

## Normalisation - Sample Solutions

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### Question A

*Assume a patient can only see a dentist once per day*

*If using Oracle have an appointment attribute containing both date and time*

1.

INSERT anomaly:

Can't insert a dentist until they have a patient appointment

DELETE anomaly:

When the last existing record of an appointment for a dentist is deleted, the dentist's details are lost

UPDATE anomaly:

If a dentist's details are to be updated e.g. change of name, multiple rows need to be updated

2.

(1)

UNF:

**APPOINTMENT**(staffno, dentistname, patno, patname, appointment, surgeryno)

(2)

UNF:

**DENTIST**(staffno, dentistname, {patno, patname, appointment, surgeryno})

(3)

UNF:

**DENTIST**(staffno, dentistname, {patno, patname, {appointment, surgeryno}})

3.

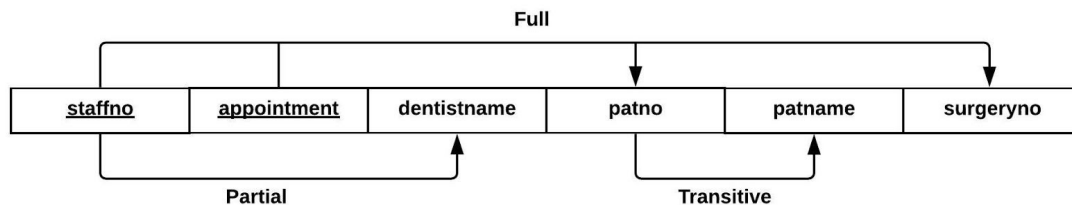
UNF:

**APPOINTMENT** (staffno, dentistname, patno, patname, appointment, surgeryno)

**Using Simple Definition - based on PK:**

1NF:

**APPOINTMENT** (staffno, appointment, dentistname, patno, patname, , surgeryno)



OR

staffno, appointment -> patno, surgeryno (FULL)

staff\_no -> dentistname PARTIAL

patno -> patname TRANSITIVE

2NF:

**DENTIST** (staffno, dentistname)

**APPOINTMENT** (staffno, appointment, patno, patname, surgeryno)

3NF:

**DENTIST** (staffno, dentistname)

**APPOINTMENT** (staffno, appointment, patno, surgeryno)

**PATIENT** (patno, patname)

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4.

UNF:

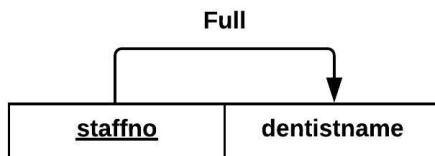
DENTIST (staffno, dentistname, (patno, patname, appointment, surgeryno))

Using Simple Definition - based on PK:

1NF:

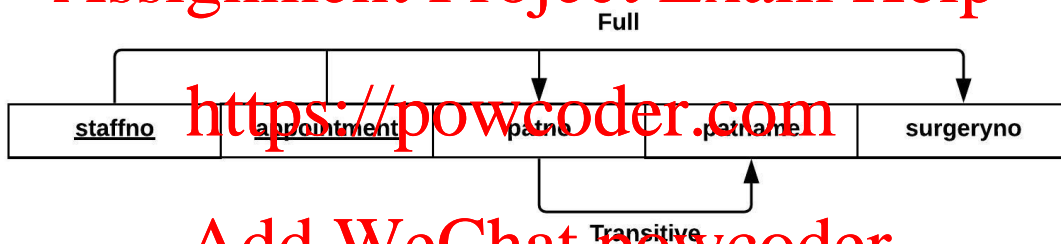
DENTIST (staffno, dentistname)

APPOINTMENT(staffno, appointment, patno,patname,surgeryno)



OR

staffno -> dentistname FULL



OR

staffno, appointment -> patno, surgeryno FULL

patno -> patname TRANSITIVE

2NF:

*There is no partial dependency.*

DENTIST (staffno, dentistname)

APPOINTMENT(staffno, appointment, patno,patname,surgeryno)

3NF:

DENTIST (staffno, dentistname)

APPOINTMENT(staffno, appointment, patno,surgeryno)

PATIENT(patno,patname )

## Question B

### STEP 1: NORMALISATION:

Take each form on a *form-by-form* basis and list it as a UNF relation, then normalise through 1NF, 2NF and 3NF. Do not pool the normalisation data until you have completed all the normalisations.

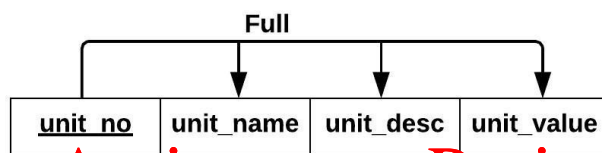
#### APPROVED UNITS REPORT

UNF

UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)

1NF

UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)



OR

unit\_no -> unit\_name, unit\_desc, unit\_value FULL

2NF

UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)

3NF

UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)

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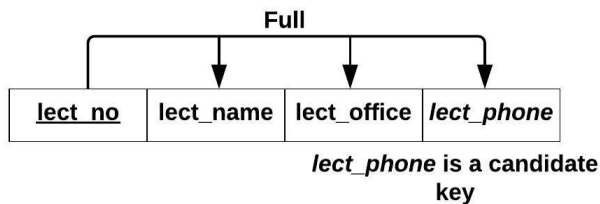
## LECTURER REPORT

UNF

**LECTURER** (lect\_no, lect\_name, lect\_office, lect\_phone (unit\_no, unit\_name) )

1NF

**LECTURER** (lect\_no, lect\_name, lect\_office, lect\_phone)



There is no transitive dependency here related to lect\_phone as lect\_phone is a candidate key - transitive dependency is about the *removal of non-key dependencies* ie. dependencies between non-key attributes (lect\_phone is not a non-key attribute)

OR

lect\_no -> lect\_name, lect\_office, lect\_phone FULL

**ADVISES** (lect\_no, unit\_no, unit\_name)



Partial

OR

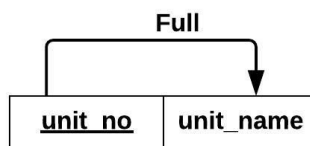
unit\_no -> unit\_name PARTIAL

2NF

**LECTURER** (lect\_no, lect\_name, lect\_office, lect\_phone)

**ADVISES** (lect\_no, unit\_no)

**UNIT** (unit\_no, unit\_name)



OR

unit\_no -> unit\_name FULL

### 3NF

**LECTURER** (lect\_no, lect\_name, lect\_office, lect\_phone)

(lect\_phone is a candidate key and hence transitive dependencies are not present)

**ADVISES** (lect\_no, unit\_no)

**UNIT** (unit\_no, unit\_name)

### STUDENT REPORT

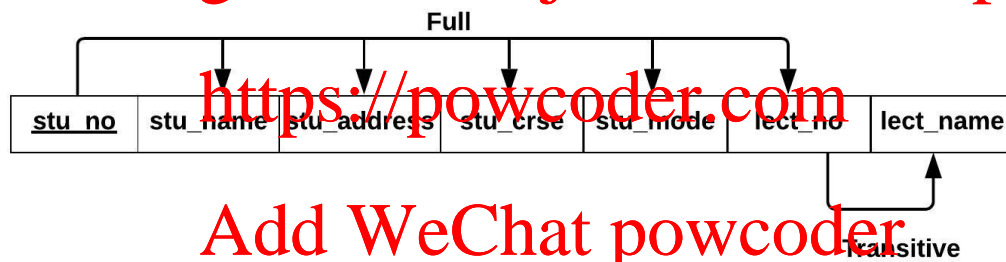
#### UNF

**STUDENT** (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no, lect\_name (unit\_no, unit\_name, yr\_sem, grade))

Note: replacement of mentor details with lecturer details - a mentor is a lecturer - this prevents the introduction of synonyms (attributes with different names but representing the same thing)

#### 1NF

**STUDENT** (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no, lect\_name)

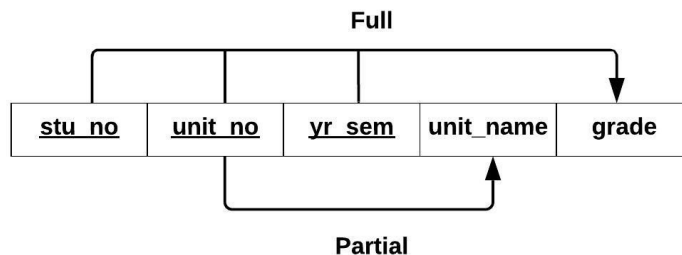


#### OR

stu\_no -> stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no FULL

lect\_no -> lect\_name TRANSITIVE

**AC-REC** (stu\_no, unit\_no, yr\_sem, unit\_name, grade)



#### OR

stu\_no, unit\_no, yr\_sem -> grade

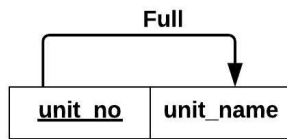
unit\_no -> unit\_name PARTIAL

## 2NF

**STUDENT** (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no, lect\_name)

**AC-REC** (stu\_no, unit\_no, yr\_sem, grade)

**UNIT** (unit\_no, unit\_name)



## OR

unit\_no -> unit\_name FULL

## 3NF

**STUDENT** (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no)

**LECTURER** (lect\_no, lect\_name)



## OR

lect\_no -> lect\_name

**AC-REC** (stu\_no, unit\_no, yr\_sem, grade)

**UNIT** (unit\_no, unit\_name)

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**COLLECTED 3 NF Relations:**

1. UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)
2. LECTURER (lect\_no, lect\_name, lect\_office, lect\_phone )
3. ADVISES (lect\_no, unit\_no)
4. UNIT (unit\_no, unit\_name)
5. STUDENT (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no)
6. LECTURER (lect\_no, lect\_name)
7. AC-REC (stu\_no, unit\_no, yr\_sem, grade)
8. UNIT (unit\_no, unit\_name)

**STEP 2: ATTRIBUTE SYNTHESIS**

Join together relations, which have an **identical** PK – ie. represent the same entity:

1. 4. & 8.

UNIT (unit\_no, unit\_name, unit\_desc, unit\_value)

2. & 6.

LECTURER (lect\_no, lect\_name, lect\_office, lect\_phone )

- 3.

ADVISES (lect\_no, unit\_no)

- 5.

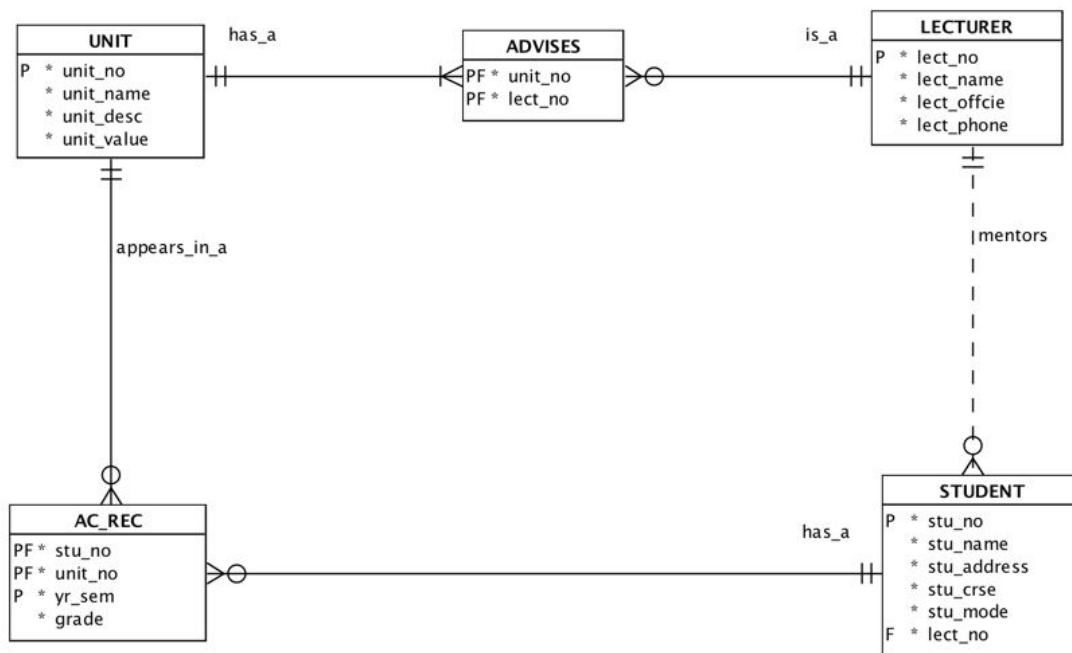
STUDENT (stu\_no, stu\_name, stu\_address, stu\_crse, stu\_mode, lect\_no)

- 7.

AC-REC (stu\_no, unit\_no, yr\_sem, grade)



## Logical Model



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