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CSE 572

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Homework 14.16

14.16 An agency called *Instant Cover* supplies part-time/temporary staff to hotels within Scotland. The table shown in Figure 14.20 displays sample data, which lists the time spent by agency staff working at various hotels. The National Insurance Number (NIN) is unique for every member of staff.

- The table shown in Figure 14.20 is susceptible to update anomalies. Provide examples of insertion, deletion, and update anomalies.
- Identify the functional dependencies represented by the attributes shown in the table of Figure 14.20. State any assumptions that you make about the data and the attributes shown in this table.
- Describe and illustrate the process of normalizing the table shown in Figure 14.20 to 3NF. Identify primary, alternate, and foreign keys in your relations.

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

Figure 14.20 Table displaying sample data for the *Instant Cover* agency.

A. Anomalies

- Insert 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 must update all instance of employee 'Smith J' or else data inconsistencies occur.

B. Functional dependencies:

- Assumptions
 - Assume that a hotel may be associated with more than one contract.
- Functional Dependencies:
 - $Fd1 = NIN, contractNo \rightarrow hours$
 - $Fd2 = NIN \rightarrow eName$
 - $Fd3 = contractNo \rightarrow hNo, hLoc$
 - $Fd4 = hNo \rightarrow hLoc$

C.

1NF

There are no repeating groups in the given relation, so the relation is in 1NF. The attributes NIN and contractNo as a set forms the primary key

NIN	contractNo	Hours	eName	hNo	hLoc
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PK: NIN, contractNo

2NF

Second normal form stats that there shouldn't be any partial functional dependency's in the relation. The functional dependency statements 'fd2' and 'fd3' violates the rules of 2NF. So, the relations are decomposed as

Employee_contract_inof

NIN	contractNo	hours
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PK: NIN, contractNo

FK: NIN

Contract_info

contractNo	hNo	hLoc
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PK: contractNo

Dentist_details

NIN	eName
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PK: NIN

3NF

Third Normal Form 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 into two relations 'contract_info' and 'hotel_details'

Employee_contract_info

NIN	contractNo	hours
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PK: NIN, contractNo

FK: NIN

Contract_info

contractNo	hNo
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PK: contractNo

FK: hNo

Hotel_details

hNo	hLoc
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PK: hNo

Alt key: hLoc

employee_details

NIN	eName
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PK: NIN

Alt Key: eName