CS405G: Introduction to database systems

Quiz 4

Consider the following schema and a list of functional dependencies. Ar

Schema: *WorkOn* (*EID, Ename, email, PName, hours*)

Functional Dependencies:

1. *EID -> Ename, email*
2. *EID, Pname-> hours*

Here is an actual database

EID	Ename	email	Pname	Hours
1234	John Smith	jsmith@ac.com	B2B platform	10
1123	Ben Liu	bliu@ac.com	CRM	40
1234	John Smith	jsmith@ac.com	CRM	30
1023	Susan Sidhuk	ssidhuk@ac.com	B2B platform	40

(1) Is there any redundancy in the actual Workon database? If so, please give an example.

Yes; Ename and email are repeated for each EID.

In this table, John Smith and jsmith@ac.com are repeated.

(2) What are the keys of this relation? Please explain using transitive closure.

EID, Pname

EID → Ename, EID, email

EID, Pname → Pname, hours

EID, Pname → Ename, EID, email, Pname, hours

(3) What is the highest normal form of this relation? Why?

1NF. There is a partial dependency, where Ename and email are dependent on EID, which is not a key by itself but is part of the multivalued key EID, Pname.

(4) Please suggest one way to decompose the workOn relation given the functional dependency *EID-> Ename, Email.*

$R_1 = \{\underline{EID}, Ename, email\}$

$R_2 = \{\underline{EID}, \underline{Pname}, hours\}$

(5) What does the database look like after the decomposition in (3)?

EID	Ename	email
1234	John Smith	jsmith@ac.com
1123	Ben Liu	bliu@ac.com
1023	Susan Sidhuk	ssidhuk@ac.com

EID	Pname	hours
1234	B2B platform	10
1123	CRM	40
1234	CRM	30
1023	B2B platform	40

(6) Do the database schemas from (3) satisfy BCNF norm? Why?

Yes; all productions depend only on the keys within each relation R_1 and R_2.

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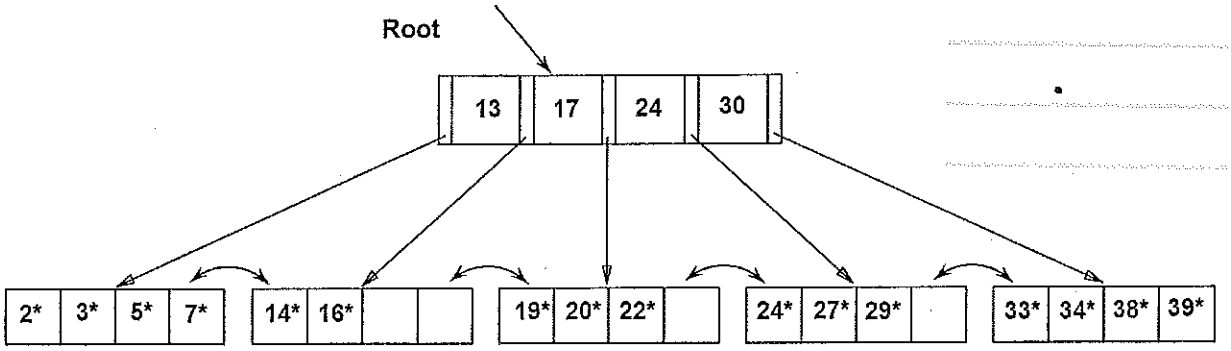
Quiz 5

Show how the given B+ tree changes after each of the following operations.



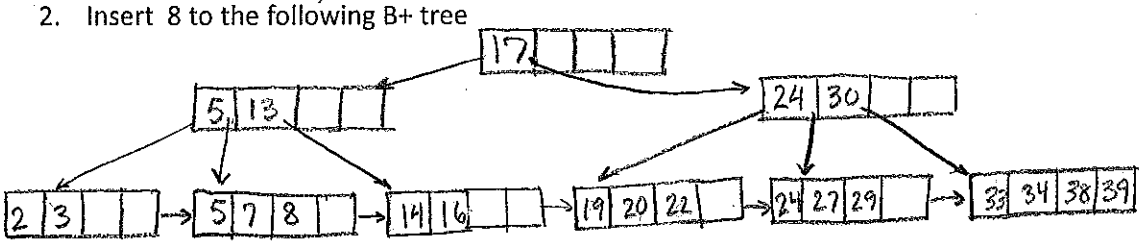
1. What's the maximum fan size shown in the current index? What are the minimum number keys allowed in the leaf nodes, internal nodes and root nodes respectively?

max fan-out = 5

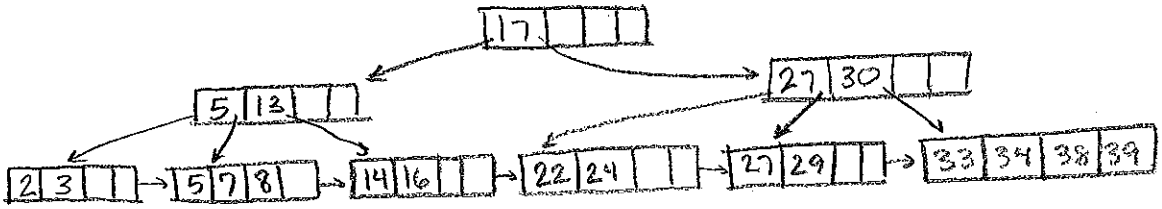
$\lceil f/2 \rceil = \lceil 5/2 \rceil = 2$ min # keys for leaf nodes

1 min # key for root node $\lceil f/2 \rceil - 1 = 1$ min # key for internal nodes

2. Insert 8 to the following B+ tree



3. Delete 19 and 20



4. Delete 24.