Osnove Podatkovnih Baz

Vaje

Vaje 3

1. naloga

1. $\Pi_{stranka}(\sigma_{operater='Telekom'}(k))$
2. $\Pi_{operater}(\sigma_{stranka='Janez'}(p \bowtie n))$
3. $\Pi_{operater}(\sigma_{stranka='Petra'}(p \bowtie))$
4. $k / \Pi_{operater}(p)$
5. $p / \Pi_{Telekom}(\sigma_{Stranka='Janez'}(n))$
6. $\Pi_{stranka}(\sigma_{opc=1}(\rho_{(StrankaOpc)}(\delta_{stranka}\tau_{count@operater}(k))))$

2. Naloga

1. $\Pi_{Sime,Sprimek}(\sigma_{Skraj='Krasj' \wedge Starost>18}(s))$
2. $\Pi_{Sime,Sprimek}(k \bowtie s)$
3. $\Pi_{Sime,Sprimek}(s) - \Pi_{Sime,Sprimek}(s \bowtie k)$
4. $\Pi_{Sime,Sprimek}(\sigma_{Gtip='nokia'}(p \bowtie k \bowtie g))$
5. $\rho_{GSMa,Kkosov}(_{Gtip}\tau_{SUM\ Kkosov}(k \bowtie g))$

3. Naloga

1. $\Pi_{FNo}(\sigma_{RType=1 \wedge RPrice<80}(\epsilon))$
2. $\Pi_{RNo,RType,RPrice}(\sigma_{HName='Bern'}(r \bowtie h))$
3. $\Pi_{GName,RPrice,RType}(\sigma_{HName='Bern' \wedge BFrom\leq'Today' \wedge BTo\geq'Today'}((b \bowtie h) \bowtie g))$

4. $\Pi_{HName,\,CRNo,\,2(atno)}\left(\rho_{(HName,CRNo,2(atno))}\left(_{HName}\tau_{COUNT\ RNo,\ AVG\ RPrice}(r \bowtie h)\right)\right)$

lahko samo to v tem primeru

5. $\Pi_{RNo,RType,RPrice,HName}\left((r \triangleright (\sigma_{HName='Bernd'}(h))) \bowtie \sigma_{BFrom \leq 'Today' \wedge BTo \geq 'Today'}(b \bowtie g)\right)$

Vaje 4

5.11.24

1. Naloga

1) RA: $\Pi_{sid}(\sigma_{color=red \vee green}(Parts \bowtie Catalog))$

DRR:

$\{<C_s> \mid <C_s, C_p, C_c> \in Catalog \wedge \exists P_p, P_c (<P_p, P_n, P_c> \in Parts \wedge (P_c = 'red' \vee P_c = 'green') \wedge P_p = C_p)\}$

TRR:

$\{X \mid \exists C \in Catalog\ \exists P \in Parts (P.color = 'red' \vee P.color = 'green') \wedge P.pid = C.pid \wedge X.sid = C.sid\}$

2) TRR:

$\{X \mid \exists C \in Catalog\ \exists S \in Suppliers\ \exists P \in Parts ((P.color = 'red' \vee S.addres = 'Koprska cesta 25') \wedge P.pid = C.pid \wedge S.sid = C.sid \wedge X.sid = S.sid)\}$

3) RA: $\Pi_{sid,pid}(Catalog) / \Pi_{pid}(Parts)$

DRR

$\{<C_s> \mid <C_s, C_p, C_c> \in Catalog \wedge \forall P_p (<P_p, P_n, P_c> \in Parts) \wedge C_p = P_p\}$

TRR

$\{X \mid \exists C \in Catalog\ \forall P \in Parts (C.pid = P.pid \wedge X.sid = P.sid)\}$

6) RA: $\rho(R1, Catalog)\ \rho(R2, Catalog)$
$\Pi_{R1.pid}(\sigma_{R1.sid=R2.sid \wedge P1.pid=R2.pid}(R1 \times R2))$

TRR:

$\{X \mid \forall C1 \in Catalog\ \forall C2 \in Catalog (C1.pid = C2.pid \wedge C1.sid \neq C2.sid \wedge X.pid = C1.pid)\}$

DRR:

$\{<C1> | <C_{s1}, C_{p1}, C_{c1}> \in Catalog \wedge \forall C_{s1}, C_{p2} (<C_{s2}, C_{p2}, C_{c2}> \in Catalog) \wedge C_{s1} \neq C_{s2} \wedge C_{p1} = C_{p2}\}$

2. Naloga

3) TRR:

$\{X | \forall A \in Aircraft \; \exists F \in Flights (F.from = 'Paris' \wedge F.to = 'Vancouver' \wedge F.distance < A.cruisingrange \wedge X.aid = A.aid)\}$

4) TRR:

$\{X | \exists E \in Employees \; \exists C1 \in Certified \; \exists A1 \in Aircraft \; (E.eid = C.eid \wedge A1.range > 3000 \wedge C1.aid = A1.aid) \wedge$

$\wedge \neg (\exists A2 \in Aircraft \exists C2 \in Certified (A2.aid = C2.aid \wedge A2.aname = 'BOEING')) \wedge X.ename = E.ename\}$

5) DRR:

$\{<Eid1> | <Eid1, En1, Es1> \in Employees \wedge \neg (\exists Es2 (<Eid2, En2, Es1> \in Employees \wedge Es2 > Es1$

$\{<Eid1> | <Eid1, En1, Es1> \in Employees \wedge \forall (Es2 (<Eid2, En2, Es1> \in Employees \wedge Es2 \leq Es1$

3. Naloga

1) (Stik vseh tabel in preverjamo eno stvar)

2) (Preverjamo 2 stvari)

3)

4) TRR:

$\{X | \forall P \in Pristane \; \exists A \in Letala (P.idTL = A.idTL \wedge X.idLE = P.idLE)\}$

Vaje 5 7.11.24

1. Naloga

1)

Pilot	surname
P.	like 'B%'

2)

airport	country	wname
P.	?'Slovenia'	like '%R_'

3)

aircraft	type	capacity
UNQ.	P.	< 170

4)

pilot	id_pilot	name	surname
	-P	P.	P.

airport	id_airport	country
	- A	'Italy'

flight	id-pilot	id-airport_arrival
	-P	- A

5)

pilot	name	surname	id-airline	
	P.	P.	-I	P. A

airline	id_airline	name
	-I	- A

6.

airline	id_airline
P.	-I

aircraft	id-airline	type
	-I	'NOT'AN-148'

2. Naloga

Tabele:

Emp (eid: integer, ename: string, salary: real)

Works (eid: integer, did: integer)

Dept (did: integer, dname: string, managerid: integer, floornum: integer)

1)

Emp	eid	e name	salary
	10	P.	< 50k

Works	eid	did
	-10	-0

Dept	did	dname	managerid	floornum
	-0			10

2)

Emp	eid	e name	salary
	-MID	P.	

Dept	did	dname	managerid	floornum
	-D1		-MID	-F
	-D2		-MID	-F
	-D3		-MID	-F

Conditions

D1 != D2 AND D2 != D3 AND D1 != D3

3)

Emp	eid	e name	salary
	-M	P.	

Dept	did	dname	managerid	floornum
	-D		G._M	G._F

Conditions

COUNT._D >= 10

4)

Emp	eid	e name	salary
	_E		U._S*1.1

Works	eid	did
	_E	_D

Dept	did	dname	managerid	floornum
	_D	'IGRAČE'		

5)

Emp	eid	e name	salary
	_E	'BOŽIČEK'	

Works	eid	did
	_E	_D

Dept	did	dname	managerid	floornum
	_D	P.A.O.		

6)

Emp	eid	e name	salary
	_E	P.	P.

Works	eid	did
	_E	_D

Dept	did	dname	managerid	floornum
	_D		'IGRAČE'	
	_D		'SLADKARIJE'	

7)

Emp	eid	e name	salary
		P.	<10K
		P.	>100K

8)

Emp	eid	e name	salary
	-B	'BOŽIČEK'	
P.	-E		

Works	eid	did
	-B	-D
	-E	-D

9)

Emp	eid	e name	salary
D.	-E	'BOŽIČEK'	

Works	eid	did
	-E	-D

Dept	did	dname	managerid	floornum
	-D			
			-E	

10)

Emp	eid	e name	salary
	-E	P.	>20K

Works	eid	did
	-E	-D

Dept	did	dname	managerid	floornum
	-D	-N		

Conditions:

-N = 'IGRAČE' OR -N='VIDEU'

11)

Emp	eid	e name	salary
	-E	P.	>-S
	-M		-S

Works	eid	did
	-E	-D

Dept	did	dname	managerid	floornum
	-D		-M	

Conditions:

12)

Emp	eid	e name	salary
	_E2	P.	
	_E3	'JANEZ'	

Works	eid	did
	_E2	_D2
	_E3	_D3

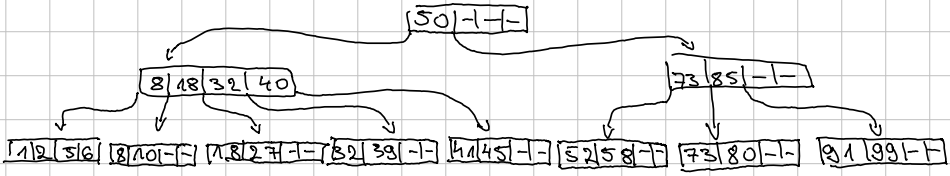
Dept	did	dname	managerid	floornum
	_D2			_F
	_D3			_F

Vaje 6

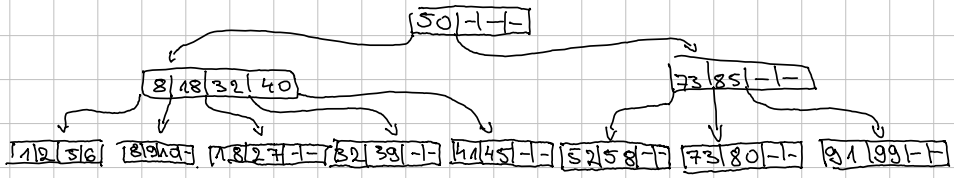
14.11.24

1.

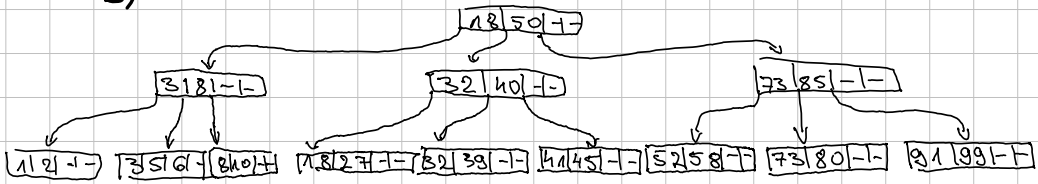
Začetno drevo



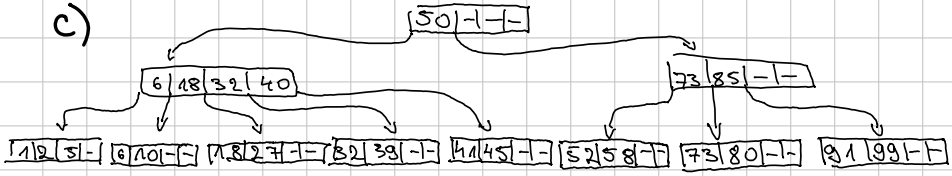
a)



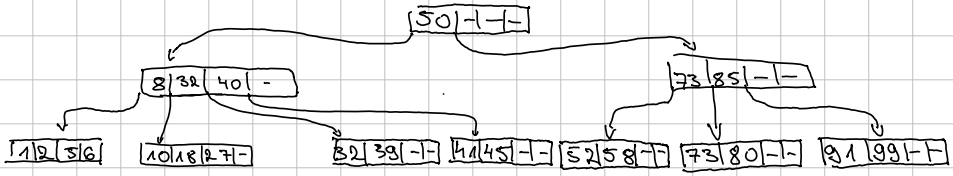
b)



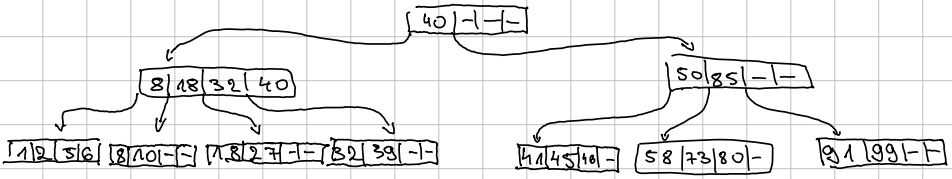
c)


50 | - | - | -
6 | 18 | 32 | 40
73 | 85 | - | -
1 | 2 | 3 | 5 | - | -
6 | 10 | - | -
17 | 18 | 27 | - | -
32 | 39 | - | -
41 | 45 | - | -
52 | 58 | - | -
73 | 80 | - | -
91 | 99 | - | -

d)


50 | - | - | -
8 | 32 | 40 | -
73 | 85 | - | -
1 | 2 | 3 | 6
10 | 18 | 27 | -
32 | 39 | - | -
41 | 45 | - | -
52 | 58 | - | -
73 | 80 | - | -
91 | 99 | - | -

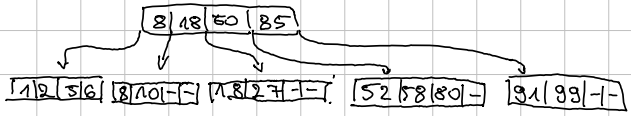
e)


40 | - | - | -
8 | 18 | 32 | 40
50 | 85 | - | -
1 | 2 | 3 | 6
8 | 10 | - | -
17 | 18 | 27 | - | -
32 | 39 | - | -
41 | 45 | 46 | -
58 | 73 | 80 | -
91 | 99 | - | -

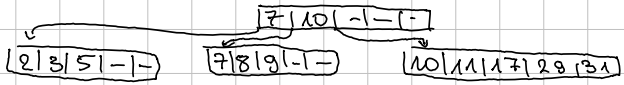
f)


40 | - | - | -
8 | 18 | 32
50 | 73 | - | -
1 | 2 | 3 | 6
8 | 10 | - | -
17 | 18 | 27 | - | -
32 | 39 | - | -
41 | 45 | - | -
52 | 58 | - | -
73 | 80 | 81 | -

g)

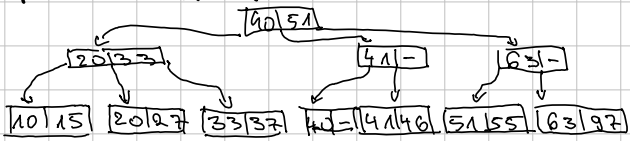

8 | 18 | 50 | 85
1 | 2 | 3 | 6
8 | 10 | - | -
17 | 18 | 27 | - | -
52 | 58 | 80 | -
91 | 99 | - | -

2.

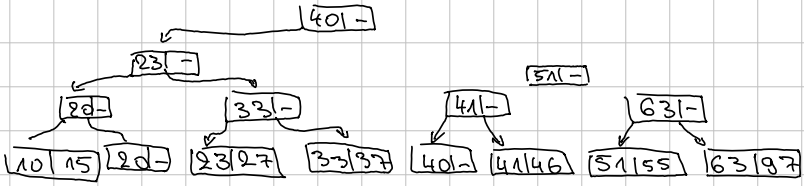

7 | 10 | - | - | -
2 | 3 | 5 | - | -
7 | 8 | 9 | - | -
10 | 11 | 17 | 28 | 31

4.

Po vstavitvi 41

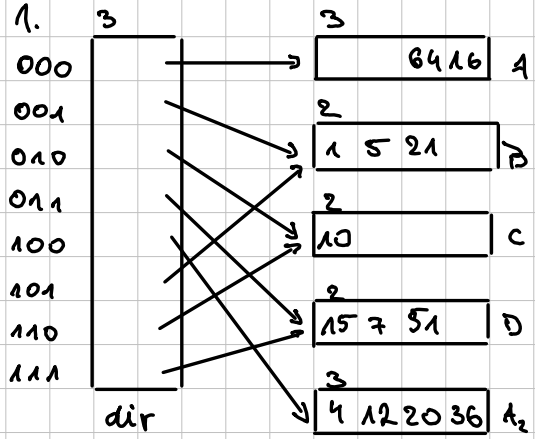


Po vstavitvi 23



Vaje 7 21. 11. 24

1.



68 = 1000100

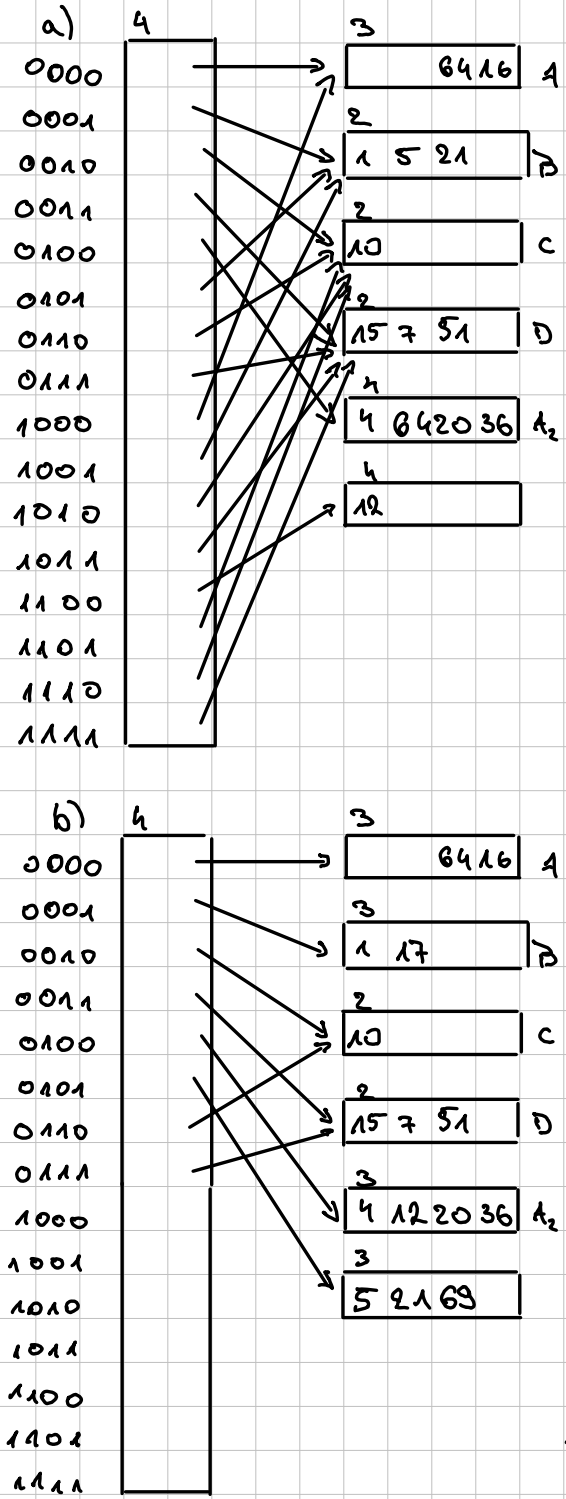
68 % 2^3 = 4

4 = 0100

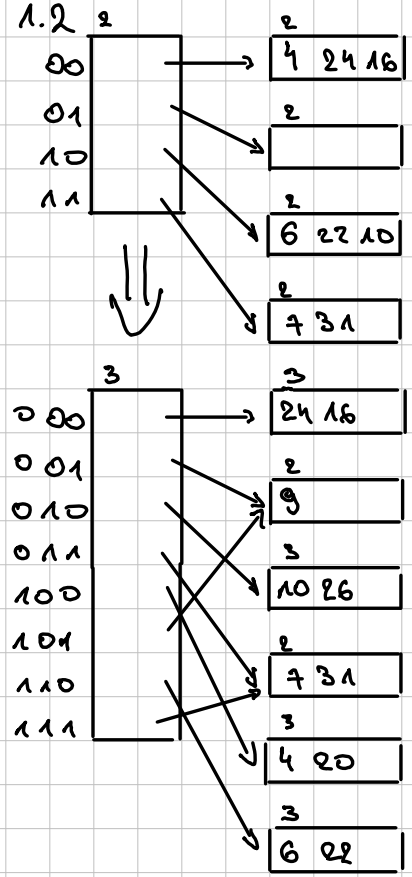
12 = 1100

20 = 10100

36 = 100100


a)
4
3
6416
A
2
1 5 21
B
2
10
C
2
15 7 51
D
4
4 B42036
A2
4
12
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111
b)
4
3
6416
A
3
1 17
B
2
10
C
2
15 7 51
D
3
4 12 20 36
A2
3
5 21 69
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111
c)
4
3
6416
A
2
1 5 2
B
2
10
C
2
15 7 51
D
3
4 12 20 36
A2
0000
0001
0010
0011
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111

1.2



9 = 1001
20 = 10100
26 = 11010

2.1 level=0, N=4

h(0)	Primarie str (Next=0)
00	32 8 4
01	9 25 41
10	14 18 10 30
11	31 35 7 11

⟹

h(1)	h(0)	Primarie str (Next=1)	Prelivate
000	00	32 8	
001	01	9 25 41 17	
010	10	14 18 10 30	
011	11	31 35 7	↔ 19
100	00	4	

2.2

level = 0, N = 4

h(0)	Primarne str
00	32 8 4
01	9 25 41
10	14 18 10
11	31 35

Next = 0

⇒

h(1)	h(0)	Primarne str
000	00	32 8
001	01	9 25 41
010	10	14 18 10
011	11	31 35 7 19
100	00	4

Next = 1

7 = 111

19 = 10011

4 = 100

⇓

h(0)	Primarne str
00	32 8
01	9 25 41
10	14 18 10
11	31 35 7 19

Next = 0

2.3

level = 0, N = 2

h(0)	
0	32 2
1	9 25

Next = 0

⇒

h(1)	h(0)	Primarne	Prelivne
00	0	32	
01	1	9 25 7	⇐ 19
10	0	2	

Next = 1

⇓

h(1)	h(0)	Primarne	Prelivne
00	0	32	
01	1	9 25 17	
10	0	2	
11	1	7 19	

Next = 0

Ker smo podvojili indeks se level poveča za 1 in N se poveča za 2x
level = 1
N = 4

Vaje 8

28.11.24

Indeksi (naloga)

Cd(cid, author, title, abbreviation, year)
400B

1. predpostavka ⇒ Velikost Cd.title → 400B / 5 = 80B = |Cd.title|

2. predpostavka ⇒ Velikost kazalcev (indeksni vpis)
|tid| + |pid| = 16B
(tid: record id, pid: page id)

|Pod.vpis| + |Indeksni vpis| = 80 + 16 = 96B
|PVS| (# pod. vpisov na stran) = 8000B : 96B = 84

|Cd| = 300k zapisov
1. nivo indeksa (listi) ⇒ $\frac{300k}{84}$ = 3572 str.
2. nivo indeksa (voz.) ⇒ $\frac{3572}{84}$ = 43 str.
3. nivo indeksa (koren) ⇒ $\frac{43}{84}$ = 1 str

Končna velikost indeksa: (1. nivo + 2. nivo + 3. nivo) strani = 3616 str.

1.

a)

$\Pi_{Ime,Priimek}$
|
Piloti
40 str

b)

$\Pi_{Ime,Priimek}$
|
$\sigma_{Starost>500}$
|
Piloti
40 str

2.

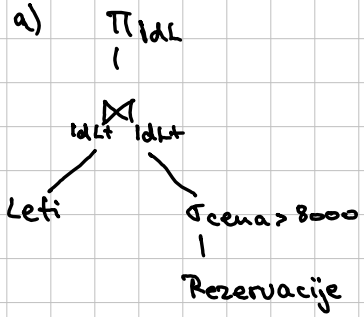
1. predpostavka ⇒ indeks je poveran
2. predpostavka ⇒ drevesni indeks ima 2 nivoja ⇒ uporabi 2 str.

Koliko pilotov ustreza pogoju?
- Skupno št. pilotov ⇒ 10 zapisov/str. · 40 str. = 400 zapisov.
- Koliko pilotov glede na pogoj (100 različnih vrednosti)?
  400 pilotov / 100 raz.vr. = 4 piloti na vsako raz. vrednost.
- Imamo 70 raz.vr. nad 500, ki jih razdelimo med 4.
  70 · 4 = 280
- Pretvorba v str. ⇒ $\frac{280}{10}$ = 28 str.

Končna cena = 2 + 28 = 30 strani

3.

a)



- Preberi Rezervacije ⇒ 30000 str.
- Preberi Leti ⇒ 150 str.
- T_1: #Rezervacij: 50 · 30000 = 1500000 rez.
  - Predpostavimo enakomerno porazdelitev
  - $\frac{\text{št. rezervacij}}{\text{št. raz. rezerv.}} = \frac{1500000}{150}$ = 10000 rezerv.
  - (št. raz. cen > 8000) = 70 · 10000 = 700000
  - št. str. = $\frac{700000}{50}$ = 14000 str ⇒ T_1

Stik z vgnezdeno zanko: (Records per page)

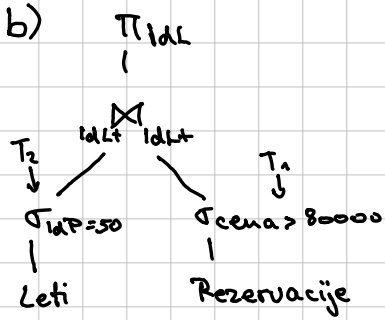
$|Leti| + |Leti| \cdot RPP \cdot |T_1| = 150 + 150 \cdot 20 \cdot 14000 = 42000150$ str.

Skupna cena: 42044800 str

Stik z zlivanjem
- Sort Leti: $2|Leti| \cdot (1 + \log_{(M-1)}(|Leti|/B)) = 2 \cdot 150 \left(1 + \frac{\log(150/10000)}{\log(9999)}\right) = 300(1+0)$
- Sort T_1: $2 \cdot 14000 \cdot \left(1 + \frac{\log(14000/10000)}{\log(9999)}\right) = 28000 \cdot (1+1) = 56000$ str
- Zliv: 150 + 14000 = 14150 str

Skupna cena: 114600 str.

b)

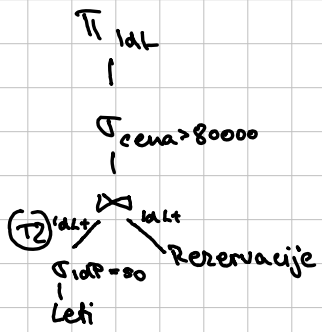


- Preberi Rezervacije ⇒ 30000 str.
- T_1 ⇒ 14000 str.
- Preberi Lete ⇒ 150 str.
- T_2:
  - Št. vseh letov: 20·150 = 3000 zapisov
  - Št. letov/pilota: $\frac{3000}{10 \cdot 40}$ = 7 zapisov
  - Št. strani = $\frac{7}{50}$ = 1 str

Stik z zlivanjem
- Sort T_1 = 56 000 str. (iz a))
- Sort T_2 = 2 · 1 (1+0) = 2 str.
- Merge: $|T_1| + |T_2|$ = 114154 str

5.12.24

4.



- Preberemo lete ⇒ 2 str (zaradi višine T_1)
  - T_2 ⇒ 1 str (3b)
  - Pred stikom rabimo # rezervacij na let
    # vseh rezerv. ⇒ 30 · 30 000 = 1.500.000 rez.
    # vsi leti ⇒ 20 · 150 = 3000 letov
    # rezerv./let ⇒ 1.500.000 / 3000 = 500 rez./let
  - Predpostavimo da imamo poveran indeks ⇒ 500/50 = 10 str.
- Stik z ugnezdeno zanko z indeksom = 7 · (1,1 · 10 str.) = 79 str
  - 7 = št. zapisov letov/pilota; 1,1 = predpostavka, da je indeks 80% zapolnjen
- Med računanjem stika naredimo σ
  - Leva str. ⇒ T_2 ⇒ 1 str.
  - Desna str. ⇒ Leti/Pilote · Rez./Leti = Rez/Pilota = 7 · 500 = 3500
    ⇓
    3500 / 50 zap/str = 70 str.

Skupna cena: 2 + 1 + 79 + 70 + 1 = 153 str.

Vaje 9

2.

- Velikost B+ indeksa na proj. sredstev
  - Pod. vpis ⇒ 16B
  - # Pod. vpis/stran ⇒ $\frac{4000B}{16B} = 250$
  - # str. na nivoju listov $\frac{4000}{250}^{proj.zap.} = 16$ str.
  - Koren ⇒ $\frac{16}{250} = 1$ str.

↳ Velikost ⇒ $(1+16) \cdot 1,5$ zapolnjenost = 26 str

↓

B+ 67% polna

- Selekcija sredstva > 5M
  - Predpostavka: selektivnost 10%
  - Cena selekcije = $((26\text{ str} \cdot \underbrace{40}_{\text{zap. str projek.}}) + \underbrace{4000}_{\text{zap projekt}}) \cdot 0,1 = 504$ zap ⇒ $\frac{504}{40}$ ⇒ 13 str
- Stik z vgnezdeno zanko
  - $13 + 13 \cdot 40 \cdot 25000 = 13\,000\,013$
    (M, M, TRM, N)
- Stik z vgn. zanko po blokih
  - Preverimo pogoj če je B-2 > Rezervacije ⇒ $(1000-2) > 13$
  - $M + N = 13 + 25000 = 25013$ str.

3.

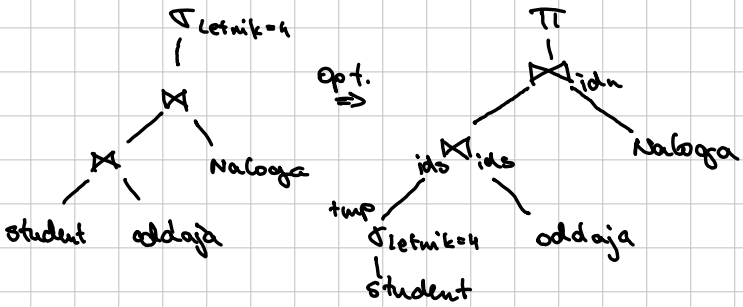
- Na levi (zunanji) str. stika ⇒ 5000 zapisov
- Na desni (notranji) str. stika ⇒ 50000 zapisov
- Predpostavimo, da je povp. # oddaj/student $\frac{50000}{5000} = 10$
  - 10 oddaj/studenta / 130 zap./str. ⇒ 1 str

- Stik z vgnezdeno zanko na indeksu

$145 + 145 \cdot 35 \cdot (1,2+1) = 11310$ str.

(str. Student, zap./str., 80% zapolnjenost)

4.



- Predpostavimo, da imamo razp. indeks na student.letnik
- Predpostavimo, da imamo 4 letnike in enakomerno porazd.
- 5000 stud. / 4 letniki ⇒ 1250 stud
  - 1250 / 35 zap./str. = 36 str ⇒ tmp1
    Kreiranje indeksa na tmp: 1,2 · 0,1 · 36 ⇒ 5 str.
    (1,2: 80% indeks × 10% vseh podatkov)

1. stik z razprš. indeksom ($B > \sqrt{TH} \Leftrightarrow B > \sqrt{36} \Leftrightarrow B > 6$)
   - Predpostavimo, da je $B > 6$
   - $3 \cdot (N + M) = 3 \cdot (36 + 385) = 1263$ str.

- Iz 1. stika preneseno 36 str. / stud. + oddaje na stud.
  385 oddaj / 4 letnik = 97 str.
  - Imamo 133 str. na levi strani 2. stika in 5 str. na desni.

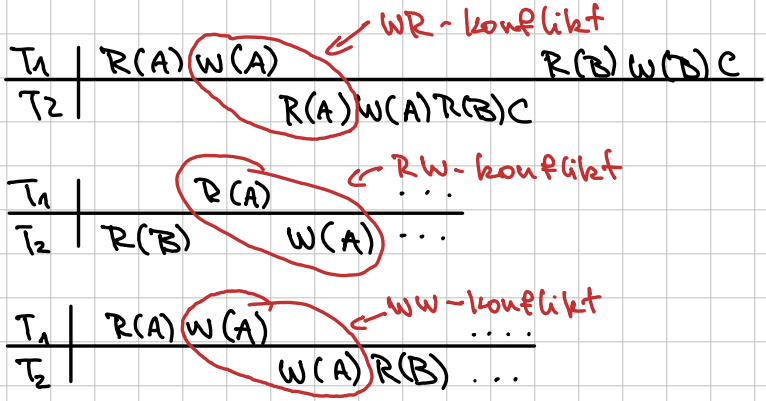
2. stik z razp. indeksom
   - Prej smo predp., da je $B > \sqrt{36}$, torej je tudi večji od $\sqrt{5}$.
     $3(N+M) = 3 \cdot (133 + 5) = 414$

SKUPNA CENA: 36 + 5 + 1263 + 414 = 1718 str.

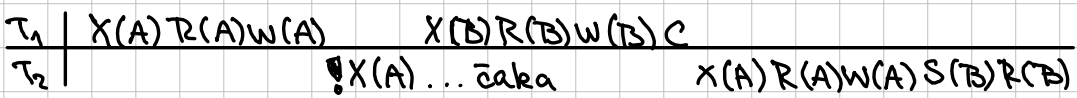
Vaje 10 12.12.24

1.

a)

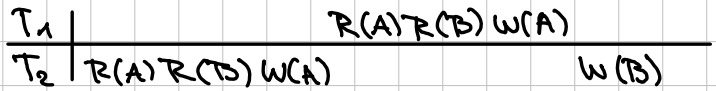


b)

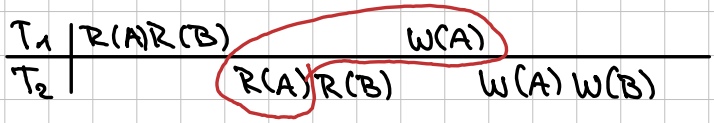


2.

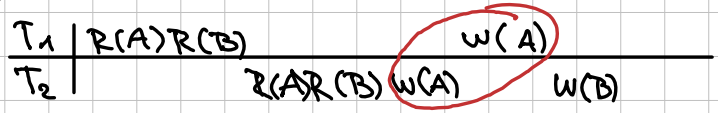
a)



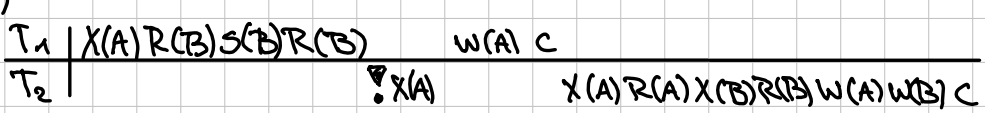
b)



c)



d)



3.

T_1 & T_2 : WW
T_2 & T_3 : $\emptyset$
T_1 & T_3 : WR

4.

a)

1	A	B
start	0	0
$P_B T_1$	0	1
$P_B T_2$	0	1

2	A	B
start	0	0
$P_B T_2$	1	0
$P_B T_1$	1	0

b)

T_1	R(A)	R(B)			'F' W(B)	C
T_2			R(B)	R(A)	'F' W(A)	C

c)

Ne obstaja

5.

$b = \{\}$, $e = \{9,16\}$, $g = \{4,9,16\}$, $h = \{4\}$, $j = \{4,9,16\}$

vaje 11 19.11.2014

1.

a)

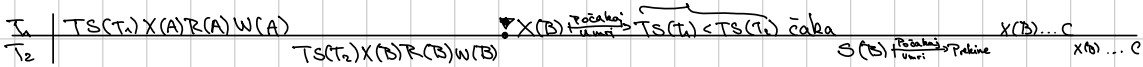
T_1	X(A)	R(A)	W(A)		! X(B)	
T_2				X(B) R(B) W(B)		! S(A)

c)

T_1 ima prednost

T_1	$TS(T_1)$ X(A) R(A) W(A)	! X(B) $\xrightarrow{\text{FRANK}}$ $TS(T_1) < TS(T_2)$		X(B) R(B) W(B)
T_2		$TS(T_2)$ X(B) R(B)	↳ ABORT	→ Restart . . . .

d)



2.

a) S_1 ni konfliktno ekvivalentno nobenemu drugemu razporedu, ker nima $R_2(C)$

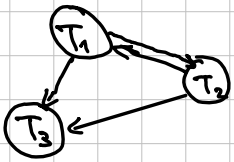
S_2 & S_3: Nista K.E.

S_3 & S_4: Nista K.E.

S_2 & S_4: Nista K.E.

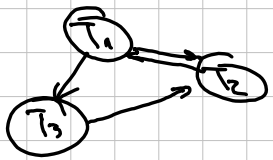
b)

S_1:



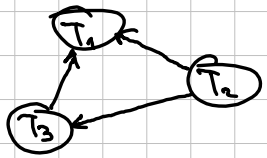
Cikel ⇒ Ni konf. uredljiv.

S_2:



Cikel ⇒ Ni konf. uredljiv.

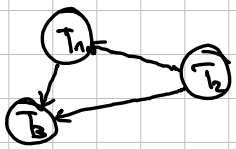
S_3:



Ni cikla ⇒ Je konf. uredljiv.

Vrnik izvajanja ⇒ $T_2 \rightarrow T_3 \rightarrow T_1$

S_4:



Ni cikla ⇒ Je konf. uredljiv.

Vrnik izvajanja ⇒ $T_2 \rightarrow T_1 \rightarrow T_3$

3.

a)

T_1	S(A) R(A)		! X(B) ...	
T_2		S(B) R(B)		! X(A)

b)

T_1	S(A) X(B) R(A)		R(B) 'IF' W(B) C	
T_2		! S(B) ...		S(B) X(A) R(B) R(A) 'IF' W(A) C

c)

T_1	TS(T_1) S(A) R(A)	! X(B) zavrni čaka → T_1 ima predkost		X(B) R(B) 'IF' W(B) C
T_2		TS(T_2) S(B) R(B)	Prekine	Restart S(B) R(B) X(A) R(A) ... C

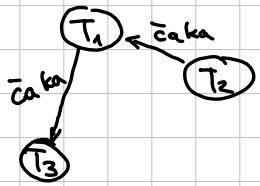
4.

a)

T_1	TS(T_1) S(A) R(A)		! X(B) Počaka → T_1 ima predkost... čaka	X(B) W(B) C
T_2		TS(T_2) ! X(A) Prekine → T_2 umre		Restart ....
T_3			TS(T_3) X(B) W(B)	C

b)

T_1	S(A) R(A)		! X(B)	X(B) W(B) C
T_2		! X(A)		X(A) W(A) X(B) W(B)
T_3		X(B)	C	



Ni cikla

5.