Normalisation - Sample Solutions

6.2.1. Adapted from Connolly and Begg

Assume a patient can only see a dentist once per day
If using Oracle have an appointment attribute containing both date and time

Q1.

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

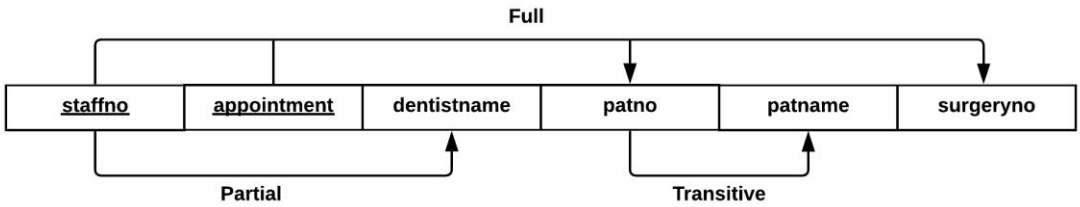
UPDATE anomaly:
If a dentist's details are to be updated e.g. change of name, multiple rows need to be updated

Q2 and Q3.
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)

6.2.2. University Database Example

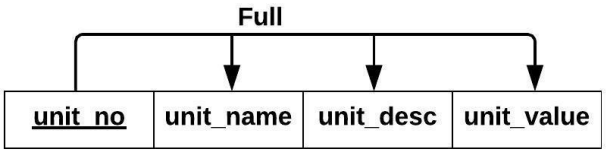
STEP 1: NORMALISATION:

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)

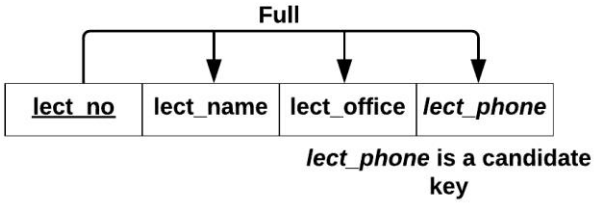
3NF

UNIT (unit_no, unit_name, unit_desc, unit_value)

LECTURER REPORT

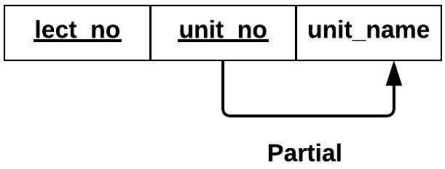
UNF
LECTURER (lect_no, lect_name, lect_office, lect_phone (unit_no, unit_name))

1NF
LECTURER (lect_no, lect_name, lect_office, lect_phone)



OR
lect_no -> lect_name, lect_office, lect_phone FULL

ADVISES (lect_no, unit_no, unit_name)

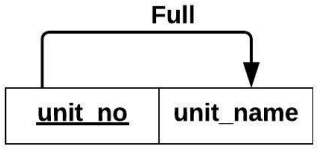


OR
unit_no -> unit_name PARTIAL

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)

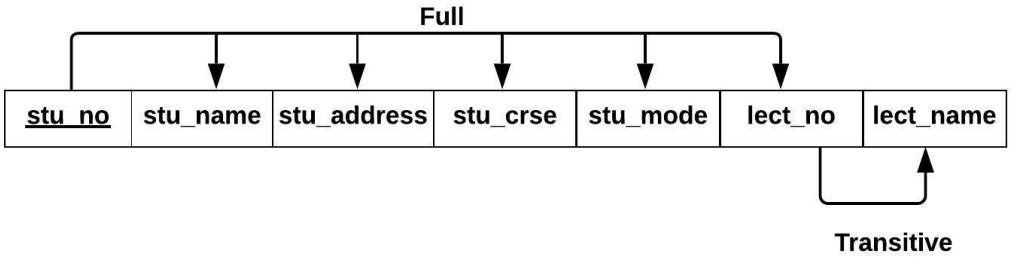
UNIT (unit_no, unit_name)

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))

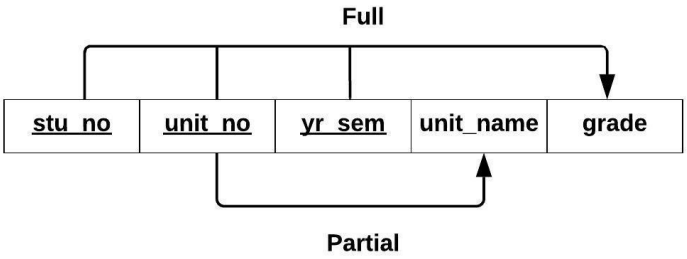
Note: replacement of mentor details with lecturer details - a mentor is a lecturer - this prevents the introduction of synonyms (attributes with different names but representing the same thing)

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)

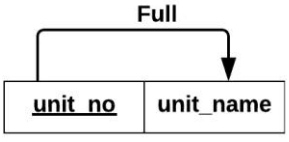


OR
stu_no, unit_no, yr_sem -> grade FULL
unit_no -> unit_name PARTIAL

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)

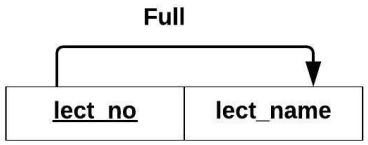
UNIT (unit_no, unit_name)



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 FULL

AC-REC (stu_no, unit_no, yr_sem, grade)

UNIT (unit_no, unit_name)

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 (<u>unit_no</u>, unit_name, unit_desc, unit_value)

2. & 6.
LECTURER (<u>lect_no</u>, lect_name, lect_office, lect_phone)

3.
ADVISES (<u>lect_no</u>, <u>unit_no</u>)

5.
STUDENT (<u>stu_no</u>, stu_name, stu_address, stu_crse, stu_mode, lect_no)

7.
AC-REC (<u>stu_no</u>, <u>unit_no</u>, <u>yr_sem</u>, grade)

Logical Model