Q1

(1) ={C} , Jso C

(2) F’={ A→B, A→C, E→A, E→D, BD→E, CE→D, CE→H, H→G, EI→J }

BD→E,, Hence, BD→E cannot be replaced by B→ E

, Hence, BD→E cannot be replaced by D→ E

so BD→E cannot be replaced

CE→D, , Hence, CE→D cannot be replaced by C→D

, Hence, CE→D can be replaced by E→D

CE→H, , Hence, CE→H cannot be replaced by C→H

, Hence, CE→H can be replaced by E→H

EI→J,, Hence, EI→J cannot be replaced by E→J

, Hence, CE→H cannot be replaced by I→J

so F’’={ A→B, A→C, E→A, E→D, BD→E, CE→H, H→G, EI→J }

={A,C}, so A→B is not redundant

={A,B}, so A→C is not redundant

={E,D}, so E→A is not redundant

={E,A}, so E→D is not redundant

={H}, so H→G is not redundant

so F’’={ A→B, A→C, E→A, E→D, BD→E, E→H, H→G, EI→J }

(3) U={A, B, C, D, E, G, H, I, J, K}

so

so

so

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | E | G | H | I | J | K |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | E | G | H | I | J | K |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

There is a row which has all the set in U, so of R is loss-less-join.

(4) left hand side of F is X={A,E,B,D,C,H,I}

step1:

step2:

step3:

So, super key are {EIK}, {BDIK},{EIKH},{EIKA},{EIKB}

(5) p={R1={EIK}, R2={EIJ}, R3={EAD}, R4={ADH}, R5={HG}, R6={ABC}}

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | B | C | D | E | G | H | I | J | K |
|  |  |  |  | a |  |  | a |  | a |
|  |  |  |  | a |  |  | a | a |  |
| a |  |  | a | a |  |  |  |  |  |
| a |  |  | a |  |  | a |  |  |  |
|  |  |  |  |  | a | a |  |  |  |
| a | a | a |  |  |  |  |  |  |  |
| a | a | a | a | a | a | a | a | a | a |

So, this BCNF relations is lossless-join, but it cannot be dependency-preserving since there is no BD→E.

Q2:

1. undo T1, T3 and redo T2
2. undo T1, T3.

Q3:

（1）

Data pages: P3, P4, P8, P7, P1

Queries:

Q1: read: P3, P4, P8, P7

Q2: read: P1, P8

Buffer: 3

FIFO:

Q1:

|  |  |  |
| --- | --- | --- |
| 3 | 4 | 8 |
| 7 | 4 | 8 |

STEP:4

Q2:

|  |  |  |
| --- | --- | --- |
| 7 | 4 | 8 |
| 7 | 1 | 8 |

STEP:1

FIFO: TOTAL STEP:1+4=5

MRU:

|  |  |  |
| --- | --- | --- |
| 3 | 4 | 8 |
| 3 | 4 | 7 |

STEP:4

Q2

|  |  |  |
| --- | --- | --- |
| 3 | 4 | 7 |
| 3 | 4 | 1 |
| 3 | 4 | 8 |

STEP:2

MRU: TOTAL STEP:4+2=6

So FIFO buffer replacement policy is better than MRU buffer replacement policy.

（2）

Data pages: P3, P4, P8, P7, P6

Queries:

Q1: read: P3, P4, P8, P7

Q2: read: P7, P6

Q3: read: P4, P6

Buffer: 3

FIFO:

Q1:

|  |  |  |
| --- | --- | --- |
| 3 | 4 | 8 |
| 7 | 4 | 8 |

STEP:4

Q2:

|  |  |  |
| --- | --- | --- |
| 7 | 4 | 8 |
| 7 | 6 | 3 |

STEP:2

Q3:

|  |  |  |
| --- | --- | --- |
| 7 | 6 | 3 |
| 4 | 6 | 3 |

STEP:1

FIFO: TOTAL STEP:4+2+1=7

LRU:

|  |  |  |
| --- | --- | --- |
| 3 | 4 | 8 |
| 7 | 4 | 8 |

STEP:4

Q2

|  |  |  |
| --- | --- | --- |
| 7 | 4 | 8 |
| 7 | 6 | 3 |

STEP:2

Q3

|  |  |  |
| --- | --- | --- |
| 7 | 6 | 3 |
| 7 | 4 | 6 |

STEP:2

LRU: TOTAL STEP:4+2+2=8

So FIFO buffer replacement policy is better than LRU buffer replacement policy.