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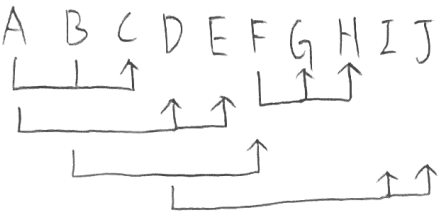
1.



(a) {A, B}，因為A, B可以找出所有值

(b) {A, B, C} {A, D, E, I, J} {B, F, G, H}

(c) {A, B, C} {A, D, E} {D, I, J} {B, F} {F, G, H}

2.

(a) 因為 {Course_no} → {Offering_dept, Credit_hours, Course_level}

是 partial dependency，所以是 1NF

(b) {Course_no, Sec_no, Semester, Year}, {Room_no, Days_hours, Semester, Year}

(c) 2NF: {Cn, Sn, Is, Semester, Year, Days_hours, Rn, Nos}
{Cn, Od, Ch, Cl}

因為 {Cn, Od, Ch, Cl} 是 partial dependency

因為 Cn 是 superkey，Cn, Sn, Is, Semester, Year, Dh, Rn, Nos 是 prime attribute

所以是 3NF

3. Buffering of data, Proper organization of data on disk, Reading data ahead of request

4. (a) $30+9+9+40+10+8+1+4+4+1 = 116$ bytes

(b) $bfr = \frac{512}{\lfloor 116 \rfloor} = 4$, $b = \frac{30000}{4} = 7500$

(c)

(i) $R = 6+9 = 15$, $bfr_i = \frac{512}{\lfloor 15 \rfloor} = 34$

(ii) 7500, $\lceil \frac{7500}{34} \rceil = 221$

(iii) $b1 = \lceil \frac{7500}{34} \rceil = 221$, $b2 = \lceil \frac{221}{34} \rceil = 7$, $b3 = \lceil \frac{7}{34} \rceil = 1$ ⇒ 3 levels

(iv) $221 + 7 + 1 = 229$

(v) $3 + 1 = 4$

(d)

(i) $R = b + 9 = 15$, $bfr_i = \frac{512}{\lfloor 15 \rfloor} = 34$

(ii) 30000, $\frac{\lceil 30000 \rceil}{34} = 883$

(iii) $b_1 = 883$, $b_2 = \frac{\lceil 883 \rceil}{34} = 26$, $b_3 = \frac{\lceil 26 \rceil}{34} = 1 \Rightarrow$ 3 levels

(iv) $883 + 26 + 1 = 910$

(v) $3 + 1 = 4$

5.

Primary index:

on the ordering key field of an ordered file

Clustering index:

on the ordering nonkey field of a file

Secondary index:

on the nonordering field of a file