資工三 109590004 呂育瑋

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Q1(a).

Candidate key : { A, B, D }

{ A, B } → { C }, ABD → ABCD (Augmentation and reflexivity)

{ B, D } → { E, F }, ABD → ABDEF (Augmentation and reflexivity)

{ A, D } → { G, H }, ABD → ABDGH (Augmentation and reflexivity)

{ A } → { I }, ABD → ABDI (Augmentation and reflexivity)

{ H } → { J }, because { A, D } → { G, H } and { H } → { J } hence ABD → ABDJ (Transitivity)

Union all of them : ABD → ABCDEFGHIJ

Thus, the key of R = { A, B, D }

Q1(b).

R1 = { A, B, C }

R2 = { B, D, E, F }

R3 = { A, D, G, H, J } ( merge { A, D } → { G, H } and { H } → { J } )

R4 = { A, I }

Q1(c).

R1 = { A, B, C }

R2 = { B, D, E, F }

R3-1 = { A, D, G, H }

R3-2 = { H, J }

R4 = { A, I }

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Q2(a).

There is no partial dependency, so R is in 2NF.

{ Room\_no, Days\_hours, Semester, Year } →{ Instructor\_ssn, Course\_no, Sec\_no }

{ Course\_no } →{ Offering\_dept, Credit\_hours, Course\_level } (transitive dependency)

So R is in 2NF.

Q2(b).

( All attribute in short term when calculate )

R = { CN, SN, OD, CH, CL, IS, S, Y, DH, RN, NS }

Candidate key : { CN, SN, S, Y } and { RN, DH, S, Y }

{ CN } → { OD, CH, CL }

{ CN, SN, S, Y } → { DH, RN, NS, IS }

{ RN, DH, S, Y } → { IS, CN, SN }

1. Check candidate key : { CN, SN, S, Y }

{ CN, SN, S, Y } → { DH, RN, NS, IS } and { CN } → { OD, CH, CL }

Hence { CN, SN, S, Y } → { CN, SN, S, Y, DH, RN, NS, IS, OD, CH, CL } = R

So { CN, SN, S, Y } is key

1. Check candidate key : { RN, DH, S, Y }

{ RN, DH, S, Y } → { IS, CN, SN } and { CN } → { OD, CH, CL }

Hence { RN, DH, S, Y } → { RN, DH, S, Y, IS, CN, SN, OD, CH, CL }

By { CN, SN, S, Y } → { DH, RN, NS, IS } found NS can depend on { CN, SN, S, Y }

which already in { RN, DH, S, Y }+

Hence { RN, DH, S, Y } → { RN, DH, S, Y, IS, CN, SN, OD, CH, CL, NS } = R

So { RN, DH, S, Y } is also a key

Ans: K1 = { Course\_no, Sec\_no, Semester, Year }

K2 = { Room\_no, Days\_hours, Semester, Year }

Q2(c).

Remove the transitive dependency.

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Q3(a).

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

Q3(b).

Bfr = floor(512/116) = 4 records/block

b = 30000/4 = 7500