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CSE 572

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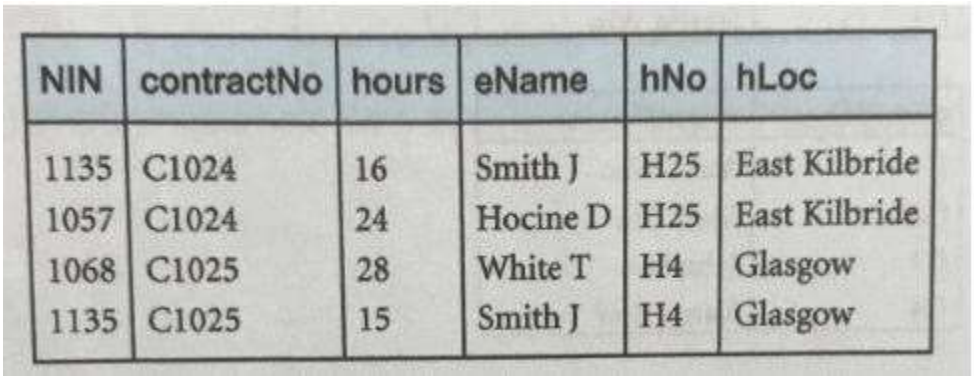
14.16 *An agency called Instant Cover supplies part-time/temporary staff to hotels within Scotland. The table shown in the Figure lists the time spent by agency staff working at various hotels. The National Insurance Number (NIN) is unique for every member of staff.*

a) The table shown in the Figure is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.

b) Describe and illustrate the process of normalizing the table shown in the Figure to 3NF. State any assumptions you make about the data shown in this table.



NIN	contractNo	hours	eName	hNo	hLoc
1135	C1024	16	Smith J	H25	East Kilbride
1057	C1024	24	Hocine D	H25	East Kilbride
1068	C1025	28	White T	H4	Glasgow
1135	C1025	15	Smith J	H4	Glasgow

A.

- Insertion Anomaly: it is not possible to add new contract information unless there is at least one employee and details of work allocation of that employee to some hotel
- Deletion Anomaly: By deleting the details of the contract with contract number 'C1025', details of the hotel with hotel number 'H4' gets lost completely
- Updating Anomaly: In order to update or to correct the name of the employee of name "Smith J", one has to update all instance of employee or else data inconsistencies occur.

B.

Following are assumptions made about the data and the attributes shown in the relation.

1. Assume that a hotel may be associated with more than one contract
2. The attribute NIN and contractNo set determines the values of the hours
3. The attribute NIN alone determines the values of the attribute eName
4. The attribute contractNo alone determines the values of the attribute hNo and hLoc.
5. The attribute hNo alone determines the values of the attribute hLoc

   This gives functional dependences as follows:

   Fd1 = {NIN, contractNo} → hours

   Fd2 = NIN → eName

Fd3 = contractNo → {hNo,hLoc}
Fd4 = hNo → hLoc

There are no repeating groups in the relation, so the relation is in 1NF. The attributes NIN and contractNo as set forms primary key. 2NF stats that there shouldn't be any partial functional dependency in the relation. The functional dependency statements fd2 and fd3 violates the rules of 2NF. So the relation is decomposed as:

2NF

Table 1 : Employee Contract Info

NIN	contractNo	Hours
1135	C1024	16
1057	C1024	24
1068	C1025	28
1135	C1025	15

CK : NIN, contractNo
FK: NIN, contractNo

Table 2 : Contract Info

contractNo	hNo	hLoc
C1024	H25	East Killbride
C1025	H4	Glasgo

PK: contractNo

Table 3: Employee details

NIN	eName
1135	Smith J
1057	Hocine D
1068	White T

PK: NIN

3NF states that there shouldn't be any transitive dependency in the relation. The functional dependency statements fd4 violates the rules of 3NF. So the relation contract info decomposes in to two relations, contract info and hotel details

3NF

Table 1 : Employee Contract Info

NIN	contractNo	Hours
1135	C1024	16
1057	C1024	24
1068	C1025	28
1135	C1025	15

CK : NIN, contractNo
FK: NIN, contractNo

Table 2 : Contract Info

contractNo	hNo
C1024	H25
C1025	H4

PK: contractNo
FK: hNo

Table 3: hotel details

hNo	hLoc
H25	East Killbride
H4	Glasgo

PK: hNo
Atl Key: hLoc

Table 4: Employee details

NIN	eName
1135	Smith J
1057	Hocine D
1068	White T

PK: NIN