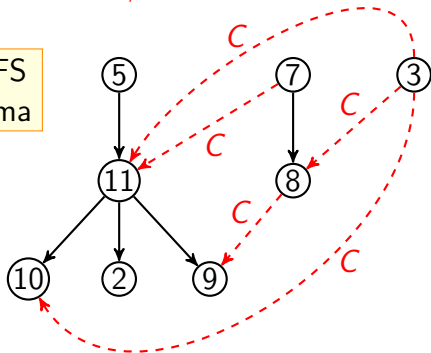


lista L 3, 7, 8, 5, 11, 9, 2, 10

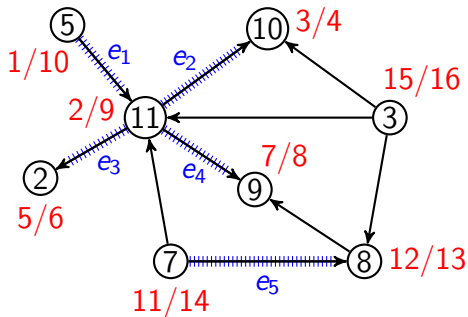


	π	d	f
2	11	5	6
3	—	15	16
5	—	1	10
7	—	11	14
8	7	12	13
9	11	7	8
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11	5	2	9

DFS
šuma

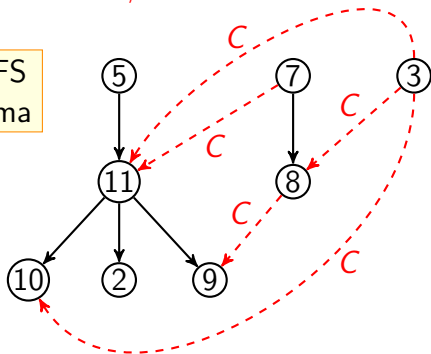


lista L 3, 7, 8, 5, 11, 9, 2, 10



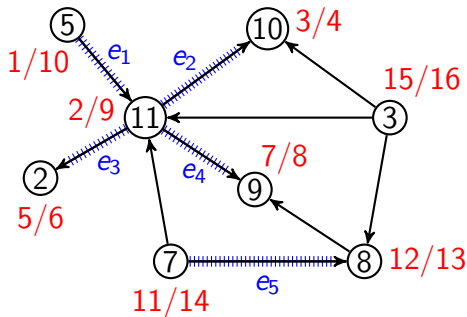
	π	d	f
2	11	5	6
3	—	15	16
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8	7	12	13
9	11	7	8
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11	5	2	9

DFS
šuma



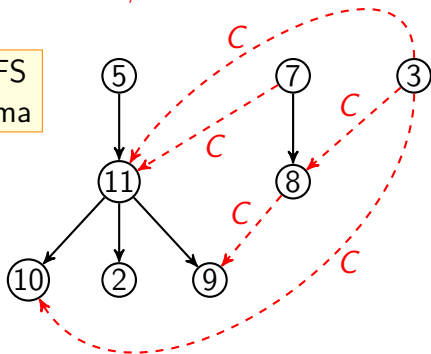
Zadani digraf je aciklički jer u njemu nema uzlaznih lukova.

lista L 3, 7, 8, 5, 11, 9, 2, 10



	π	d	f
2	11	5	6
3	—	15	16
5	—	1	10
7	—	11	14
8	7	12	13
9	11	7	8
10	11	3	4
11	5	2	9

DFS
šuma

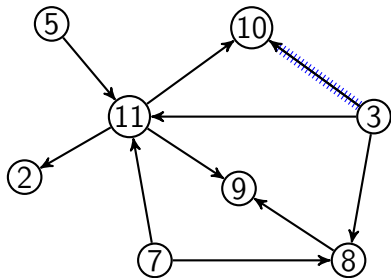


Zadani digraf je aciklički jer u njemu nema uzlaznih lukova.

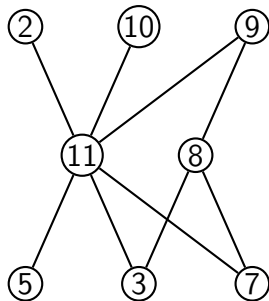
lista L 3, 7, 8, 5, 11, 9, 2, 10

↑
kanonski poredak vrhova

Aciklički digraf



Hasseov dijagram



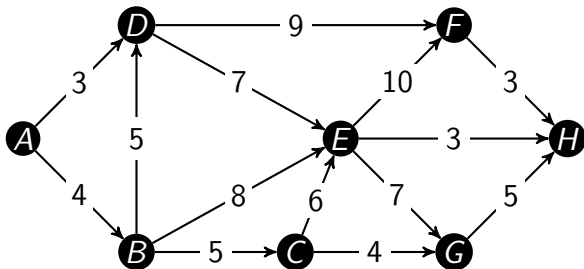
- U acikličkom digrafu mogu postojati *suvišni* lukovi, nego što je to potrebno u Hasseovom dijagramu s obzirom na tranzitivnost.
- 3, 7, 8, 5, 11, 9, 2, 10 → jedno proširenje zadanog parcijalnog uređaja na linearni uređaj

U kojem slučaju je kanonski poredak vrhova jedinstven?

šesti zadatak

Zadatak 6

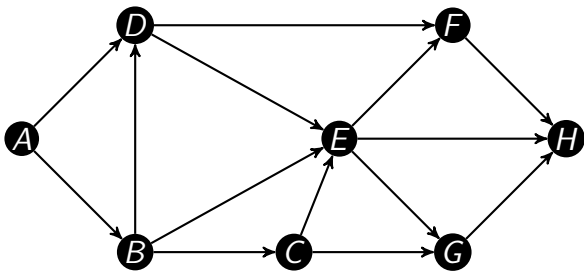
Projekt je prikazan pomoću usmjerene mreže pri čemu su vremena trajanja aktivnosti izražena u tjednima.



- Koliko minimalno tjedana traje projekt?
- Odredite kritični put.
- Koje se aktivnosti u projektu mogu odugovlačiti?

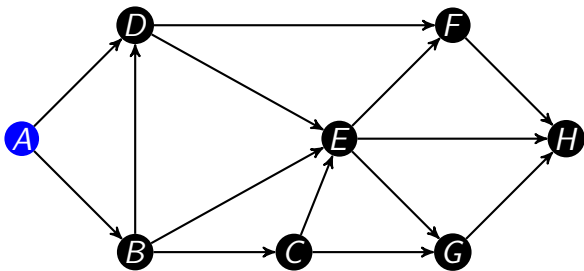
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



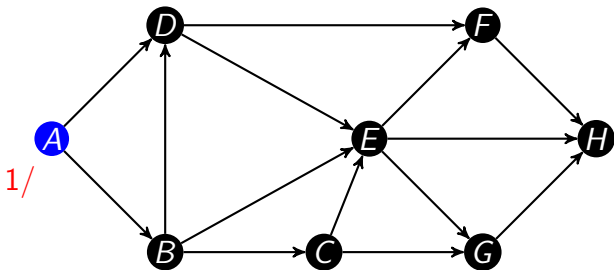
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



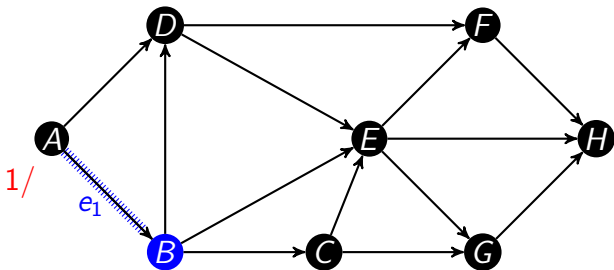
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



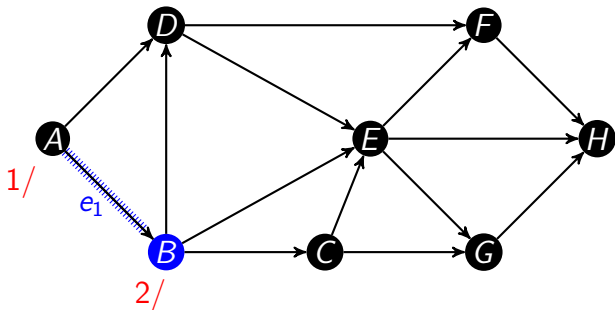
Rješenje

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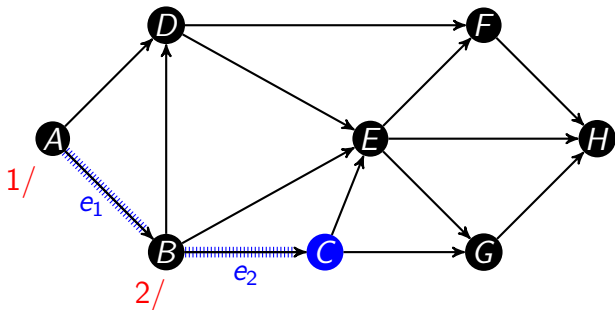
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



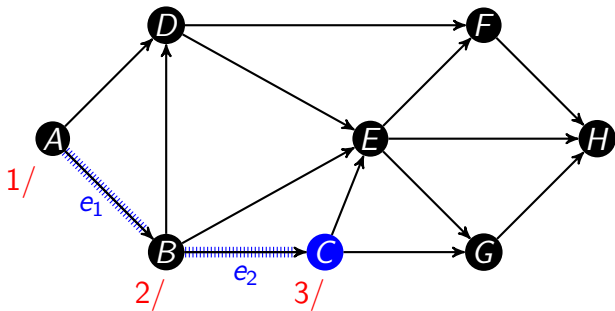
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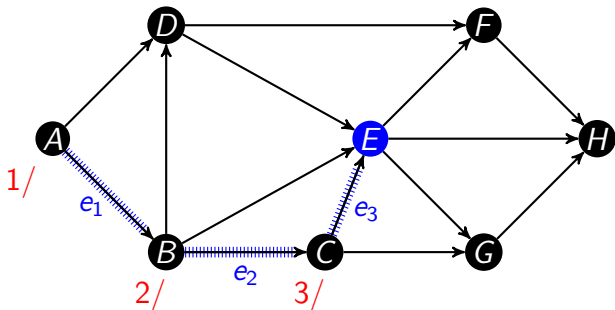
Rješenje

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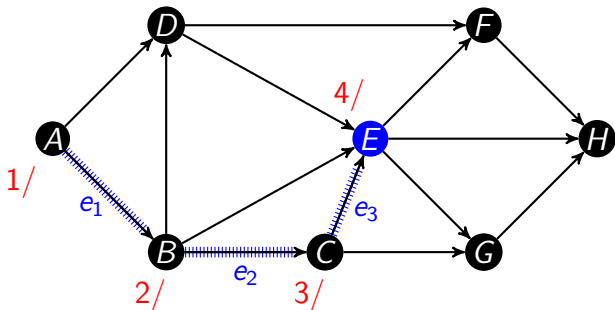
Rješenje

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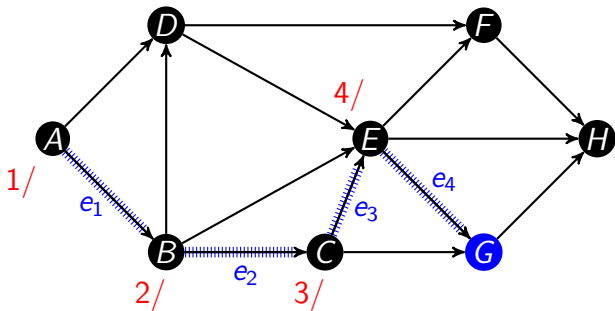
Rješenje

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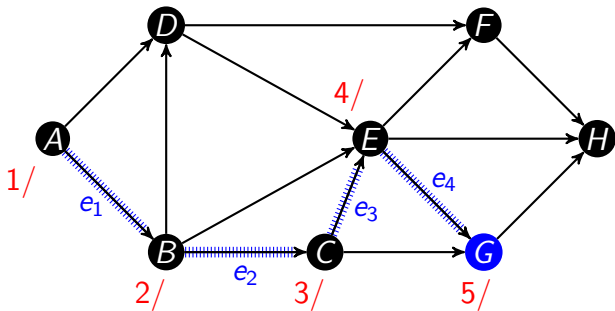
Rješenje

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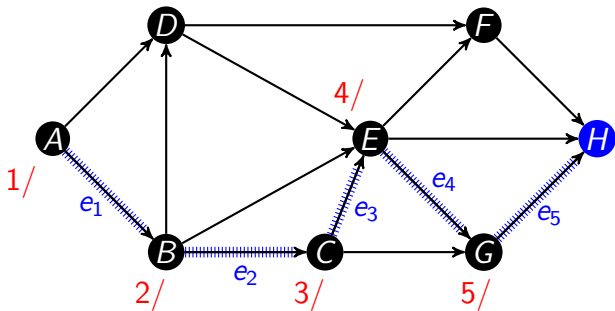
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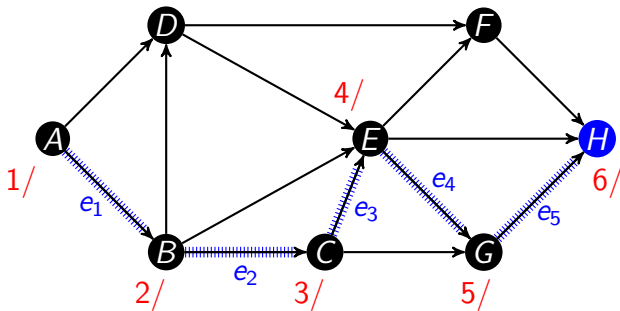
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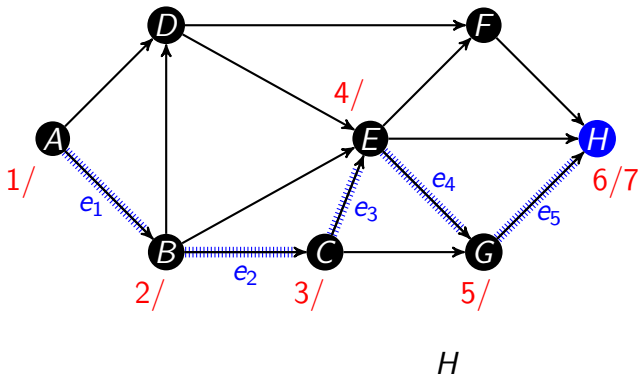
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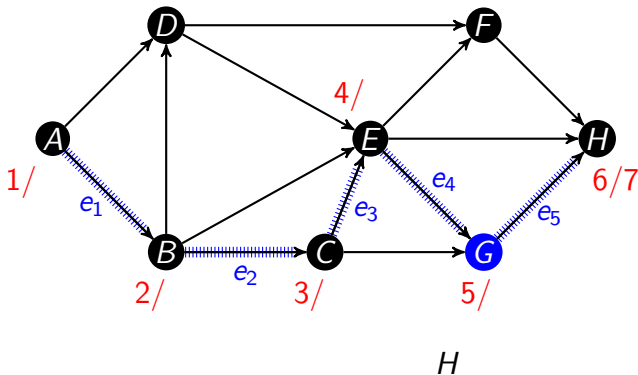
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



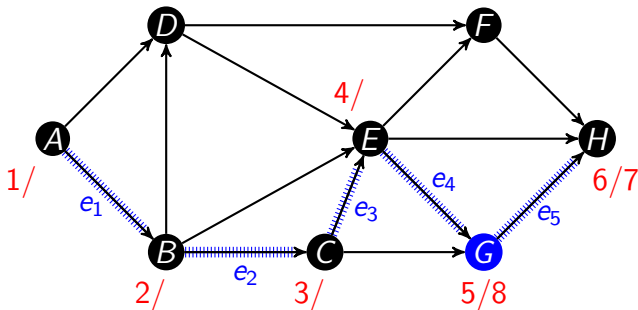
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



Rješenje

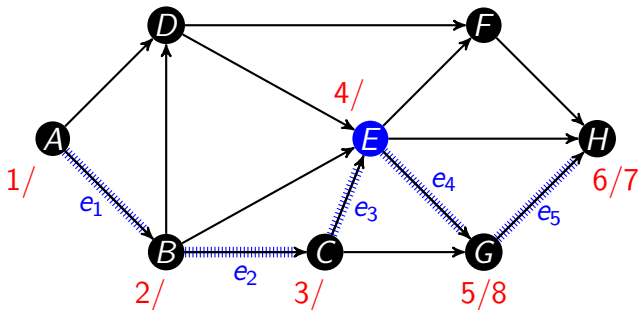
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G, H

Rješenje

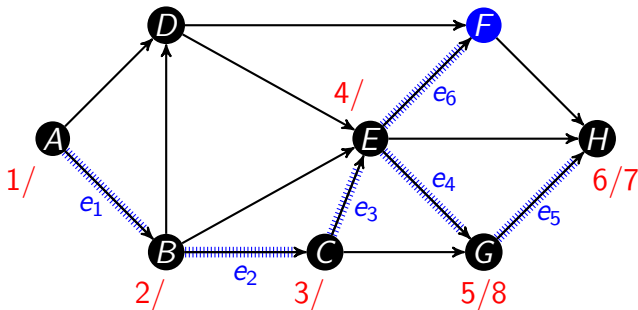
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



G, H

Rješenje

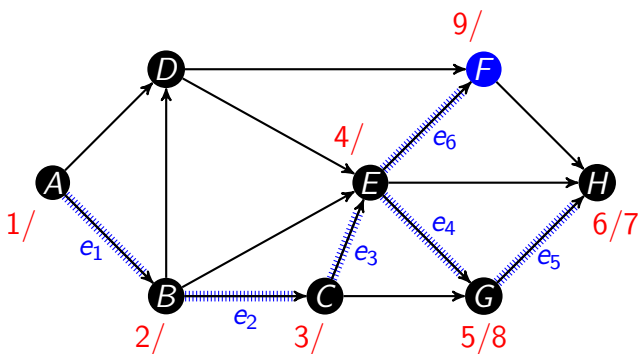
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G, H

Rješenje

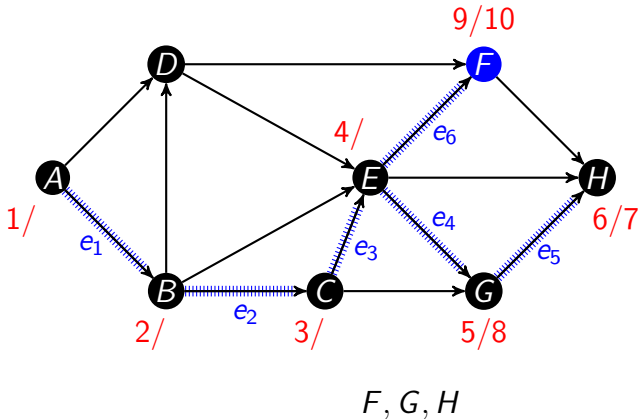
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G, H

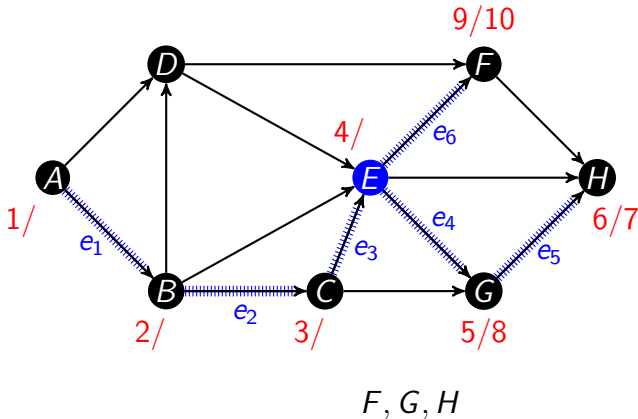
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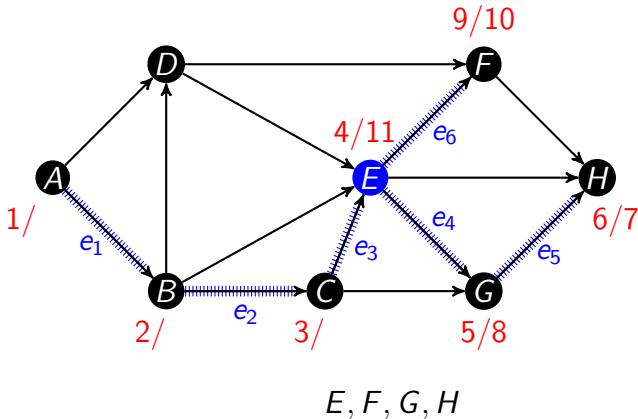
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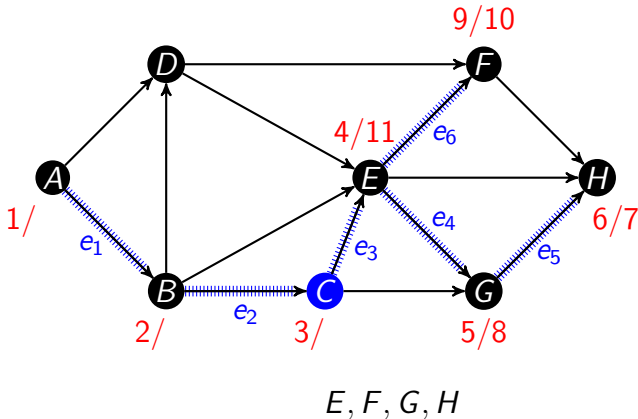
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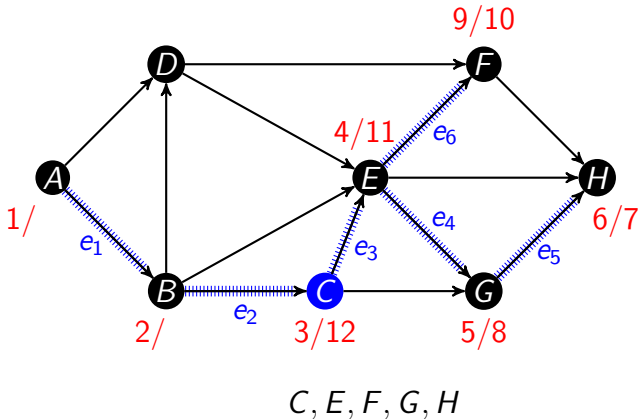
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



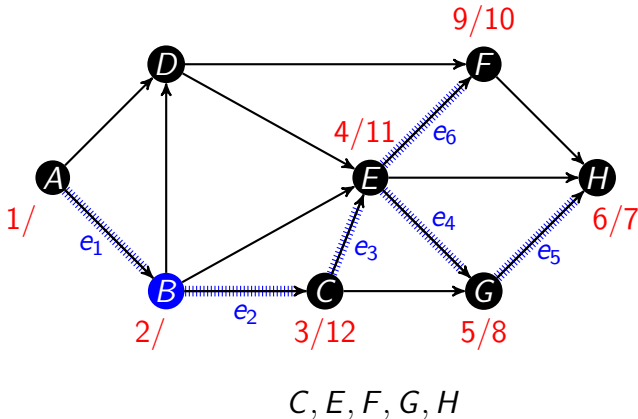
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



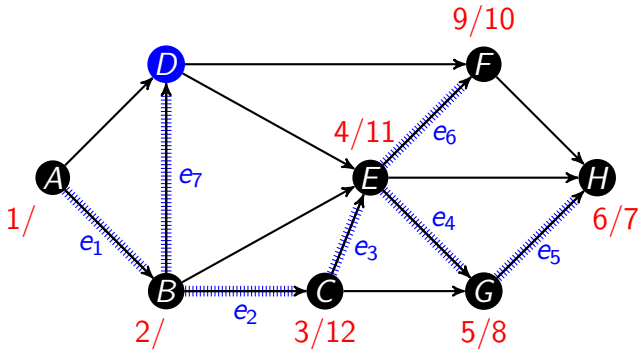
Rješenje

- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



Rješenje

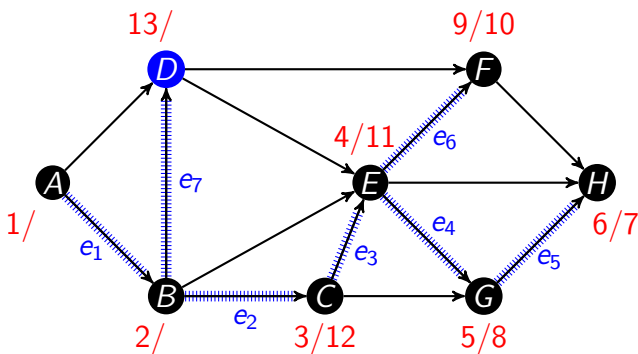
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



C, E, F, G, H

Rješenje

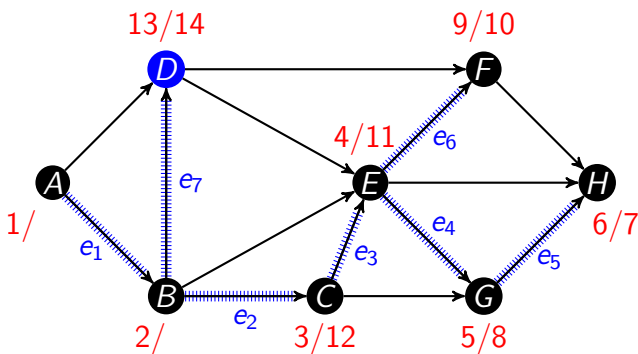
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



C, E, F, G, H

Rješenje

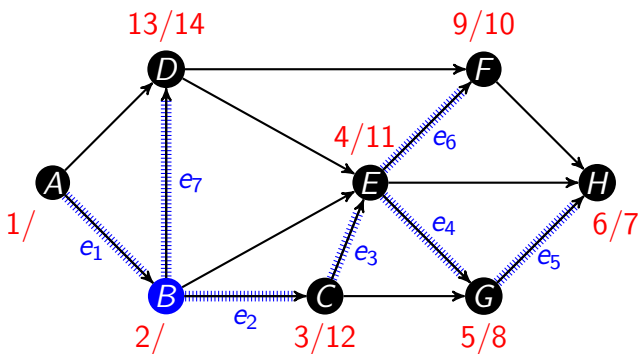
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



D, C, E, F, G, H

Rješenje

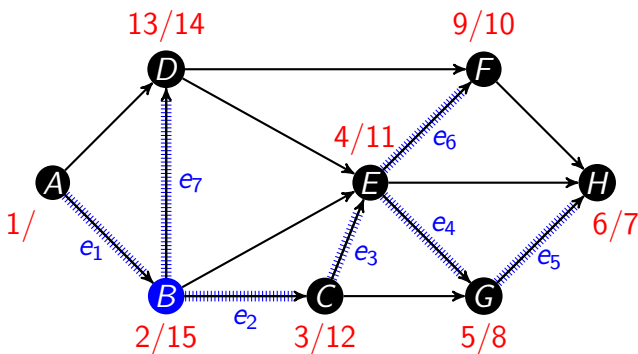
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



D, C, E, F, G, H

Rješenje

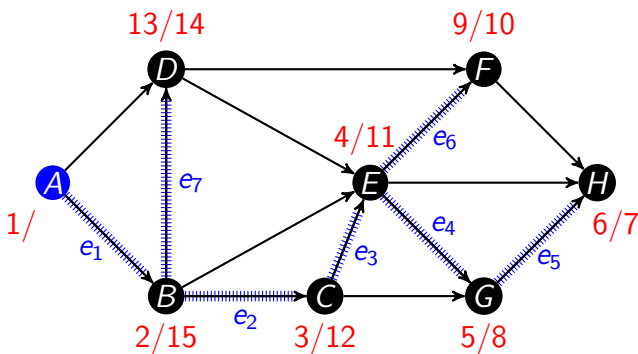
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



B, D, C, E, F, G, H

Rješenje

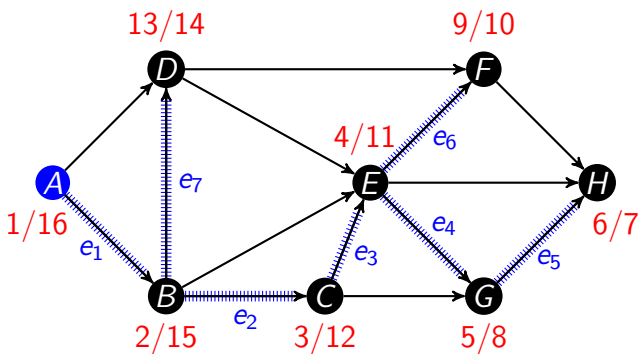
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



B, D, C, E, F, G, H

Rješenje

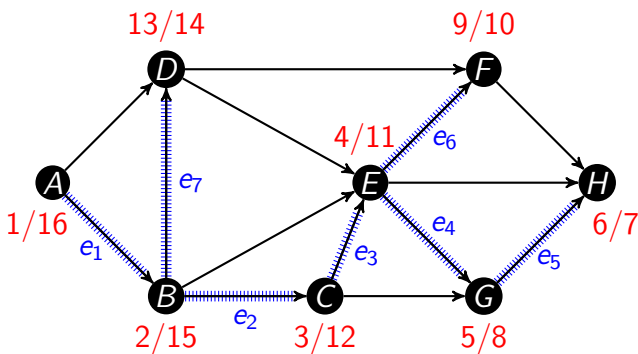
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



A, B, D, C, E, F, G, H

Rješenje

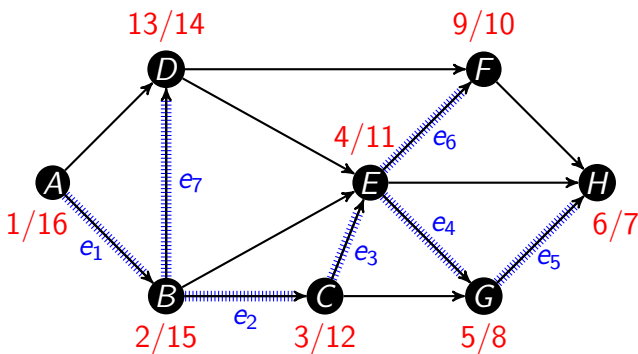
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



A, B, D, C, E, F, G, H

Rješenje

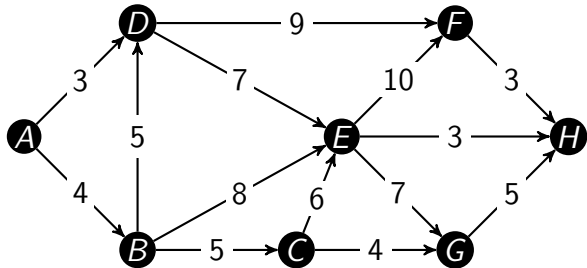
- a) Najprije pronađemo kanonski poredak vrhova (usmjerena mreža je aciklički digraf).



kanonski poredak
vrhova

→ A, B, D, C, E, F, G, H

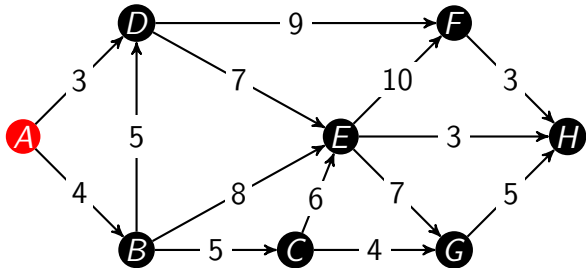
A, B, D, C, E, F, G, H



A, B, D, C, E, F, G, H



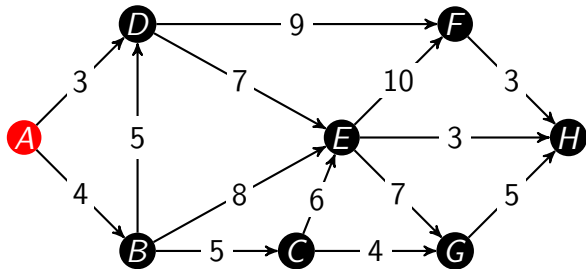
1)



A, B, D, C, E, F, G, H



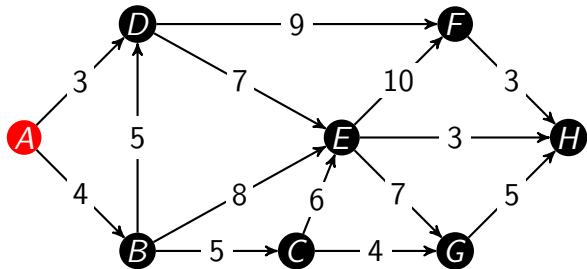
1) $A(-, 0)$



A, B, D, C, E, F, G, H



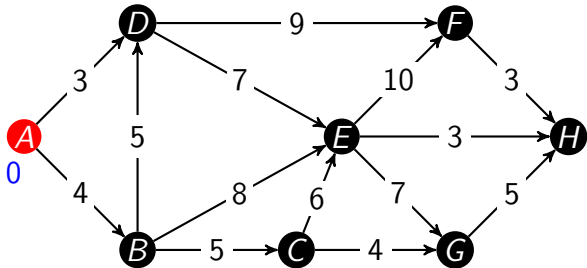
1) $A(-, 0)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

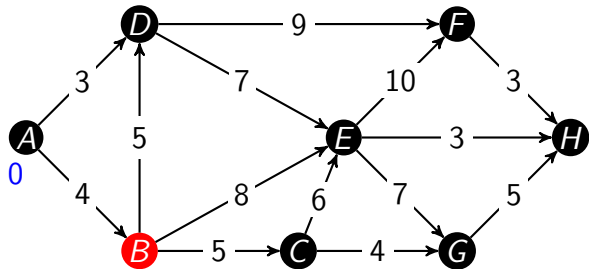


A, B, D, C, E, F, G, H



1) $A(-, 0)$

2)

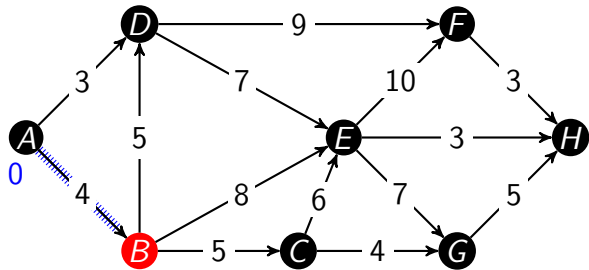


A, B, D, C, E, F, G, H



1) $A(-, 0)$

2)

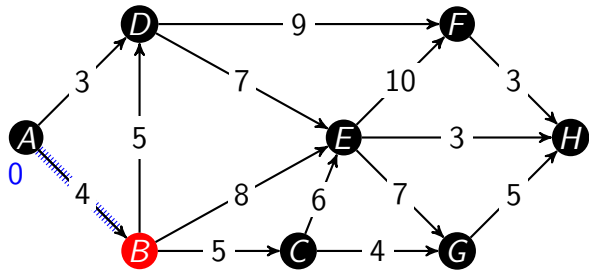


A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

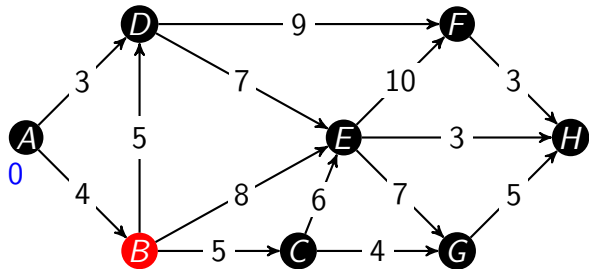


A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

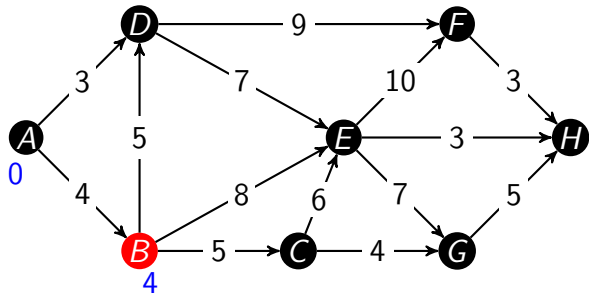


A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$



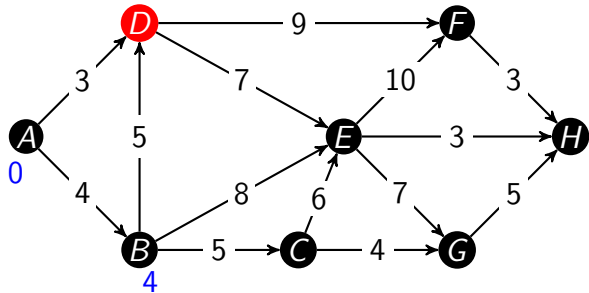
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3)



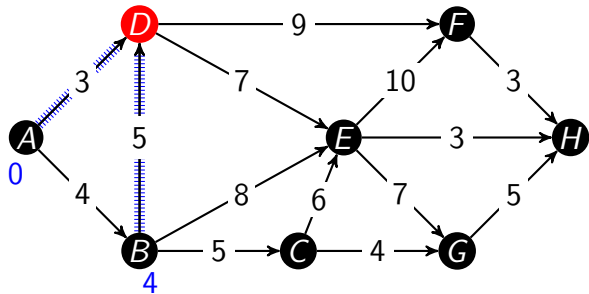
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3)



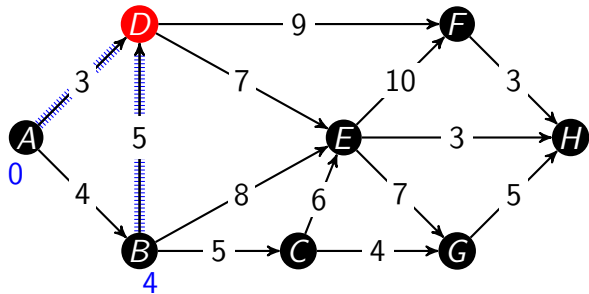
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3)$



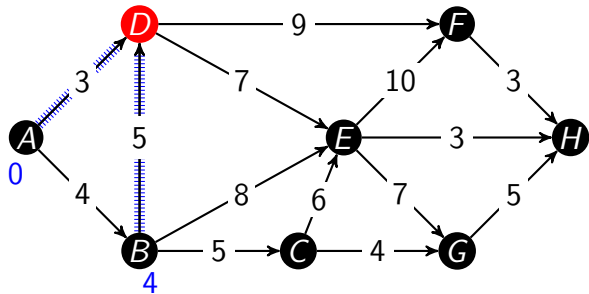
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$



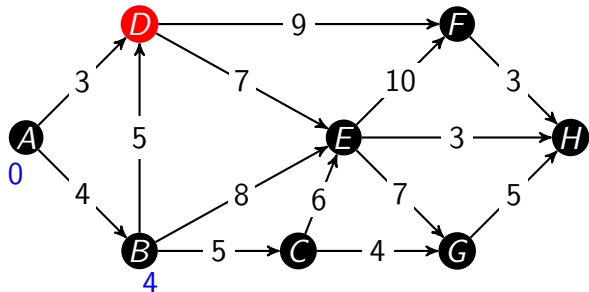
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$



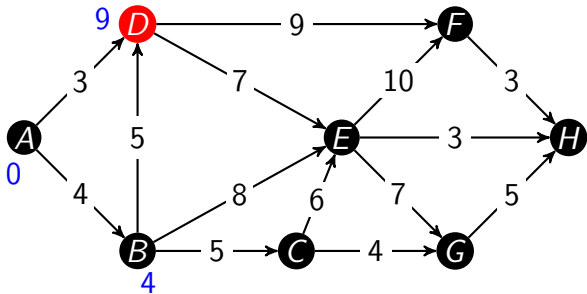
A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$



A, B, D, C, E, F, G, H

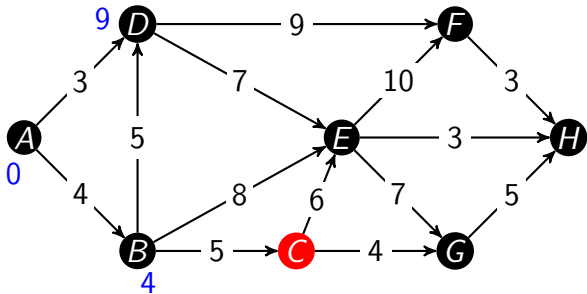


1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4)



A, B, D, C, E, F, G, H

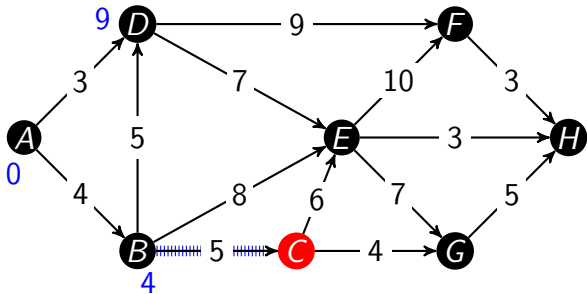


1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4)



A, B, D, C, E, F, G, H

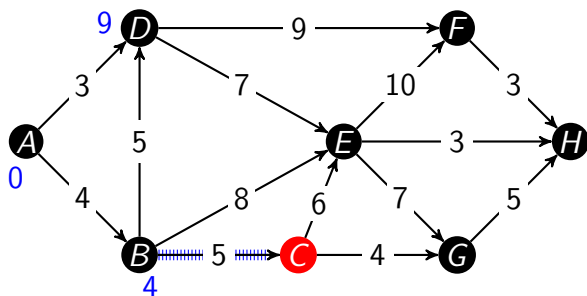


1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$



A, B, D, C, E, F, G, H

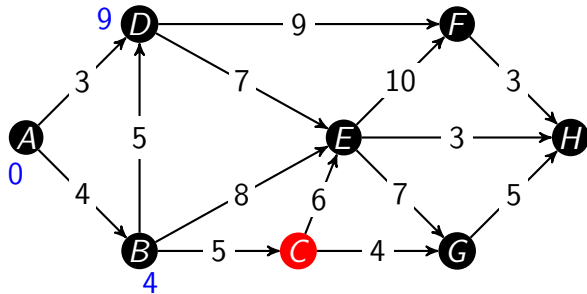


1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$



A, B, D, C, E, F, G, H

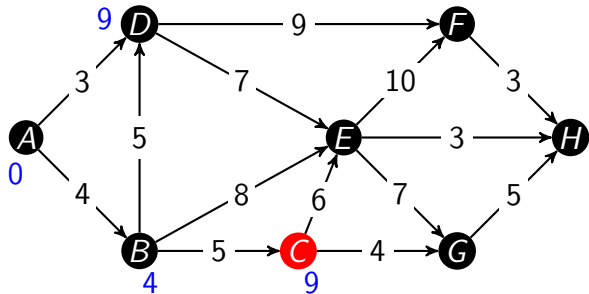


1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$



A, B, D, C, E, F, G, H



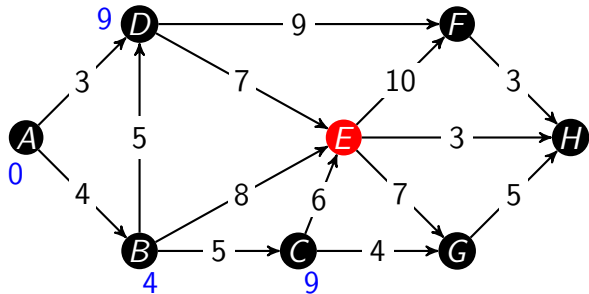
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5)



A, B, D, C, E, F, G, H



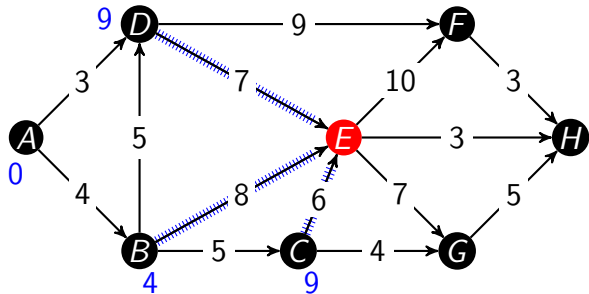
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5)



A, B, D, C, E, F, G, H



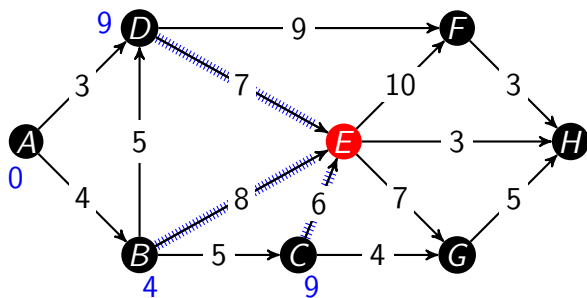
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12)$



A, B, D, C, E, F, G, H



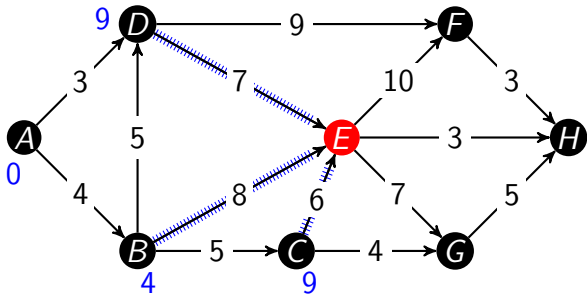
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15)$



A, B, D, C, E, F, G, H



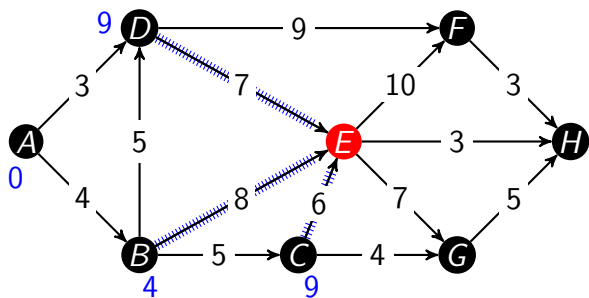
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

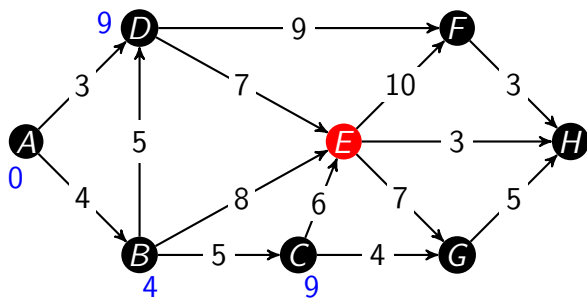
5) $E(B, 12), E(C, 15), E(D, 16)$



A, B, D, C, E, F, G, H



- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$



A, B, D, C, E, F, G, H



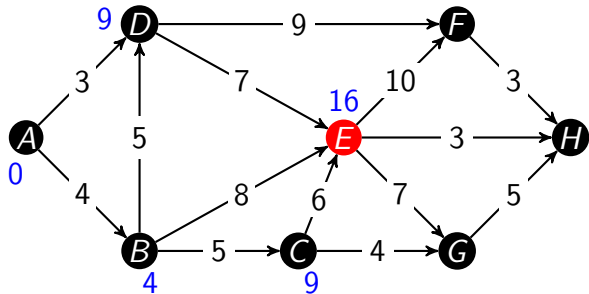
1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

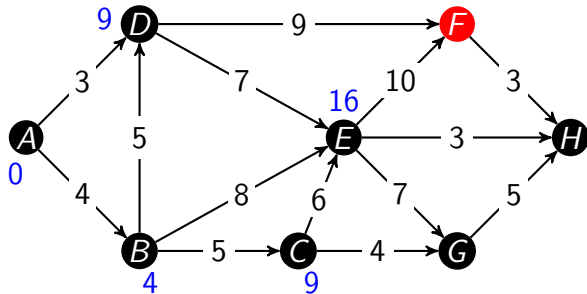
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6)



A, B, D, C, E, F, G, H



1) $A(-, 0)$

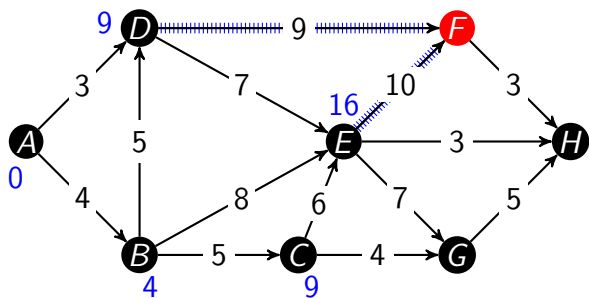
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6)



A, B, D, C, E, F, G, H



1) $A(-, 0)$

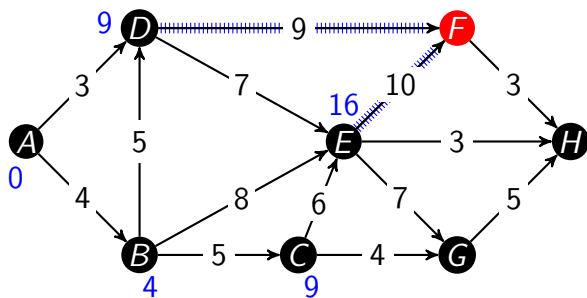
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

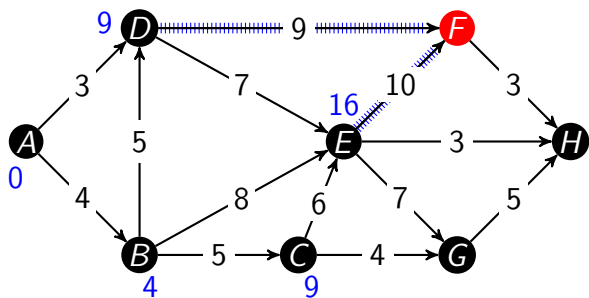
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

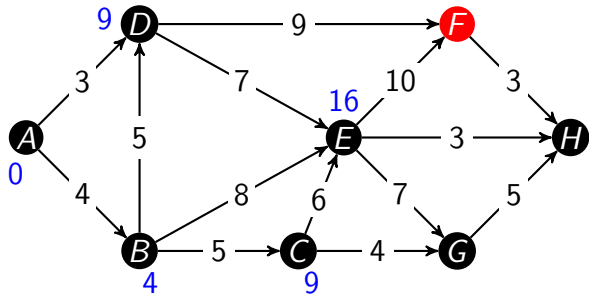
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

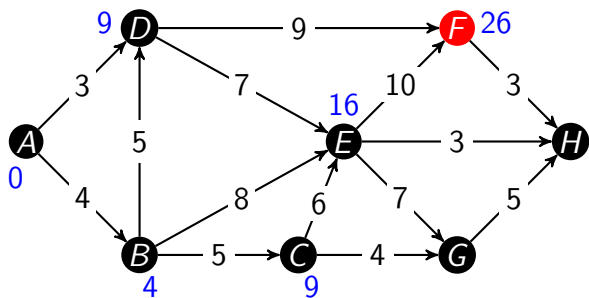
2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

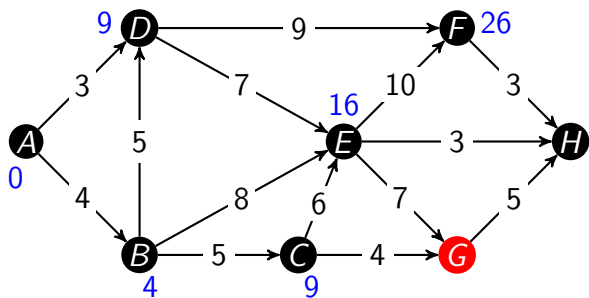
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7)



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

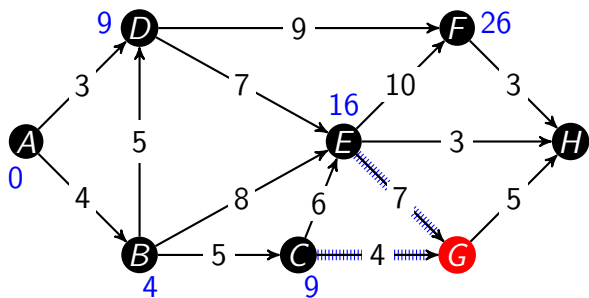
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7)



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

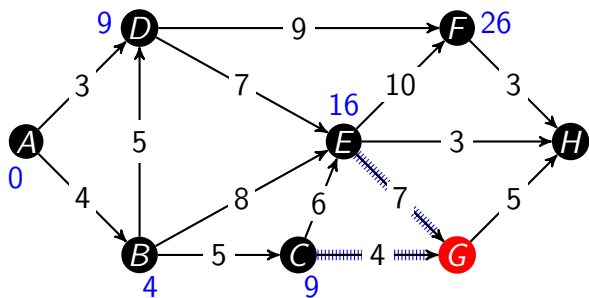
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7) $G(C, 13)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

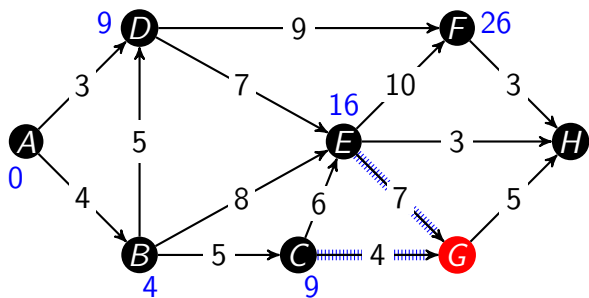
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7) $G(C, 13), G(E, 23)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

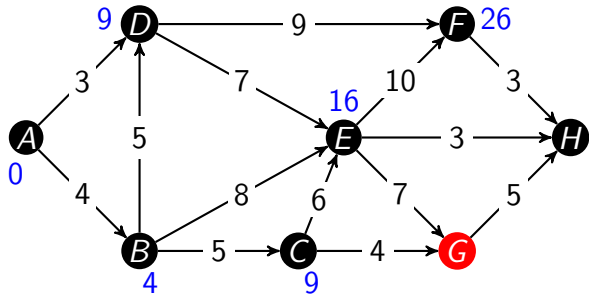
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7) $G(C, 13), G(E, 23)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

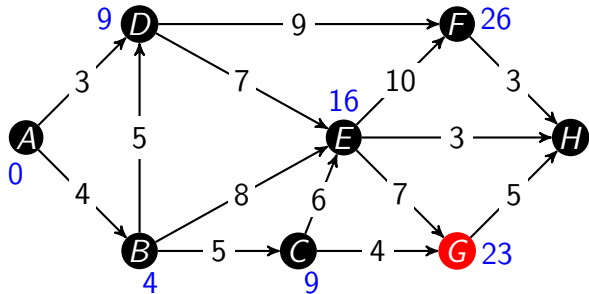
3) $D(A, 3), D(B, 9)$

4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7) $G(C, 13), G(E, 23)$



A, B, D, C, E, F, G, H



1) $A(-, 0)$

2) $B(A, 4)$

3) $D(A, 3), D(B, 9)$

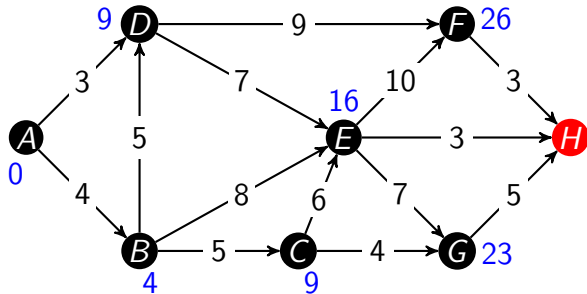
4) $C(B, 9)$

5) $E(B, 12), E(C, 15), E(D, 16)$

6) $F(D, 18), F(E, 26)$

7) $G(C, 13), G(E, 23)$

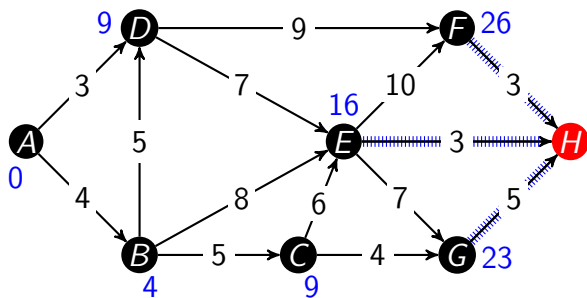
8)



A, B, D, C, E, F, G, H



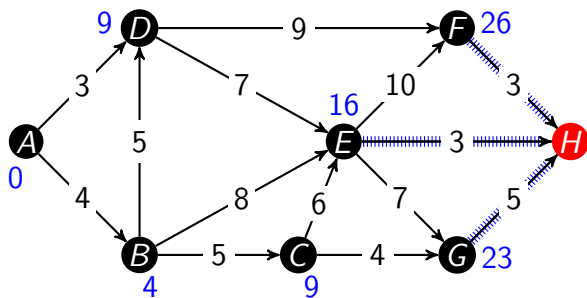
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8)



A, B, D, C, E, F, G, H



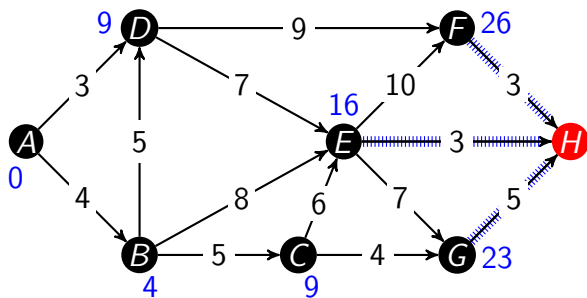
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19)$



A, B, D, C, E, F, G, H



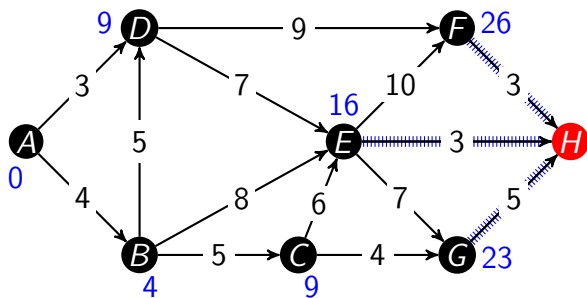
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29)$



A, B, D, C, E, F, G, H



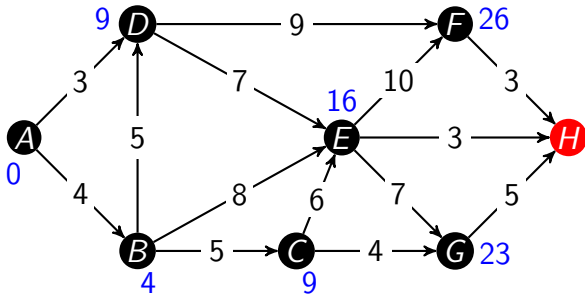
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



A, B, D, C, E, F, G, H



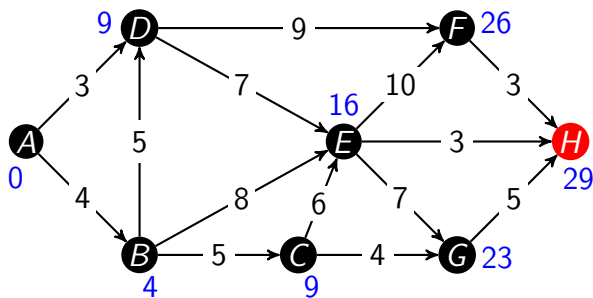
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



A, B, D, C, E, F, G, H

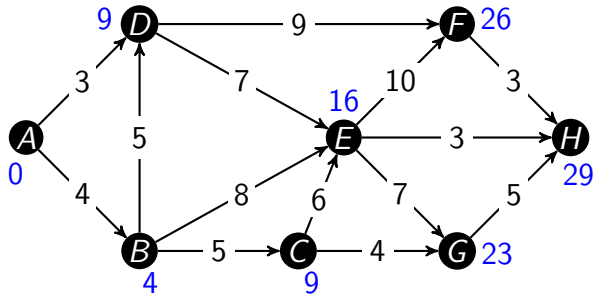


- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



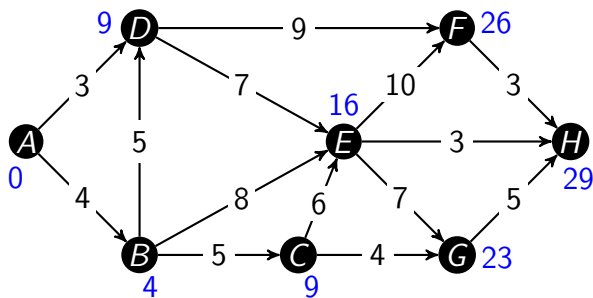
A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



A, B, D, C, E, F, G, H

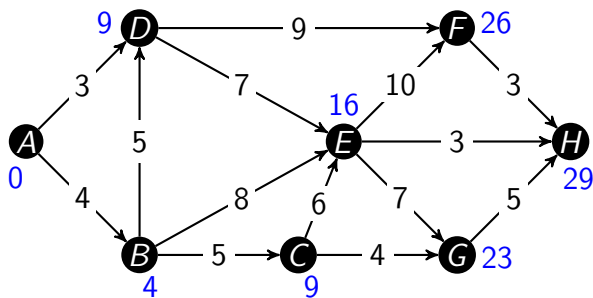
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

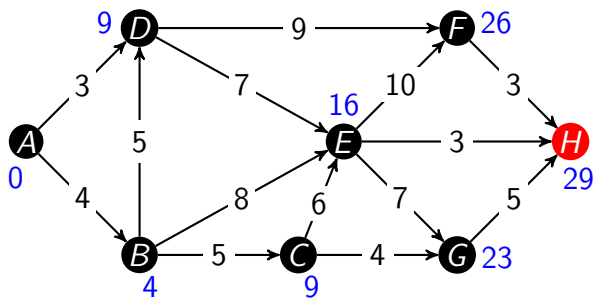


b) kritični put

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



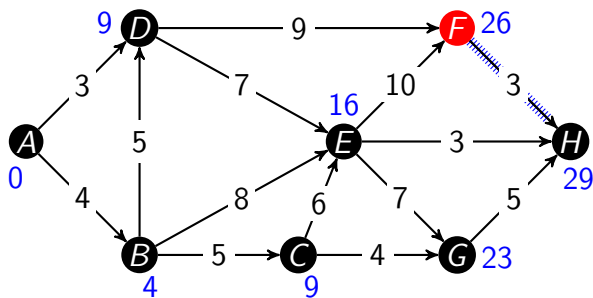
b) kritični put

H

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



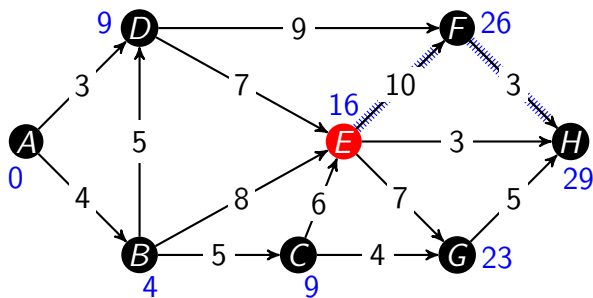
b) kritični put

FH

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

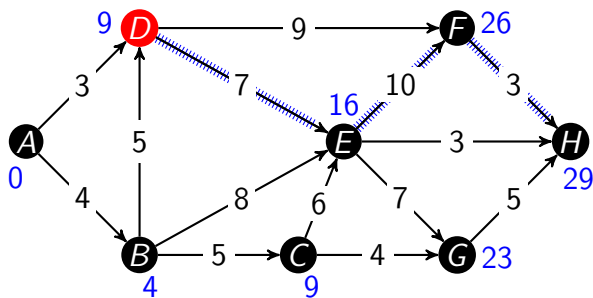


b) kritični put EFH

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

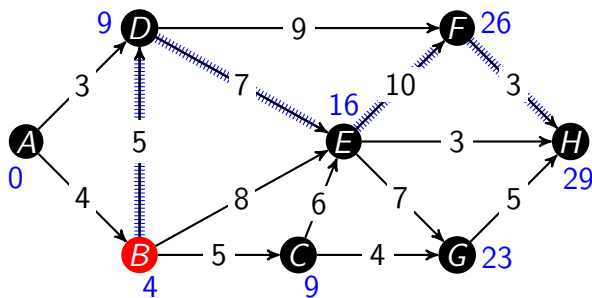


b) kritični put $DEFH$

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

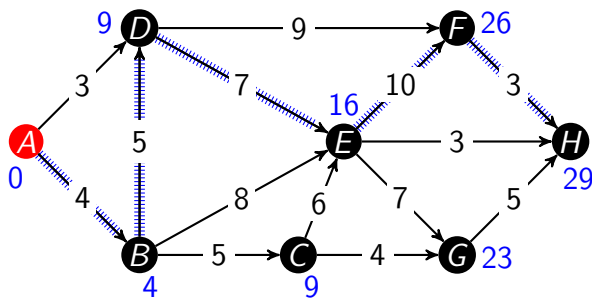


b) kritični put $BDEFH$

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

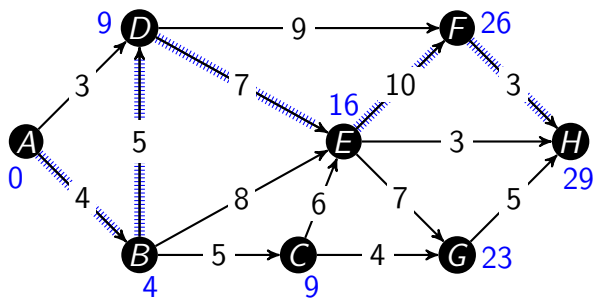


b) kritični put $ABDEFH$

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$

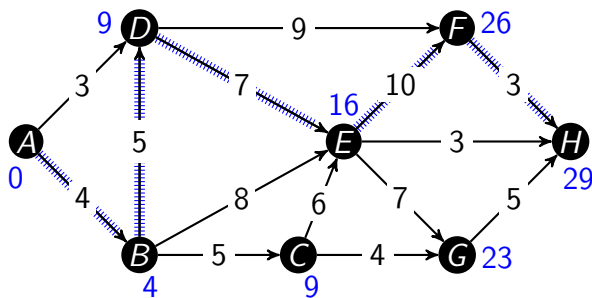


b) kritični put $ABDEFH$

Projekt traje minimalno 29 tjedana.

A, B, D, C, E, F, G, H

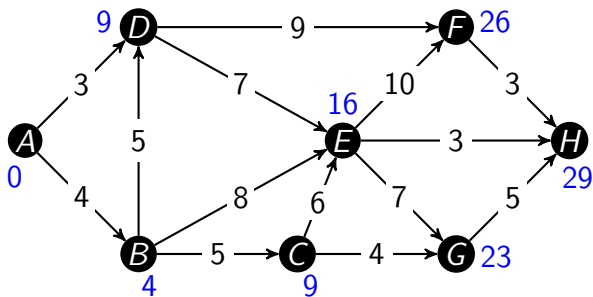
- 1) $A(-, 0)$
- 2) $B(A, 4)$
- 3) $D(A, 3), D(B, 9)$
- 4) $C(B, 9)$
- 5) $E(B, 12), E(C, 15), E(D, 16)$
- 6) $F(D, 18), F(E, 26)$
- 7) $G(C, 13), G(E, 23)$
- 8) $H(E, 19), H(F, 29), H(G, 28)$



Projekt traje minimalno 29 tjedana.

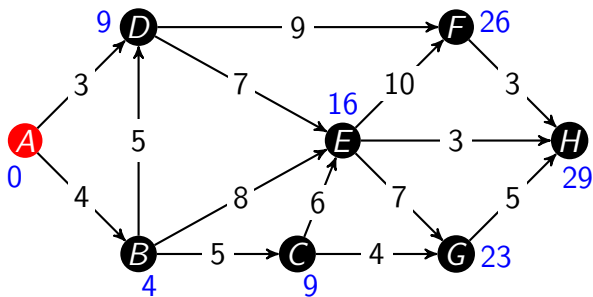
- b) kritični put $ABDEFH$
- c) Aktivnosti na kritičnom putu se ne smiju odugovlačiti ako želimo da projekt završi na vrijeme.

A, B, D, C, E, F, G, H



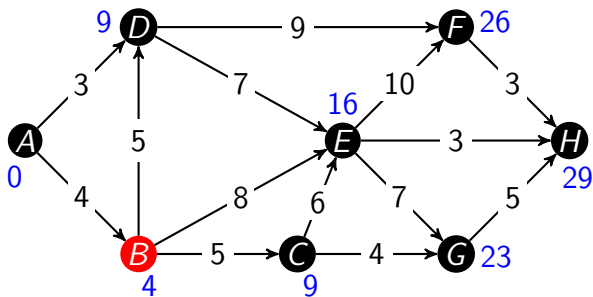
vrh	A	B	C	D	E	F	G	H
$V(v)$								
$K(v)$								

A, B, D, C, E, F, G, H



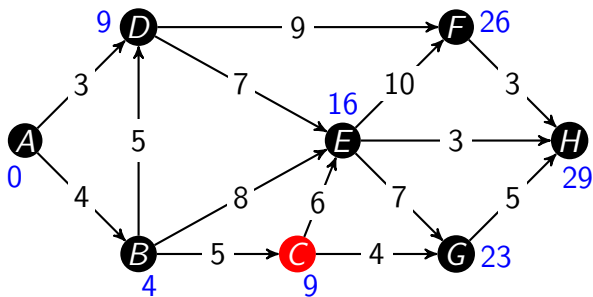
vrh	A	B	C	D	E	F	G	H
$V(v)$	0							
$K(v)$								

A, B, D, C, E, F, G, H



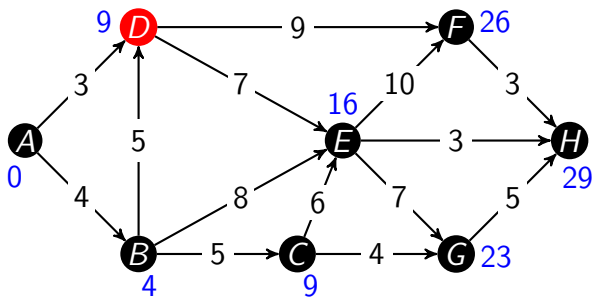
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4						
$K(v)$								

A, B, D, C, E, F, G, H



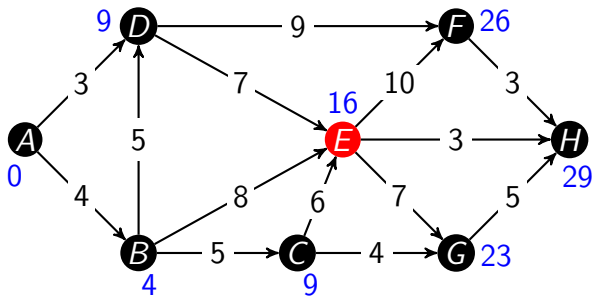
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9					
$K(v)$								

A, B, D, C, E, F, G, H



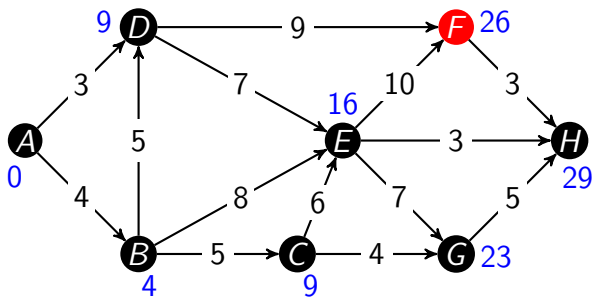
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9				
$K(v)$								

A, B, D, C, E, F, G, H



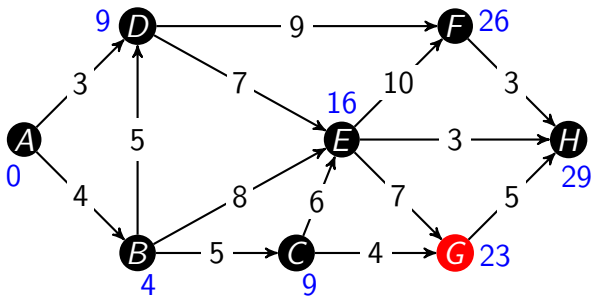
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16			
$K(v)$								

A, B, D, C, E, F, G, H



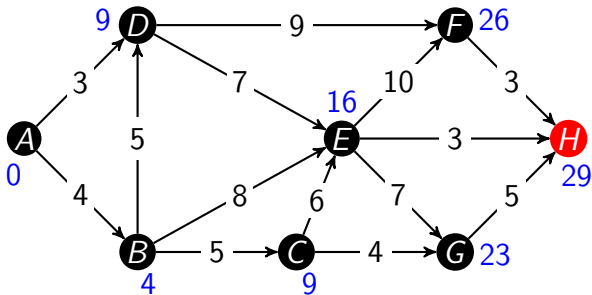
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26		
$K(v)$								

A, B, D, C, E, F, G, H



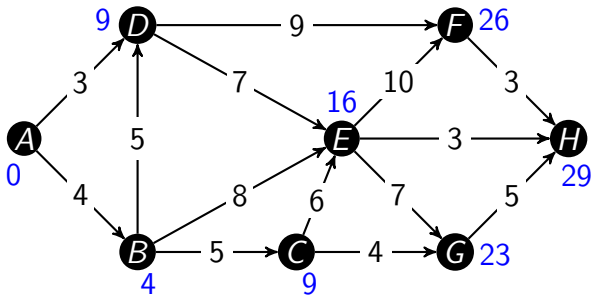
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	
$K(v)$								

A, B, D, C, E, F, G, H



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								

A, B, D, C, E, F, G, H

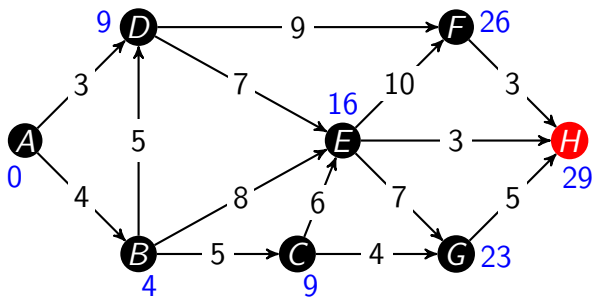


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								

A, B, D, C, E, F, G, H



$$K(H) =$$

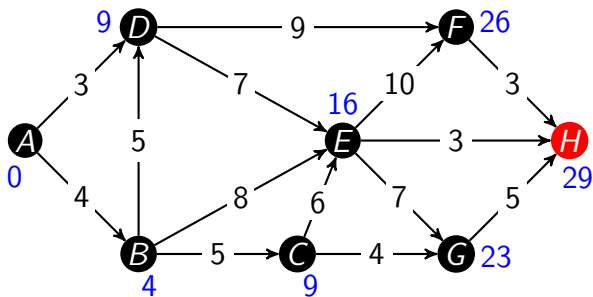


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								

A, B, D, C, E, F, G, H



$$K(H) = 29$$

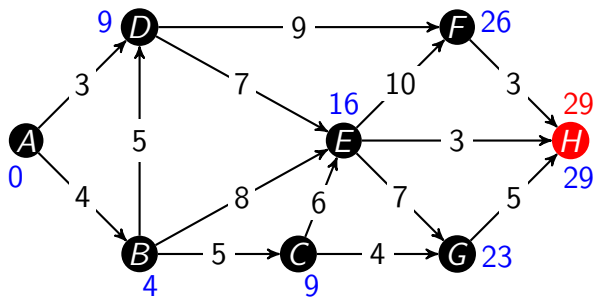


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								29

A, B, D, C, E, F, G, H



$$K(H) = 29$$

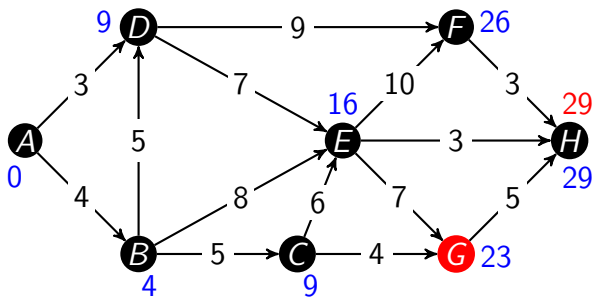


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								29

A, B, D, C, E, F, G, H



$$K(G) =$$

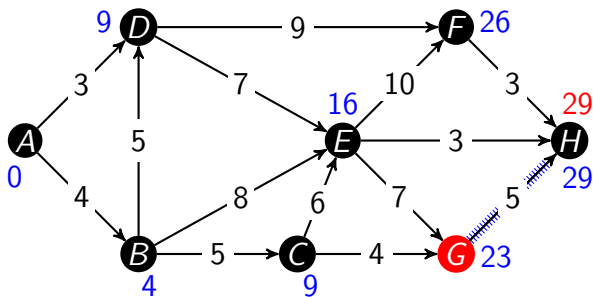


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								29

A, B, D, C, E, F, G, H



$$K(G) =$$

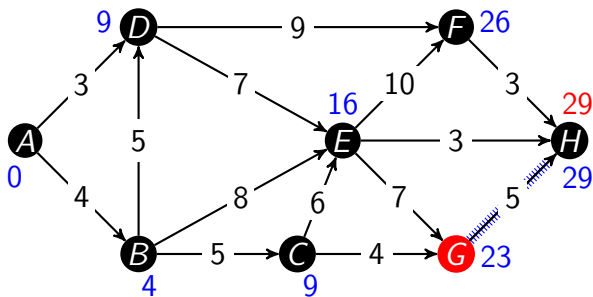


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								29

A, B, D, C, E, F, G, H



$$K(G) = \min \{29 - 5\}$$

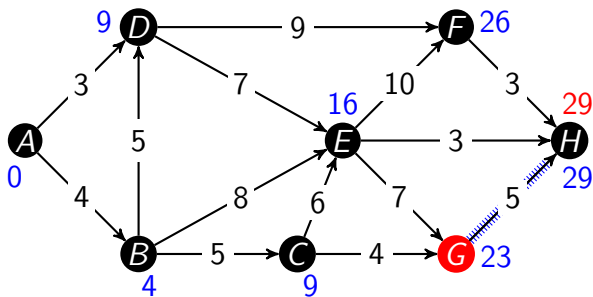


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$								29

A, B, D, C, E, F, G, H



$$K(G) = \min \{29 - 5\} = 24$$

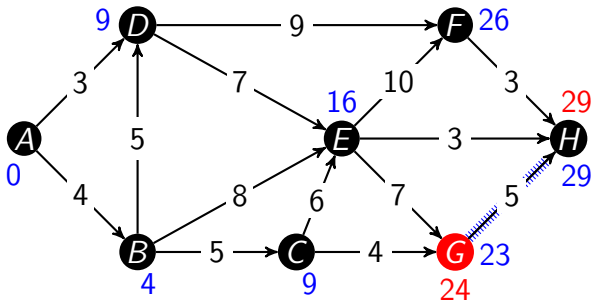


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$							24	29

A, B, D, C, E, F, G, H



$$K(G) = \min \{29 - 5\} = 24$$

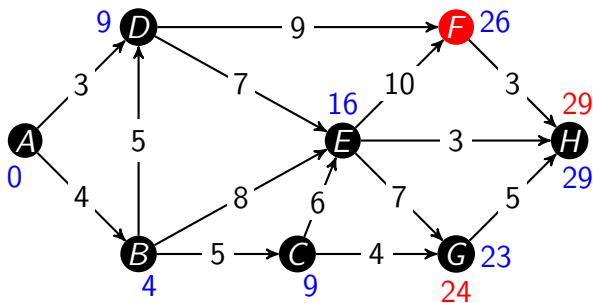


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$							24	29

A, B, D, C, E, F, G, H



$$K(F) =$$

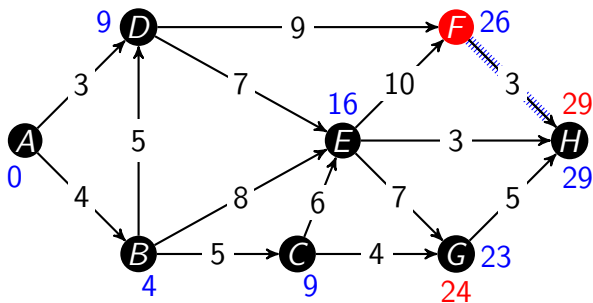


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$							24	29

A, B, D, C, E, F, G, H



$$K(F) =$$

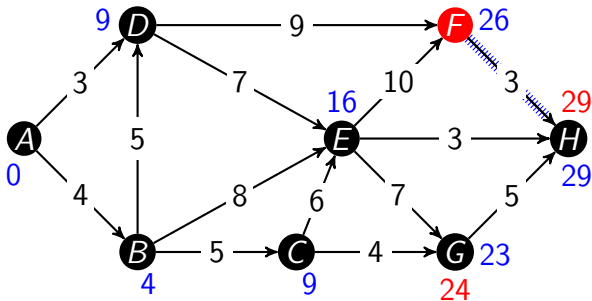


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$							24	29

A, B, D, C, E, F, G, H



$$K(F) = \min \{29 - 3\}$$

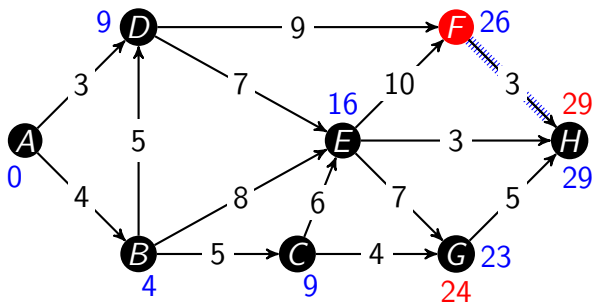


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$							24	29

A, B, D, C, E, F, G, H



$$K(F) = \min \{29 - 3\} = 26$$

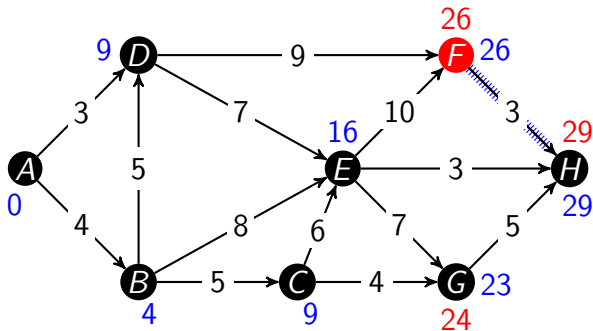


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$$K(F) = \min \{29 - 3\} = 26$$

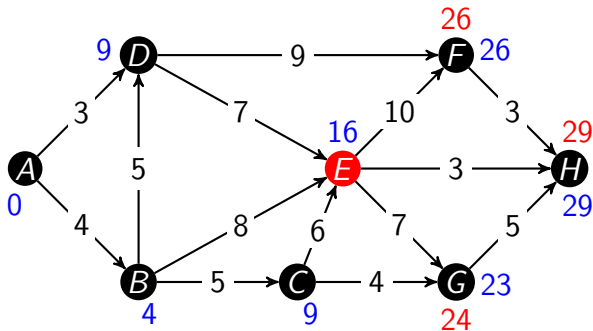


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$K(E) =$

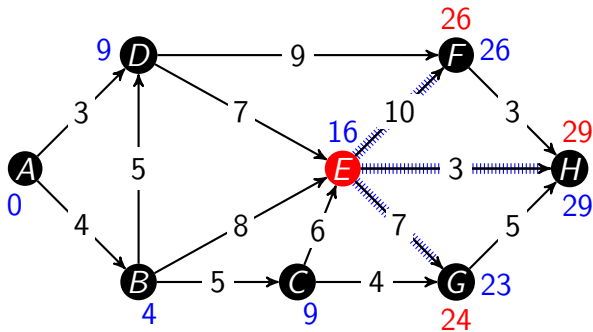


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$K(E) =$

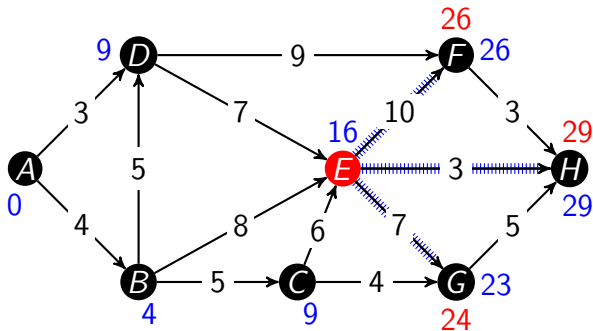


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$$K(E) = \min \{26 - 10,$$

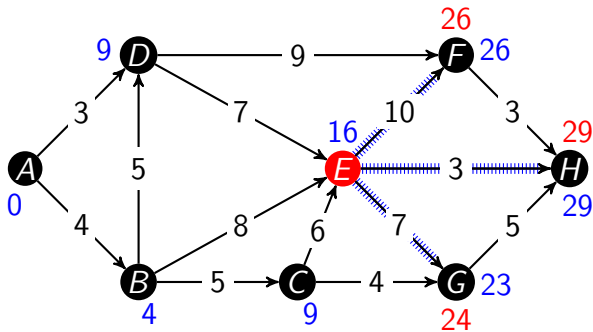


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$$K(E) = \min \{26 - 10, 24 - 7,$$

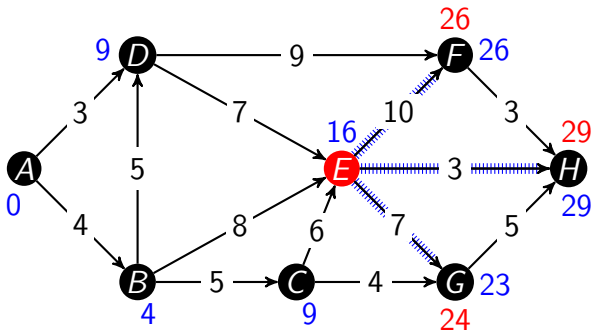


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$$K(E) = \min \{26 - 10, 24 - 7, 29 - 3\}$$

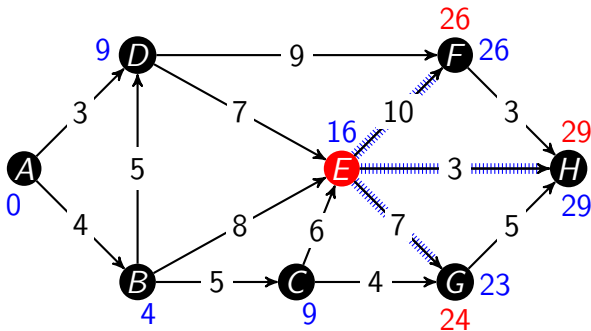


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$						26	24	29

A, B, D, C, E, F, G, H



$$K(E) = \min \{26 - 10, 24 - 7, 29 - 3\} = 16$$

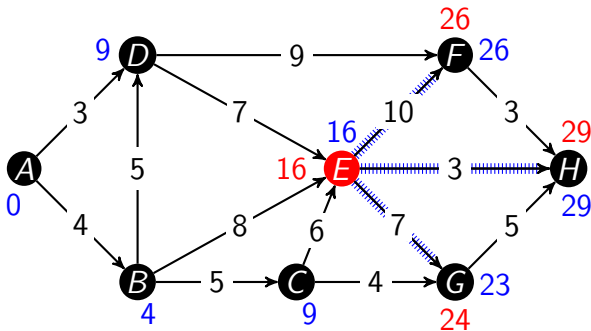


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(E) = \min \{26 - 10, 24 - 7, 29 - 3\} = 16$$

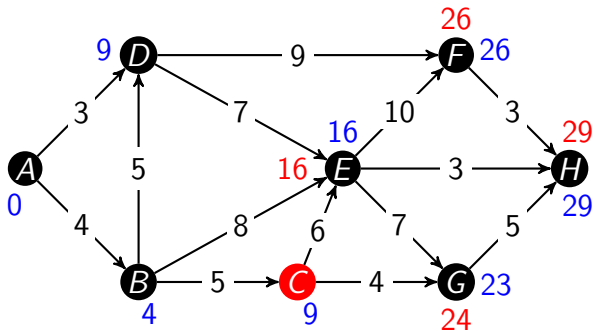


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(C) =$$

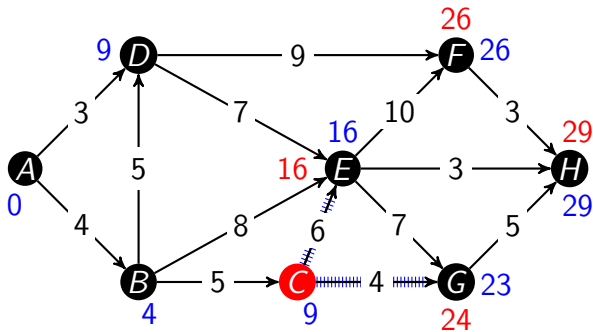


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(C) =$$

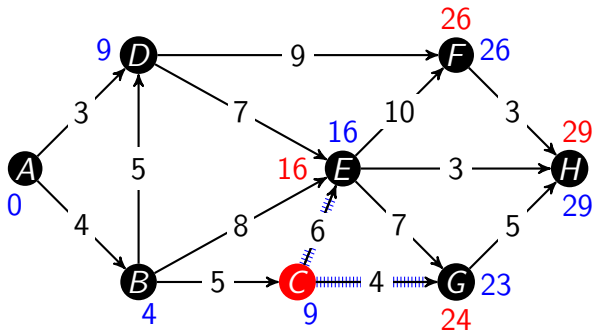


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(C) = \min \{16 - 6,$$

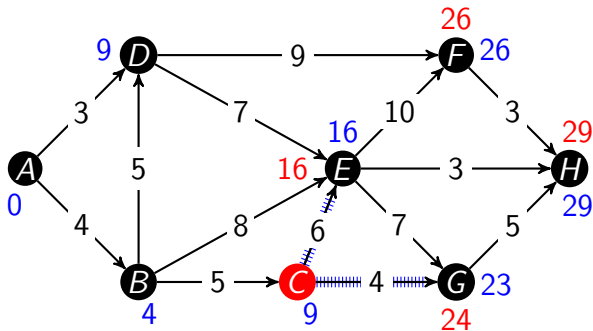


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(C) = \min \{16 - 6, 24 - 4\}$$

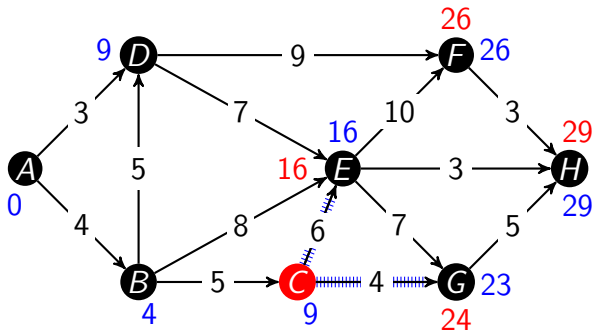


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$					16	26	24	29

A, B, D, C, E, F, G, H



$$K(C) = \min \{16 - 6, 24 - 4\} = 10$$

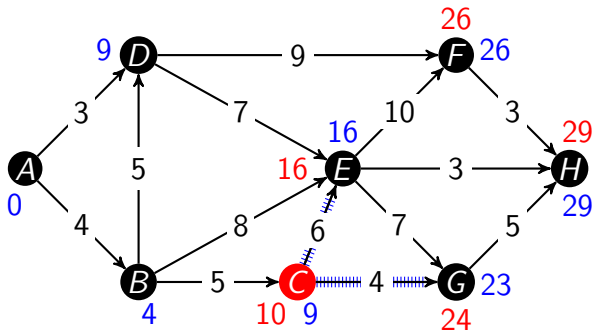


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H



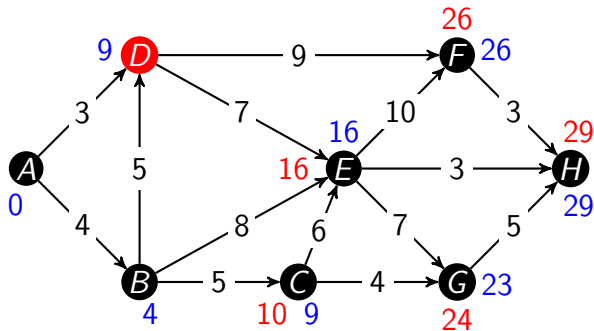
$$K(C) = \min \{16 - 6, 24 - 4\} = 10$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H

$K(D) =$

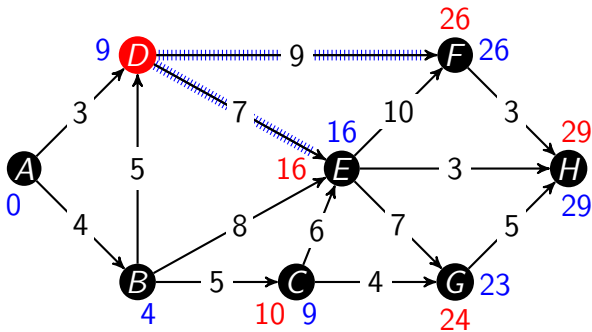


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H



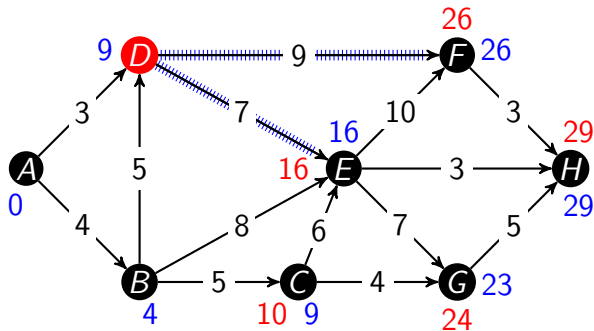
$$K(D) =$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H

$$K(D) = \min \{16 - 7,$$

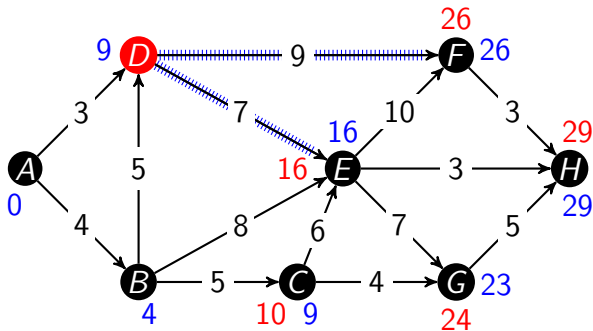


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H



$$K(D) = \min \{16 - 7, 26 - 9\}$$

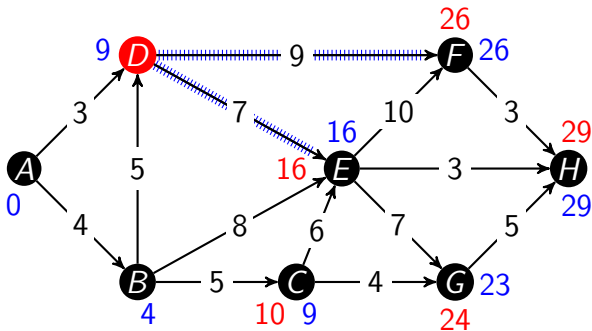


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10		16	26	24	29

A, B, D, C, E, F, G, H



$$K(D) = \min \{16 - 7, 26 - 9\} = 9$$

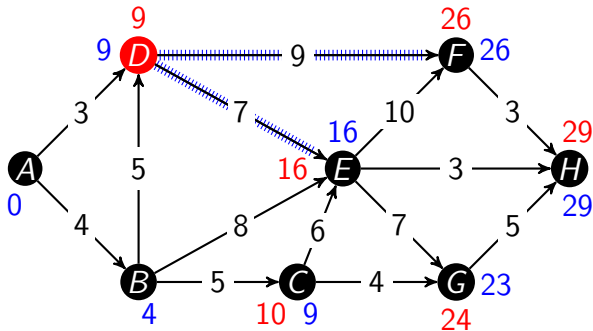


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H



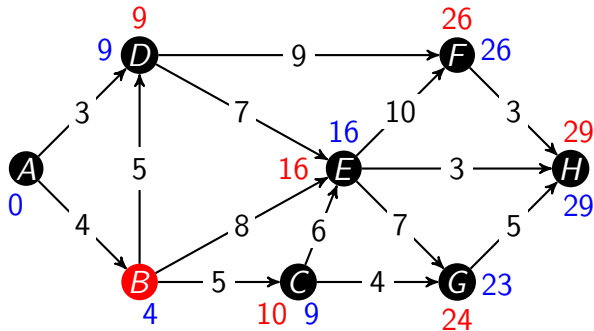
$$K(D) = \min \{16 - 7, 26 - 9\} = 9$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H

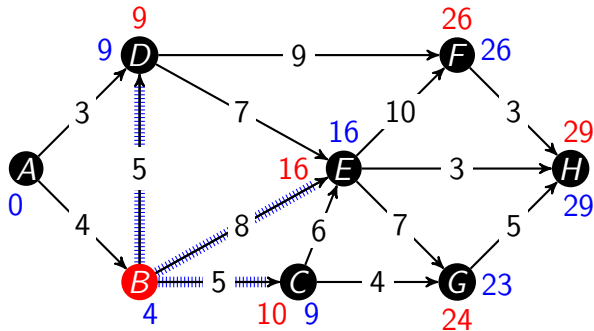
$K(B) =$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H

$K(B) =$

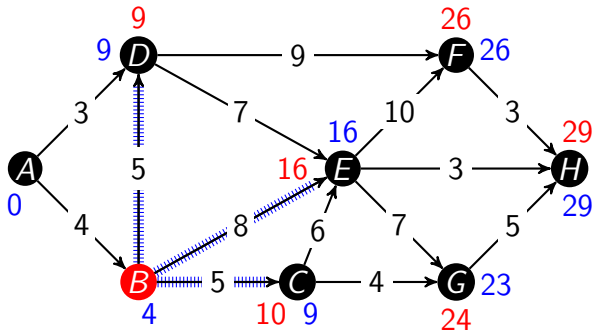


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H



$$K(B) = \min \{10 - 5,$$

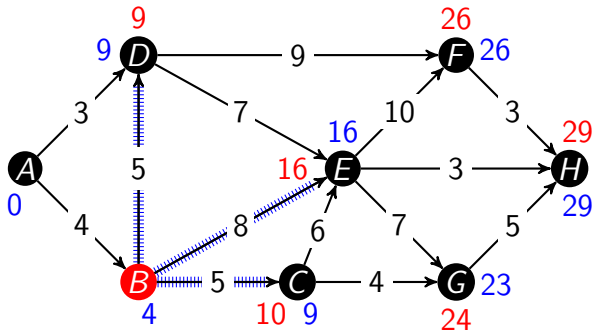


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H



$$K(B) = \min \{10 - 5, 9 - 5,$$

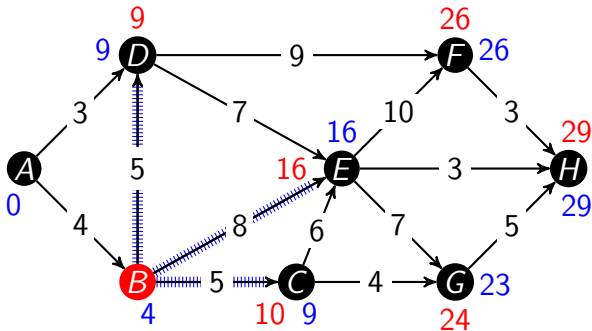


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H



$$K(B) = \min \{10 - 5, 9 - 5, 16 - 8\}$$

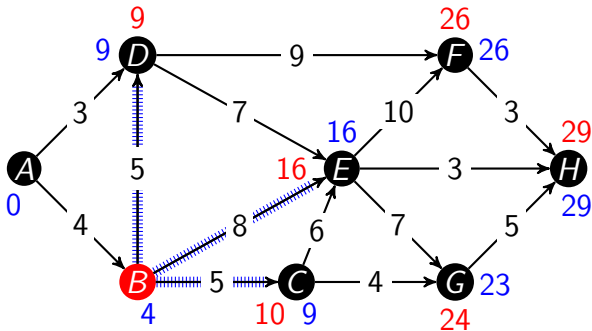


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$			10	9	16	26	24	29

A, B, D, C, E, F, G, H



$$K(B) = \min \{10 - 5, 9 - 5, 16 - 8\} = 4$$

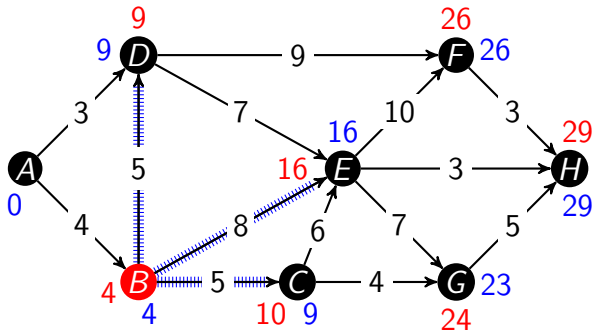


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H



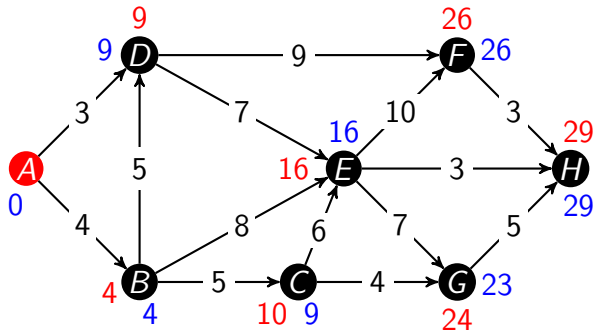
$$K(B) = \min \{10 - 5, 9 - 5, 16 - 8\} = 4$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H

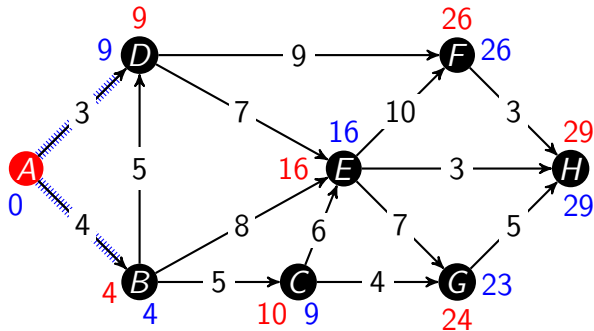
$$K(A) =$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H

$$K(A) =$$

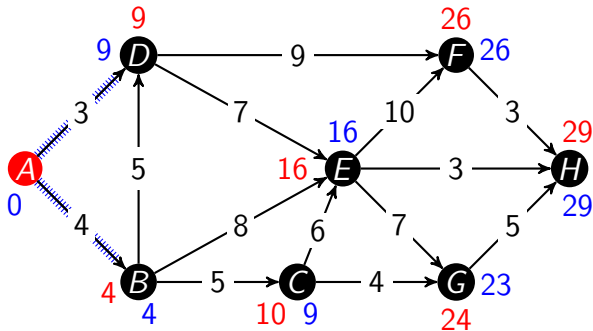


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H



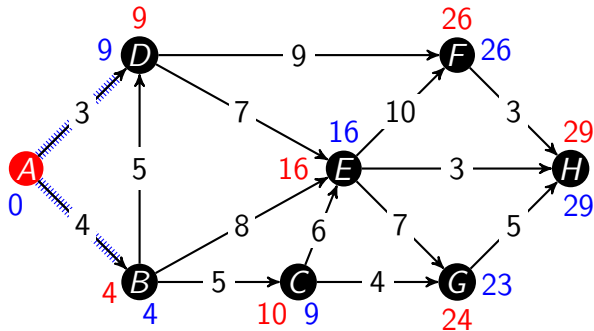
$$K(A) = \min \{4 - 4,$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H

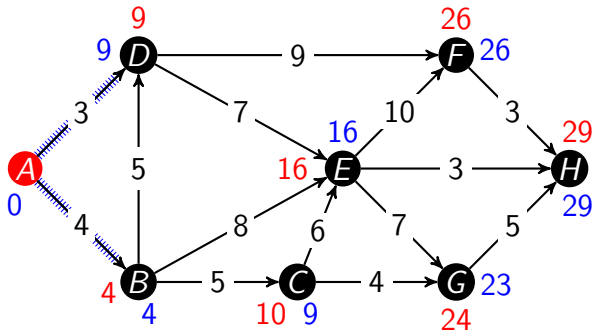
$$K(A) = \min \{4 - 4, 9 - 3\}$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$		4	10	9	16	26	24	29

A, B, D, C, E, F, G, H

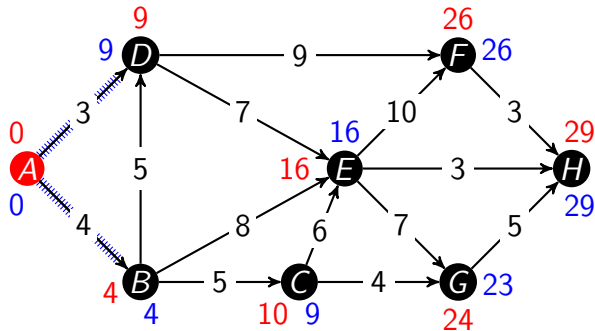
$$K(A) = \min \{4 - 4, 9 - 3\} = 0$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

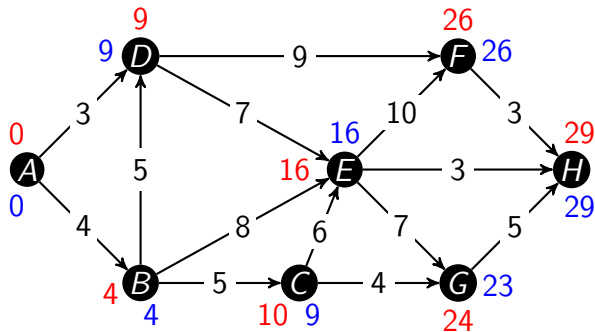
A, B, D, C, E, F, G, H

$$K(A) = \min \{4 - 4, 9 - 3\} = 0$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

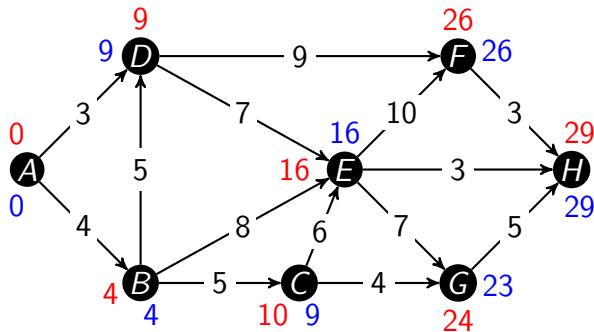
A, B, D, C, E, F, G, H



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost $\mathcal{F}(u, v)$

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$



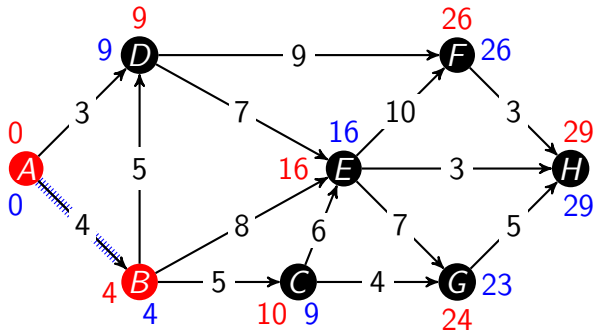
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost $\mathcal{F}(u, v)$

AB

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, B) =$$



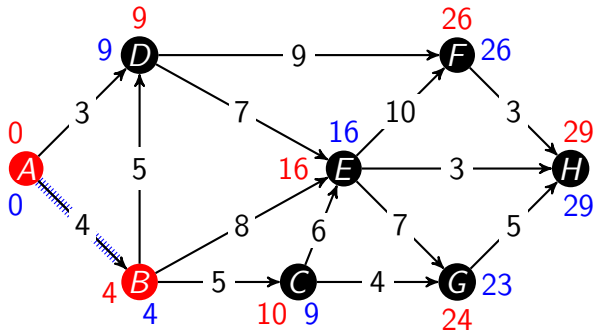
vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost $\mathcal{F}(u, v)$

AB

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, B) = 4 - 0 - 4$$

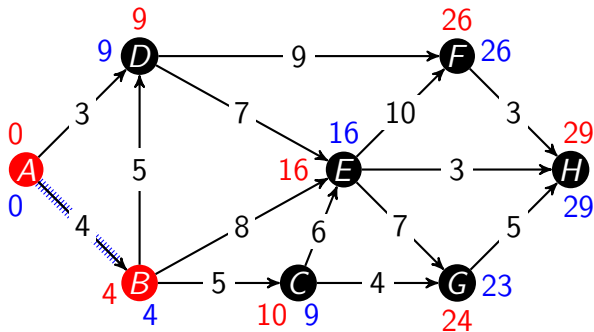


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, B) = 4 - 0 - 4 = 0$$

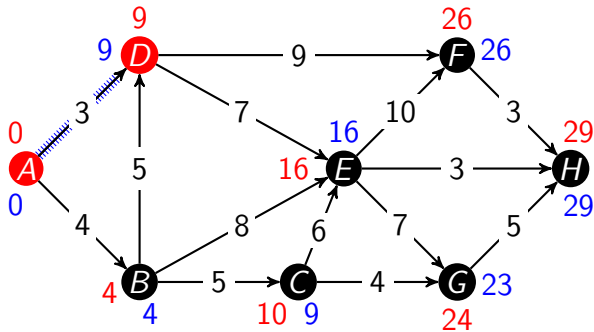


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, D) =$$

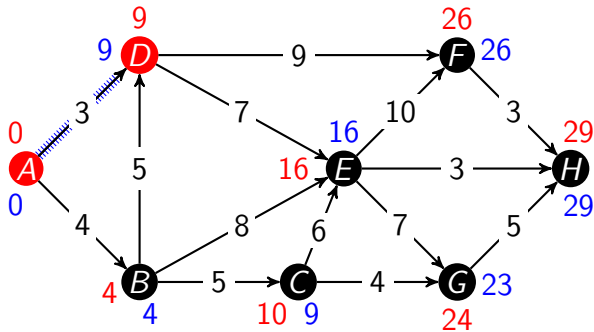


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, D) = 9 - 0 - 3$$

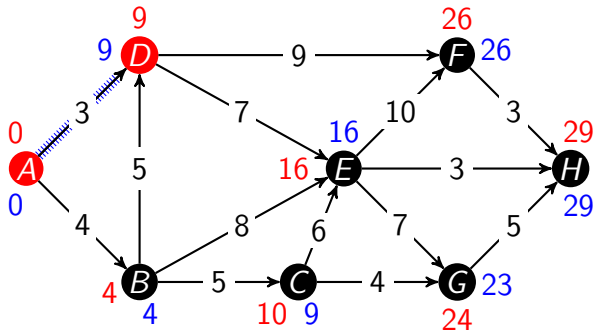


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(A, D) = 9 - 0 - 3 = 6$$

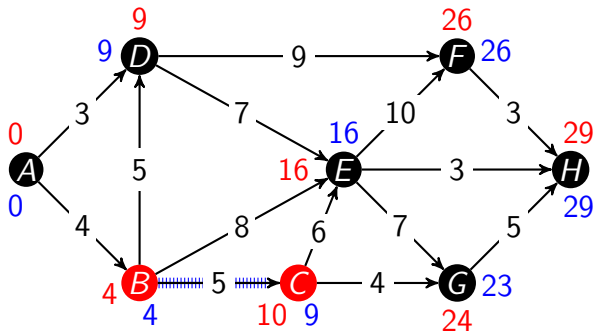


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(B, C) = 10 - 4 - 5$$

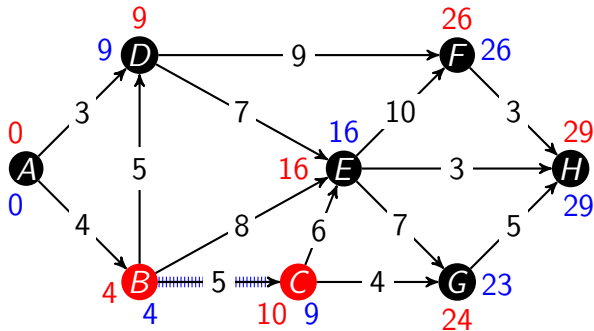


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(B, C) = 10 - 4 - 5 = 1$$

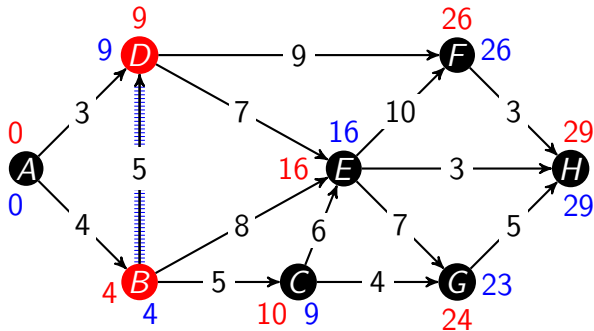


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(B, D) = 9 - 4 - 5$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

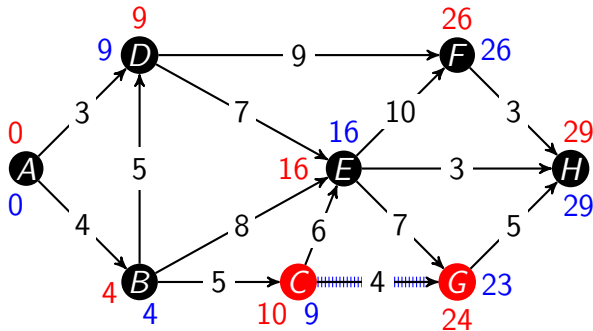
[illegible]

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(C, G) =$$

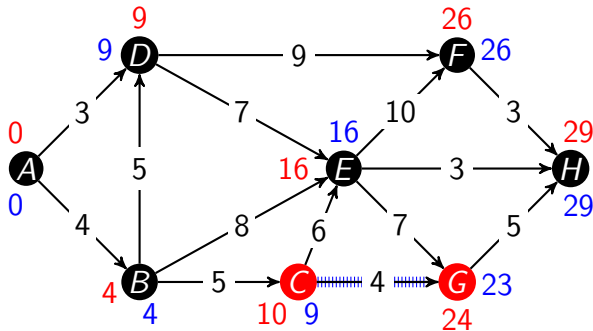


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(C, G) = 24 - 9 - 4$$

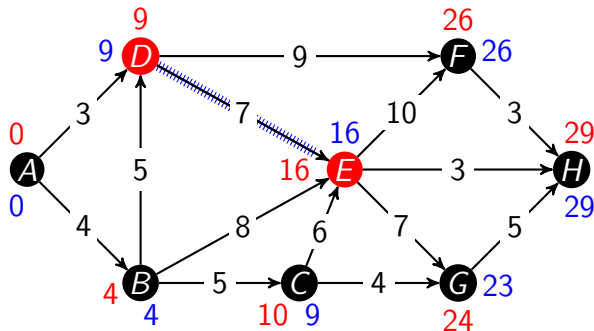


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(D, E) =$$

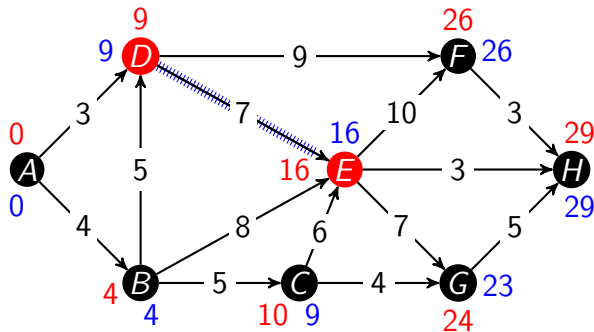


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(D, E) = 16 - 9 - 7$$

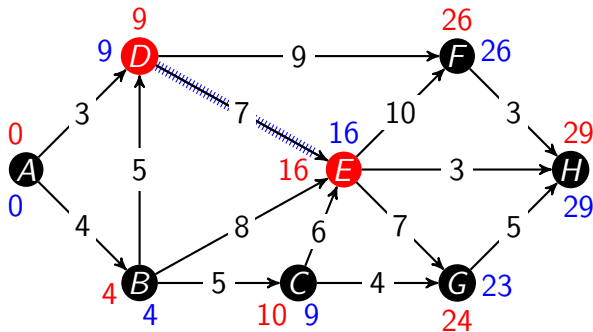


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(D, E) = 16 - 9 - 7 = 0$$

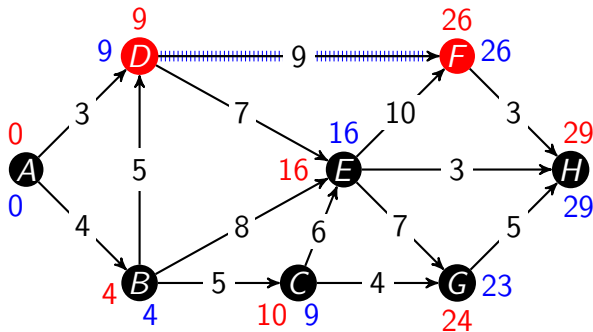


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(D, F) = 26 - 9 - 9$$

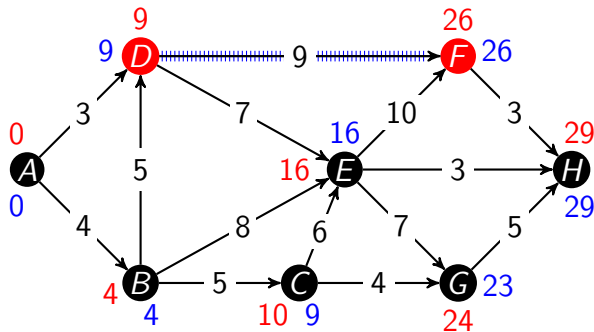


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(D, F) = 26 - 9 - 9 = 8$$

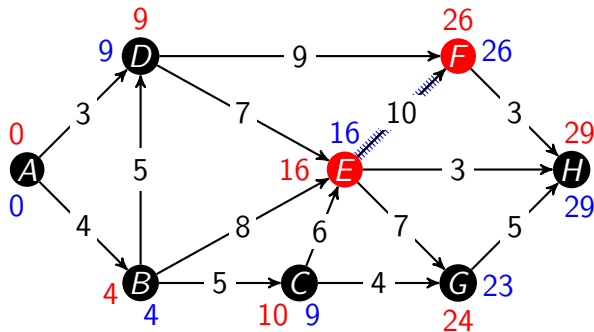


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, F) =$$

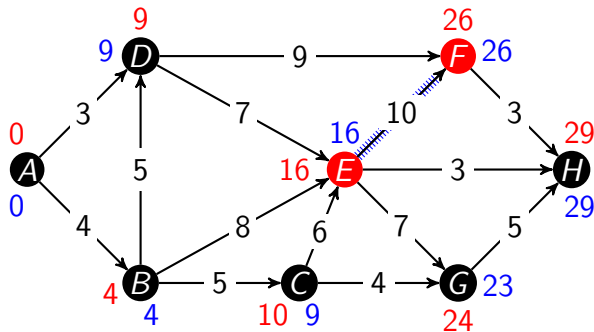


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, F) = 26 - 16 - 10$$

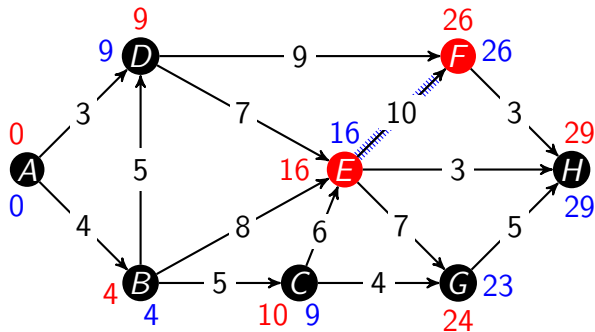


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, F) = 26 - 16 - 10 = 0$$

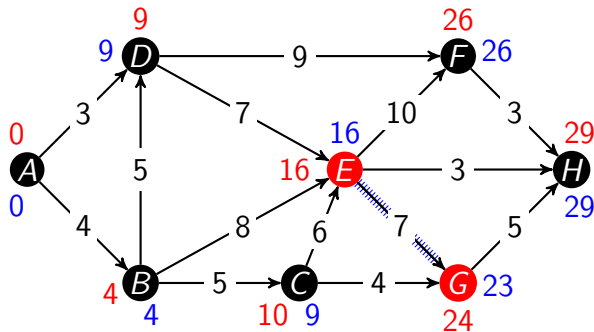


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, G) =$$

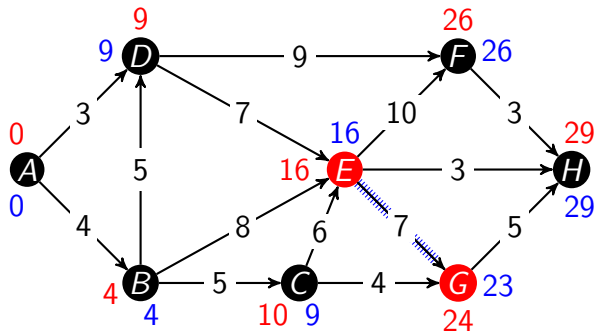


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, G) = 24 - 16 - 7$$

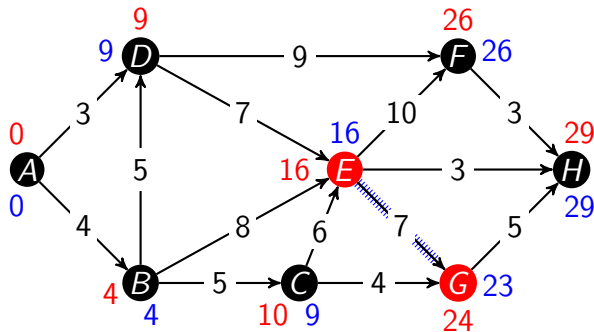


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, G) = 24 - 16 - 7 = 1$$

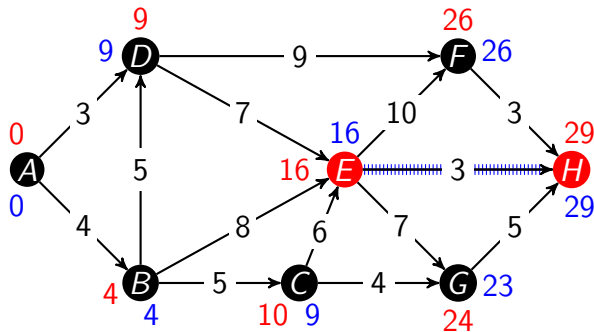


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, H) =$$

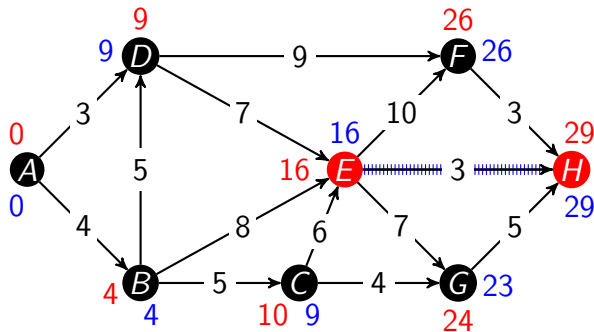


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, H) = 29 - 16 - 3$$

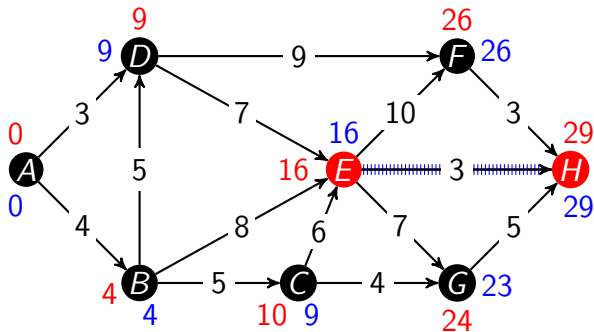


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(E, H) = 29 - 16 - 3 = 10$$

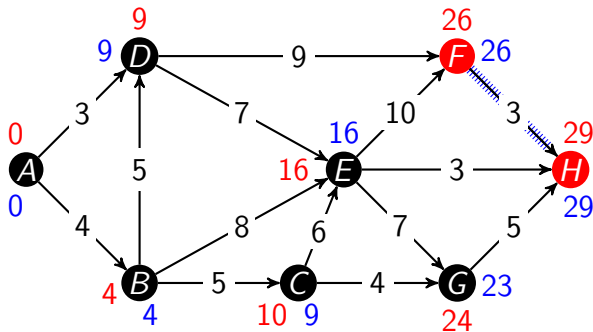


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(F, H) =$$

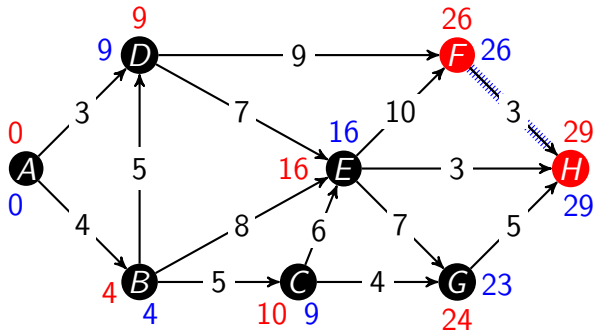


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(F, H) = 29 - 26 - 3$$

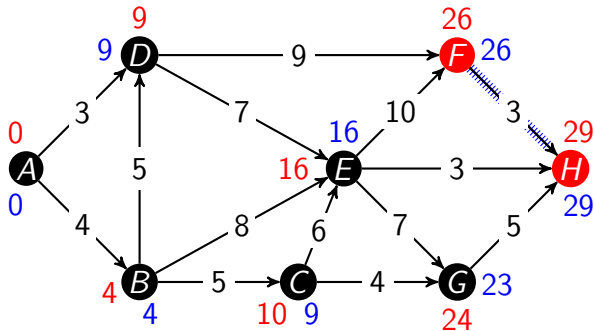


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(F, H) = 29 - 26 - 3 = 0$$

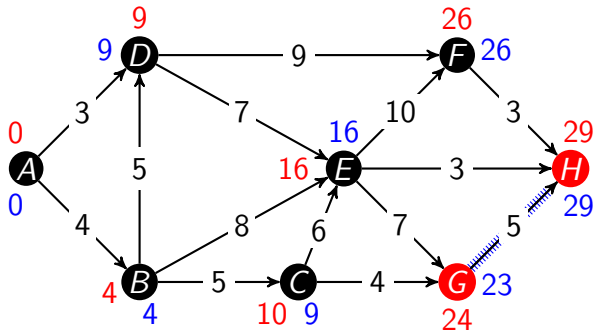


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0
GH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(G, H) =$$

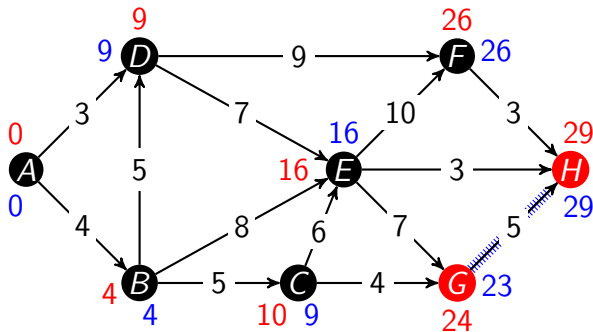


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0
GH	

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

$$\mathcal{F}(G, H) = 29 - 23 - 5$$

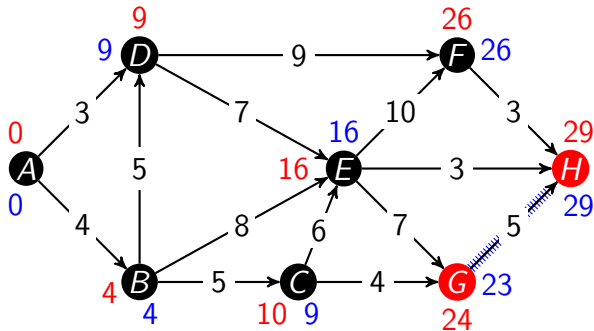


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0
GH	1

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

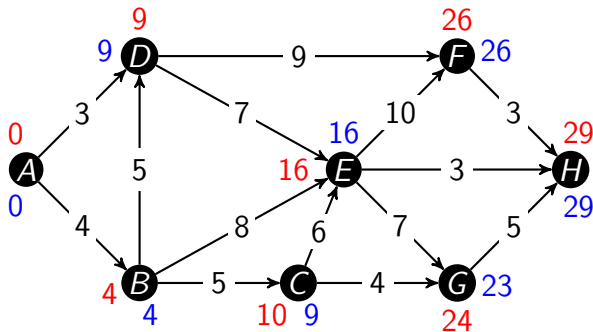
$$\mathcal{F}(G, H) = 29 - 23 - 5 = 1$$



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0
GH	1

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

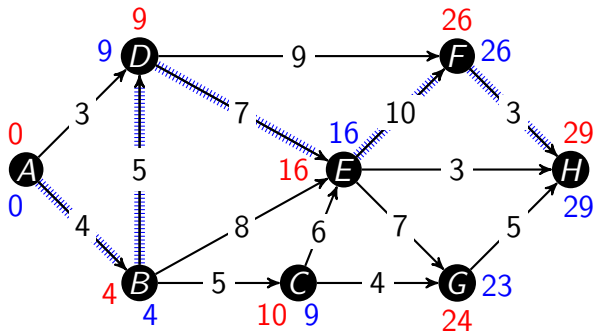


vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29

aktivnost	$\mathcal{F}(u, v)$
AB	0
AD	6
BC	1
BD	0
BE	4
CE	1
CG	11
DE	0
DF	8
EF	0
EG	1
EH	10
FH	0
GH	1

$$\mathcal{F}(u, v) = K(v) - V(u) - w(u, v)$$

Aktivnosti za koje je $\mathcal{F} \neq 0$
smiju se odugovlačiti.



vrh	A	B	C	D	E	F	G	H
$V(v)$	0	4	9	9	16	26	23	29
$K(v)$	0	4	10	9	16	26	24	29