

'D 3/IN-IC CONO NOEP

RM

ES1 (A, B)

ES2 (C, D)

ES3 (E, F)

ES4 (H, I)

R1 (A, C)

R2 (C, E)

R3 (E, H)

(1) N (1)

Interface ES1 (key A) {

Attribute string A;

Attribute string B;

Relationship SET<ES2> R11

Inverse ES2:: R12

};

(2)

Interface ES2 (key C) {

Attribute string C;

Attribute string D;

Relationship SET<ES3> R21

Inverse ES3:: R22

Relationship SET<ES1> R12

Inverse ES2:: R11

};

Interface ES4 (key H) {

Attribute string H;

Attribute string I;

Relationship SET<ES3> R32

Inverse ES3:: R31

};

Interface ES3 (key E) {

Attribute string E;

Attribute string F;

Relationship SET<ES4> R31

Inverse ES4:: R32

Relationship SET<ES2> R22

Inverse ES2:: R21

};

①
ES1 (A, B, C)

ES2 (C, D, E)

ES3 (E, F, H)

ES4 (H, I, E)

②
ES1 (A, B, C)

ES2 (C, D, E)

ES3 (E, F)

ES4 (H, I, E)

(3)

A	B	C	D	E
1	2	3	1	1
2	1	4	5	1
1	3	3	1	1
2	2	4	5	1
3	2	2	1	1

≡

FD's: $A \rightarrow C$, $A \rightarrow D$, $A \rightarrow E$, $B \rightarrow C$

(1)

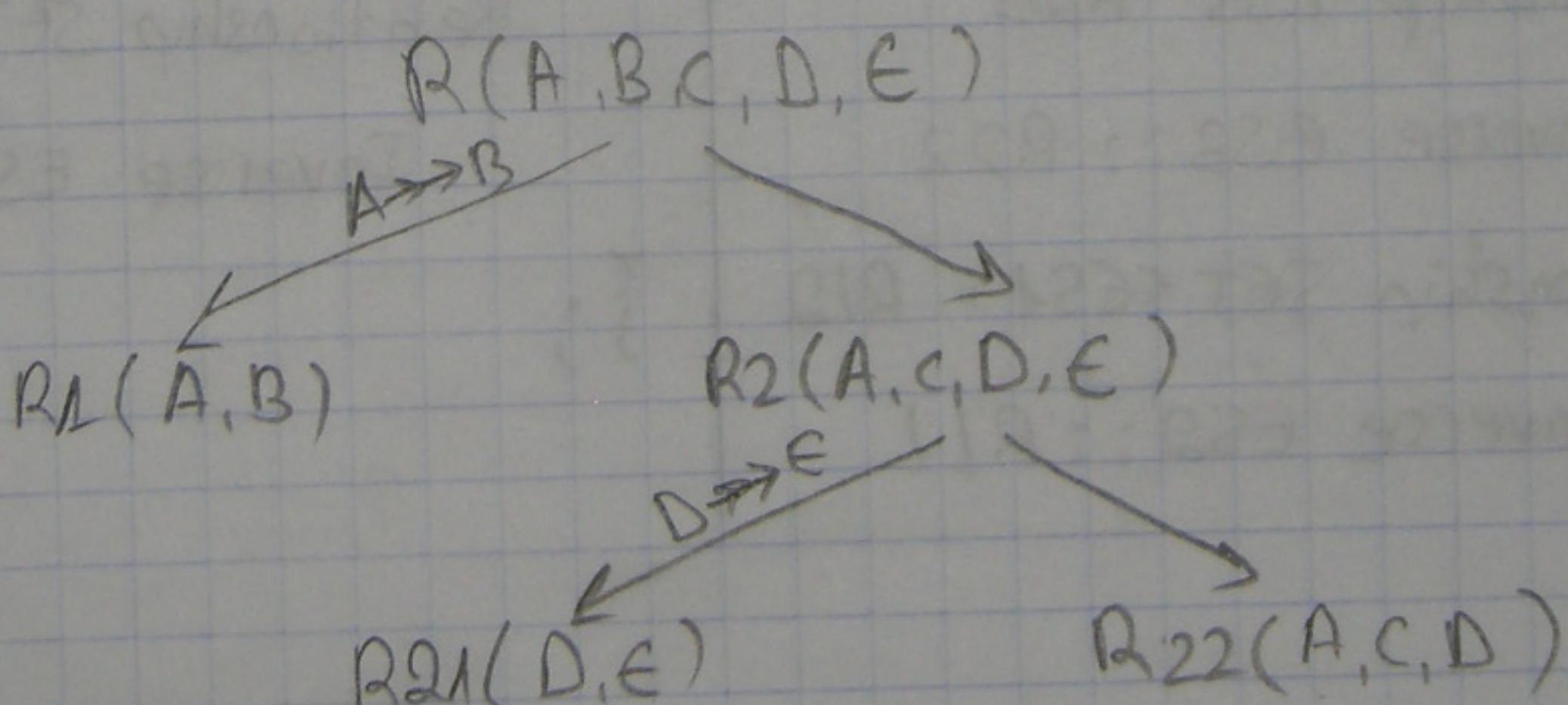
$C \rightarrow A$, $D \rightarrow E$, $C \rightarrow E$, $C \rightarrow D$

Keys: (A, B), (B, C)

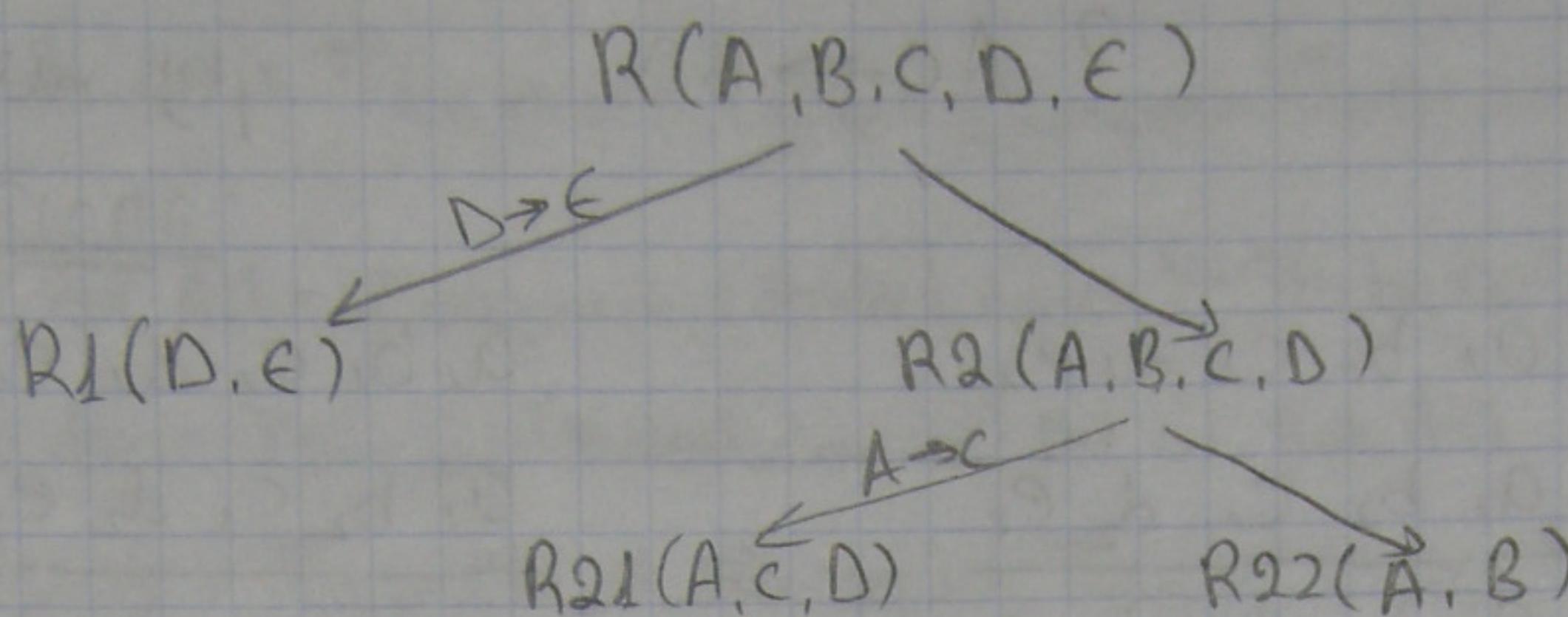
$ACD \Rightarrow B$, $AC \Rightarrow B$, : FD's & the MD's

$A \Rightarrow B$, $C \Rightarrow B$,

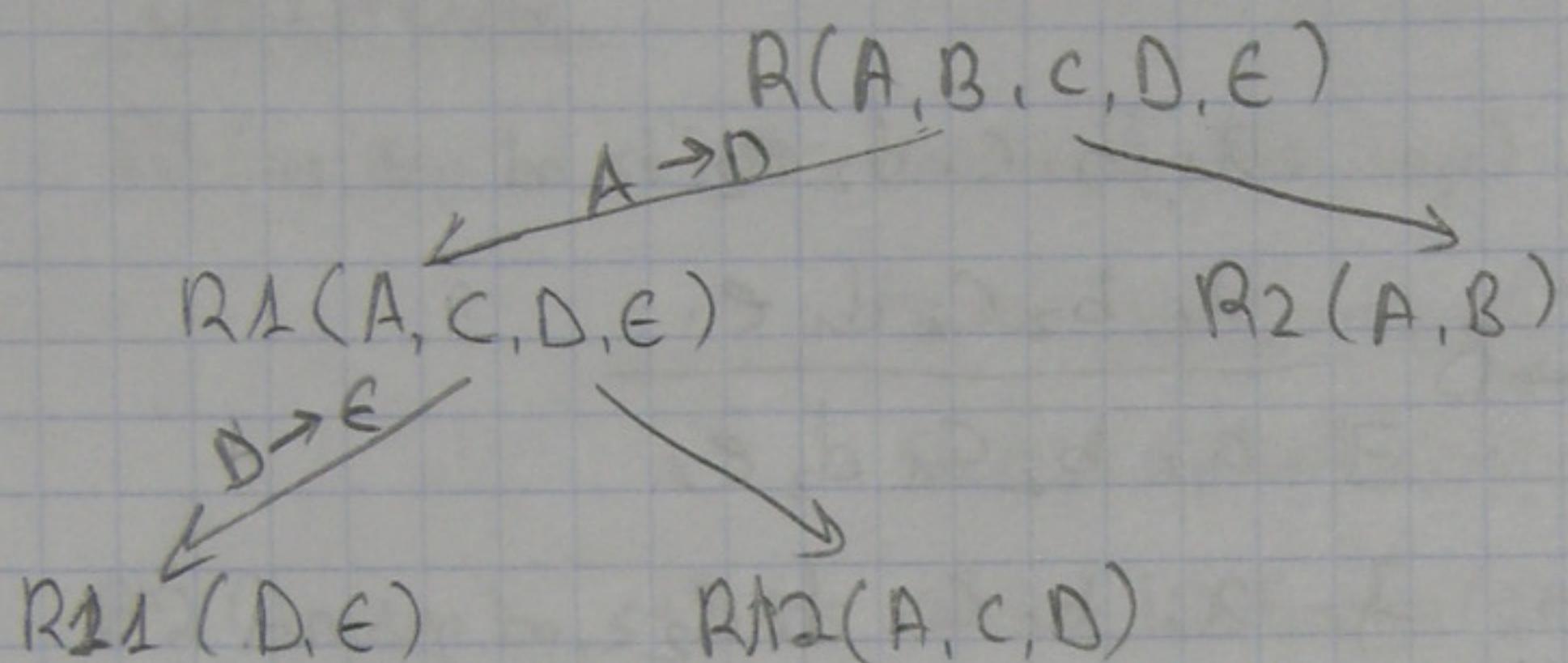
Normal form, 1NF (2)



BCNF \rightarrow 1.8 R (3)



3NF \rightarrow 1.8 R (4)



A	B	C	D
1	2	4	1
2	3	5	2
1	2	4	3
2	3	5	4

(1) ?

$C \rightarrow B$ r2) $A \rightarrow B$ 1.1) (2)

? $AC \rightarrow B$ 1.1) 1.1)

לעכלה

$a_1 b_1 c_1 d_1$

$a_1 b_1 c_1 d_1$

$$A \rightarrow B \quad \frac{a_1 b_1 c_1 d_1}{\exists a_1 b_1 c_1 d_2} \leftarrow \frac{a_1 b_2 c_1 d_2}{\exists a_1 b_1 c_1 d_2} \text{ ס"ז}$$

$\exists a_1 b_2 c_1 d_1 \quad \exists a_1 b_2 c_1 d_1$

S.l.N

לעכלה: 1.001) ס"ז

$A \rightarrow B \Rightarrow AC \rightarrow BC \Rightarrow AC \rightarrow B$

- trivial rule

$C \rightarrow D$ (2) $A \rightarrow B$ (1) (3)

? $AC \rightarrow BD$ (12) (3)

תrac

$a_1 b_1 c_1 d_1 e_1$

$a_1 b_1 c_1 d_1 e_1$

$$\begin{array}{c} A \rightarrow B \\ \frac{a_1 b_2 c_1 d_2 e_2}{\exists a_1 b_1 c_1 d_2 e_2} \end{array} \Leftarrow \begin{array}{c} a_1 b_2 c_1 d_2 e_2 \\ \exists a_1 b_1 c_1 d_1 e_2 \text{ (3)} \\ \exists a_1 b_2 c_1 d_2 e_1 \end{array}$$

$a_1 b_1 c_1 d_2 e_2'$

$$\begin{array}{c} C \rightarrow D \\ \frac{a_1 b_2 c_1 d_1 e_1}{\exists a_1 b_2 c_1 d_2 e_1} \end{array} \quad \begin{array}{c} \exists a_1 b_1 c_1 d_1 e_2 \end{array}$$

RA

N (2)

infC pg, rbo
onf f 200 St-b-co = $\Pi_{S-B.studID, S-B.bID, B-D-C.course} (\cup_{bID=rbID} (Student_Books \times Books_Dep_Courses))$

infC pg, rbo
onf f 200 St-Not-All = $\Pi_{S-ID, course} (Student_course) - St-b-co$

St-dep = $\Pi_{S-ID, dep} (Student_Courses) \bowtie St-Not-All$

Answer = $\Pi_{dep} (Student_course) - \Pi_{dep} (St-dep)$

DATALOG

I

R1(un, dep, bo, st) \leftarrow University(un, dep) AND
Books-Dep-Courses(-, dep, bo) AND
Store_Lib_Books(st, -, -, -)

R2(un, dep, bo, st) \leftarrow Store_Lib_Books(st, un, bo, -) AND
Books-Dep-courses(-, dep, bo)

R3(st, un) \leftarrow R1(un, dep, bo, st) AND NOT
R2(un, dep, bo, st)

R4(st, un) \leftarrow Store_Lib_Books(st, -, -, -) AND University(un, -)

R5(store) \leftarrow R4(store, un) AND NOT R3(store, un)

$\text{un_rec_book} = \Pi_{\text{uID}, \text{dep}, \text{rbID}} (\text{University} \bowtie \text{Books_Dep_Courses})$ \equiv
 $\rho_3 \sqcap \text{NIN} \rho_7 \sqcap \text{O1} \wedge \rho_7 \sqcap \text{N2} \wedge \text{C0} \sqcap \text{Y1}^k$

$\text{Lib_un_book} = \Pi_{\text{uID}, \text{dep}, \text{rbID}} (\text{Lib_of_univ_Books} \bowtie \text{rbID} = \text{bID} \text{ AND } \text{num} \geq 10)$
 $\text{Books_Dep_Courses})$

$\text{Lib_Not_All} = \Pi_{\text{uID}} (\text{un_rec_book} - \text{Lib_un_book})$

$\text{Lib_Not_All} = \emptyset$

N/B

```
SELECT studID, COUNT(bID) AS b, course
FROM student-course SC, Student-book SB
WHERE studID = STID
AND bID IN (SELECT rbID
              FROM Books-Dep-Course
              WHERE sc.dep = dep
              AND sc.course = conum)
GROUP BY studID, course
```

```
SELECT studID
FROM student-course
MINUS
SELECT studID
FROM ①, (SELECT course, MAX(b)
          FROM ①
          GROUP BY course) T
WHERE l.b < T.b AND l.course = T.course
```

R
update Lib_of_univ_books L

SET lnum =
(SELECT AVG(lnum)
FROM Lib_of_univ_books
WHERE bID IN (SELECT rbID
FROM Books_Dep_Courses
WHERE conum = (SELECT conum
FROM Books_Dep_Courses
WHERE L.bID=rbID)))

WHERE lnum=0
AND bID IN (SELECT rbID
FROM Books_Dep_Courses)

```
<!DOCTYPE doc [  
<!ELEMENT doc (#PCDATA, sub1+)>  
<!ELEMENT sub1 (#PCDATA, sub2+)>  
<!ELEMENT sub2 (#PCDATA, sub3?)>  
<!ELEMENT sub3 (#PCDATA, sub4)>  
<!ELEMENT sub4 EMPTY>  
<!ATTLIST sub1 par1 CDATA #IMPLIED>  
<!ATTLIST sub4 par2 CDATA #REQUIRED>  
]>
```

4

/doc//sub2/following::*

(1)

```
<sub2> How are you? </sub2>  
<sub2> Where? </sub2>  
<sub1>  
<sub2> What is this? </sub2>  
</sub1>  
<sub2> What is this? </sub2>  
<sub2> Where? </sub2>  
<sub1>  
<sub2> What is this? </sub2>  
</sub1>  
<sub2> Where? </sub2>
```

//ancestor::sub2

(2)

```
<sub3> And this?  
<sub4 par2="Hello 2"/>  
</sub3>  
<sub4 par2="Hello 2"/>
```

$$0.9 = \underline{\underline{0.9}}$$

(5)

Insert 1001, 0011

0 - Null

1 -	<table border="1"> <tr><td>0011</td></tr> <tr><td>1001</td></tr> </table>	0011	1001
0011			
1001			

Insert 0111

0 - Null

1 -	<table border="1"> <tr><td>0011</td></tr> <tr><td>1001</td></tr> </table>	0011	1001	<table border="1"> <tr><td>0111</td></tr> <tr><td></td></tr> </table>	0111	
0011						
1001						
0111						

\Rightarrow

$$\left[\begin{array}{l} r=2, n=2, b=2 \\ \frac{3}{2} = 0.75 < 0.9 \\ \text{over float 0.325} \end{array} \right]$$

Insert 1111

0 - Null

1 -	<table border="1"> <tr><td>1001</td></tr> <tr><td>0011</td></tr> </table>	1001	0011	<table border="1"> <tr><td>1111</td></tr> <tr><td>1111</td></tr> </table>	1111	1111
1001						
0011						
1111						
1111						

Insert 1100, 1110

0 -	<table border="1"> <tr><td>1100</td></tr> <tr><td>1110</td></tr> </table>	1100	1110
1100			
1110			

1 -	<table border="1"> <tr><td>1001</td></tr> <tr><td>0011</td></tr> </table>	1001	0011	<table border="1"> <tr><td>0111</td></tr> <tr><td>1111</td></tr> </table>	0111	1111
1001						
0011						
0111						
1111						

Insert 1011

00 -	<table border="1"> <tr><td>1100</td></tr> <tr><td></td></tr> </table>	1100	
1100			

01 -	<table border="1"> <tr><td>1001</td></tr> <tr><td>0011</td></tr> </table>	1001	0011	<table border="1"> <tr><td>0111</td></tr> <tr><td>1111</td></tr> </table>	0111	1111
1001						
0011						
0111						
1111						

10 -	<table border="1"> <tr><td>1110</td></tr> <tr><td></td></tr> </table>	1110	
1110			

$$\left[\begin{array}{l} r=6, n=2, b=2 \end{array} \right]$$

$$\frac{7}{2} > 0.9$$

bucket overflow

00 -	<table border="1"> <tr><td>1100</td></tr> <tr><td>1000</td></tr> </table>	1100	1000
1100			
1000			

01 -	<table border="1"> <tr><td>1001</td></tr> <tr><td></td></tr> </table>	1001	
1001			

10 -	<table border="1"> <tr><td>1110</td></tr> <tr><td></td></tr> </table>	1110	
1110			

11 -	<table border="1"> <tr><td>0011</td></tr> <tr><td>1011</td></tr> </table>	0011	1011	<table border="1"> <tr><td>0111</td></tr> <tr><td>1111</td></tr> </table>	0111	1111
0011						
1011						
0111						
1111						

Insert 1000

$$\left[\begin{array}{l} r=6, n=3, b=2 \end{array} \right]$$

$$\frac{7}{3} > 0.9$$

bucket overflow

11 - index p/c
10 - 10.1c
10.1c - 10.1c
11 - 11.1c
11.1c - 11.1c
11.1c - 11.1c

84100