Step 1 Build conceptual data model for each user view Step

1.1 Identify entity types

Entity	Deskripsi	Alias	Kejadian/Kemunculan kemungkinan data yang tersimpan didalamnya
Student	Penjelasan mengenai murid yang akan menyewa ruangan	Tenant	Setiap murid dapat menyewa satu ruangan di hall atau flat.
Hall of Residence	Penjelasan mengenai hall yang tersedia untuk disewakan.	Room	Hall memiliki beberapa ruangan dan memiliki manajer yang mengontrol hall.
Student Flats	Penjelasan mengenai flat yang tersedia untuk disewakan.	Room	Flat memiliki beberapa ruangan yang dapat disewakan.
Invoice	Penjelasan mengenai tagihan yang akan didapatkan oleh murid.	-	Setiap murid akan dikirimkan satu tagihan setelah melakukan sewa ruangan.
Accomodation Staff	Penjelasan mengenai karyawan yang bekerja di universitas.	Employee	Anggota staff memiliki tanggung jawab untuk mengontrol hall dan melakukan inspeksi pada flat.
Courses	Penjelasan mengenai course yang dapat diambil oleh murid.	-	Setiap murid harus menghadiri satu course.
Next-of-kin	Penjelasan mengenai salah satu anggota keluarga murid.	Family Members	Setiap murid memiliki setidaknya satu anggota keluarga.

1.2 Identify relationship types

Entity	Multiplicity	Relationship	Multiplicity	Entity
Students	1..1 1..1 1..1	Request – Lease Request – Lease Has	1..1 1..1 0..1	Student Flats Halls of Resident Next-of-kin
Halls of Resident	1..1	For – Lease	1..1	Students
Student Flats	1..1	For – Lease	1..1	Students
Invoice	1..1	Generated	1..1	Students
Accomodation Staff	1..1	Inspect	1..1	Student Flats
	1..1	Manages	0..1	Hall of Residence
Courses	1..1	AttendBy	1..*	Students
Next-of-kin	0..1	Appertain	1..1	Students

1.3 Identify and associate attributes with entity or relationship types

Attributes for entity

Student :
MatricNo, StuName, address, dob , sex, category, nationality, smoker, specialneed, comments, status, courseTitle , courseNo

Invoice :
invoiceNo, stuName, paymentDue, methodOfPayent, semester, address, matricNo, placeNo, roomNo, leaseNo

Halls of Residence:
hallNo, hallName, hallAddress, telNo, hallManager, roomNo, placeNo, monthlyRentRate

Student flats :
flatNo, flatAddress, totalRooms, monthlyRentRate, roomNo, placeNo

Accomodation Staff :

staffNo, staffName, address, sex, location, dob, postion

Courses :
courseNo, departmentName, leaderID, courseLeadTelNo, courseLeader, courseTitle, roomNo, placeNo

Next-of-Kin:
nokNo, nokName, nokTelNo, relationship, address

Attributes for relationship (entity relationship)

Inspection :
staffName, indication, dateInspection, comments

Lease :
leaseNo, durationLease, dateEnter, dateLeave

Document attributes

Entity	Attributes	Deskripsi	Type & Width	Nulls	Multivalues	Composite
Student	**matricNo**,	Primary key, mengidentifikasi setiap student	Char(6)	No	No	No
	StuName (fname, lname)	Nama student	Varchar(30)	No	No	Yes
	Address (street, city, postcode),	Alamat student	Varchar(90)	No	No	Yes
	DOB,	Tanggal lahir student	Date	Yes	No	No
	sex,	Jenis kelamin student	Char(1)	Yes	No	No
	category,	Kategori student	Varchar(30)	No	No	No
	nationality,	Negara asal student	Varchar(30)	No	No	No
	smoker,	Student yang merokok atau tidak	Varchar(5)	No	No	No
		Student yang memliki kebutuhan khusus				

	specialNeeds, comment, status, courseTitle, courseNo	Komentar student Status student Course yang diambil student Kode course yang diambil student	Varchar(5) Varchar(30) Varchar(30) Varchar(30) Char(6)	No No No No No	No No No No No	No No No No No
Hall of Residence	hallNo hallName hallAddress telNo hallManager roomNo placeNo monthlyRentRate	Primary key,mengidentifikasi setiap hall Nama hall Alamat hall Nomor Telepon hall Nama hall manager Nomor room Foreign key dari entitas place Biaya bulanan	Char(6) Varchar(30) Varchar(90) Int Varchar(30) Varchar(6) Varchar(6) Int	No No No No No No No No	No No No No No No No No	No No No No No No No No
Student Flats	flatNo flatAddress totalRooms monthlyRentRate roomNo placeNo	Primary key,mengidentifikasi setiap flat Alamat flat Total room Biaya bulanan Nomor room Foreign key dari entitas place	Char(6) Varchar(90) Int Int Varchar(6) Varchar(6)	No No No No No No	No No No No No No	No No No No No No
Invoice	invoiceNo stuName (firstName,lastName) paymentDue methodOfPayent semester address (street,city,postcode) matricNo placeNo roomNo leaseNo	Primary key,mengidentifikasi setiap invoice Nama student Tanggal pembayaran Metode/cara pembayaran Semester saat ini Alamat student Foreign key dari entitas student Foreign key dari entitas place Nomor room Nomor lease	Char(6) Varchar(30) Date Varchar(30) Int Varchar(90) Varchar(6) Varchar(6) Varchar(6)	No No No No No No No No No	No No No No No No No No No	No Yes No No No Yes No No No

			Varchar(6)	No	No	No
Accomodation Staff	staffNo	Primary key,mengidentifikasi setiap hall	Char(6)	No	No	No
	staffName (firstName, LastName)	Nama staff	Varchar(30)	No	No	Yes
	address (street, city, postcode)	Alamat staff	Varchar(90)	No	No	Yes
	sex	Jenis kelamin	Char(1)	Yes	No	No
	location	Lokasi penempatan staff	Varchar(30)	No	No	No
	dob	Tanggal lahir staff	Date	No	No	No
	postion	Posisi/jabatan staff	Varchar(30)	No	No	No
Courses	courseNo	Primary key,mengidentifikasi setiap hall	Char(6)	No	No	No
	departmentName	Nama department	Varchar(30)	No	No	No
	leaderID	Nomor ID leader	Varchar(6)	No	No	No
	courseLeadTelNo	Nomor telepon course leader	Int	No	No	No
	courseLeader	Nama course leader	Varchar(30)	No	No	No
	courseTitle	Nama course yang diambil	Varchar(30)	No	No	No
	roomNo	Nomor room	Varchar(6)	No	No	No
	placeNo	Foreign key dari entitas place	Varchar(6)	No	No	No
Next-of-kin	nokNo	Primary key,mengidentifikasi setiap hall	Char(6)	No	No	No
	nokName	Nama nok	Varchar(30)	No	No	No
	nokTelNo	Nomor Telepon nok	Int	No	No	No
	relationship	Hubungan pada nok	Varchar(30)	No	No	No
	address (street,city, postcode)	Alamat nok	Varchar(90)	No	No	Yes
Lease	leaseNo	Primary key, mengidentifikasi setiap lease	Char(6)	No	No	No
	durationLease	Lama durasi lease Tanggal masuk	Int	No	No	No
	dateEnter,	Tanggal keluar	Date	No	No	No
	dateLeave		Date	No	No	No
Inspection	staffName	Nama staff	Varchar(30)	No	No	Yes

	(firstName,lastNam e)	(firstName,lastName)				
	indication	Indikasi masalah	Varchar(30)	No	No	No
	dateInspection	Tanggal inspection	Date	No	No	No
	comments	Komentar	Vanchar(30)	No	No	No

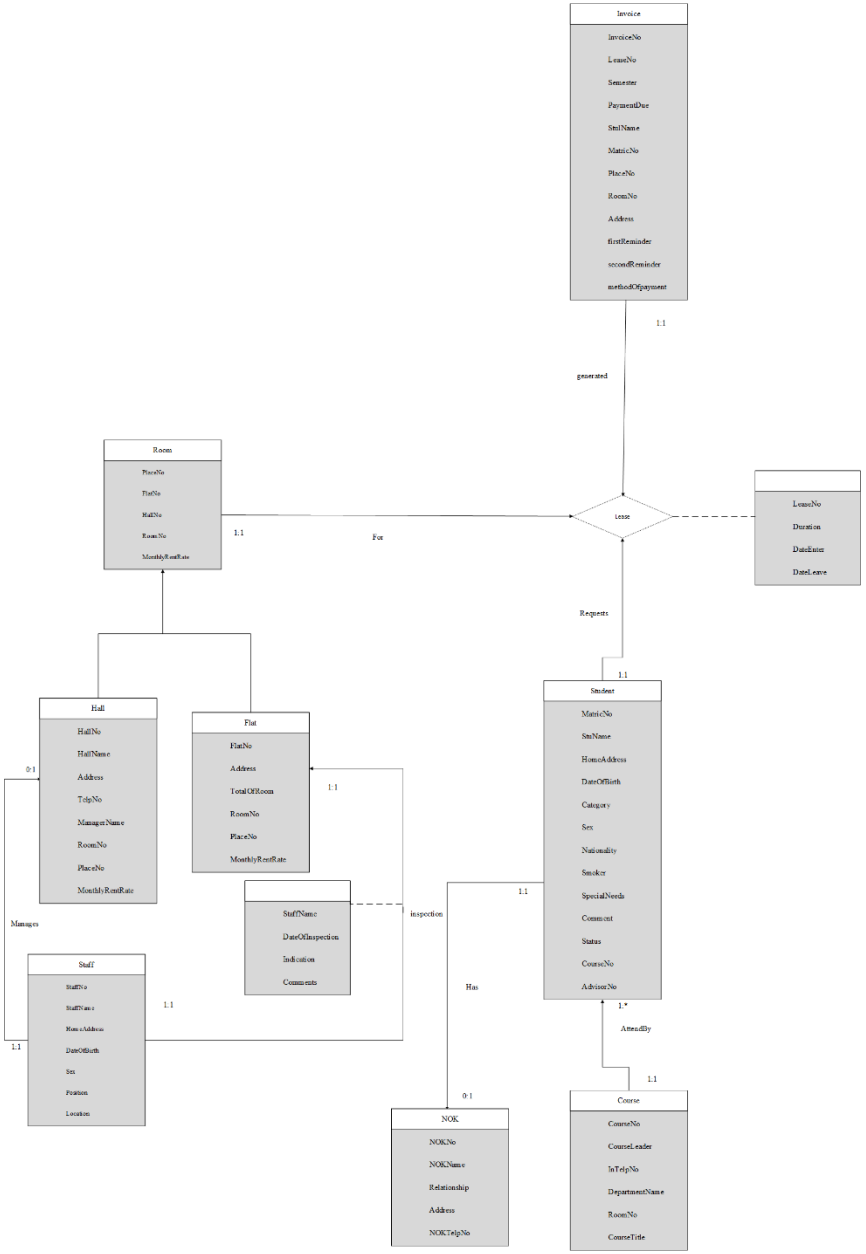
1.4 Determine attribute domains

Entity	Attributes	Deskripsi	Domain
Student	**matricNo**,	Primary key,mengidentifikasi setiap student	Nomor
	StuName	Nama student	Nama
	(firstName,lastName)		
	Address	Alamat student	Alamat
	(street,city,postcode)		
	DOB,	Tanggal lahir student	Tanggal
	category,	Jenis kelamin student	M or F
	sex,	Kategori student	Kategori
	nationality,	Negara asal student	Negara
	smoker,	Student yang merokok atau tidak	Yes or No
	specialNeeds,	Student yang memliki kebutuhan khusus	Yes or No
	comment,	Komentar student	Komentar
	status,	Status student	Status
	courseNo,	Course yang diambil student	Course
	advisorNo	Kode course yang diambil student	Nomor
Hall of Residence	hallNo	Primary key,mengidentifikasi setiap hall	Nomor
	hallName	Nama hall	Nama
	hallAddress	Alamat hall	Alamat
	telNo	Nomor Telepon hall	Nomor
	hallManager	Nama hall manager	Nama
	roomNo	Nomor room	Nomor
	placeNo	Foreign key dari entitas place	Nomor
	monthlyRentRate	Biaya bulanan	200-800 CAD
Student Flats	flatNo	Primary key,mengidentifikasi setiap flat	Nomor
	flatAddress	Alamat flat	Alamat

	totalRooms	Total room	2-5 room
	monthlyRentRate	Biaya bulanan	200-800 CAD
	roomNo	Nomor room	Nomor
	placeNo	Foreign key dari entitas place	Nomor
Invoice	invoiceNo	Primarykey,mengidentifikasi setiap invoice	Nomor
	stuName (firstName,lastName)	Nama student	Nama
	paymentDue	Tanggal pembayaran	Tanggal
	methodOfPayent	Metode/cara pembayaran	Metode
	semester	Semester saat ini	Semester
	address (street,city,postcode)	Alamat student	Alamat
	matricNo	Foreign key dari entitas student	Nomor
	placeNo	Foreign key dari entitas place	Nomor
	roomNo	Nomor room	Nomor
	leaseNo	Nomor lease	Nomor
Accomodation Staff	staffNo	Primary key,mengidentifikasi setiap hall	Nomor
	staffName (firstName,lastName)	Nama staff	Nama
	address (street,city,postcode)	Alamat staff	Alamat
	sex	Jenis kelamin	M or F
	location	Lokasi penempatan staff	Lokasi
	dob	Tanggal lahir staff	Tanggal
	postion	Posisi/jabatan staff	Manager,Administrative Assistant,Cleaner
Courses	courseNo	Primary key,mengidentifikasi setiap hall	Nomor
	departmentName	Nama department	Nama
	leaderID	Nomor ID leader	Nomor
	courseLeadTelNo	Nomor telepon course leader	Nomor
	courseLeader	Nama course leader	Nama
	courseTitle	Nama course yang diambil	Nama

	roomNo placeNo	Nomor room Foreign key dari entitas place	Nomor Nomor
Next-of-kin	nokNo nokName nokTelNo relationship address (street,city,postcode)	Primary key,mengidentifikasi setiap hall Nama nok Nomor Telepon nok Hubungan pada nok Alamat nok	Nomor Nama Nomor Hubungan Alamat
Inspection	staffName (firstName,lastName) indication dateInspection comments	Nama staff Indikasi masalah Tanggal inspection Komentar	Nama Indikasi Tanggal Komentar
Lease	leaseNo durationLease dateEnter, dateLeave	Primary key,mengidentifikasi setiap lease Lama durasi lease Tanggal masuk Tanggal keluar	Nomor Durasi Tanggal Tanggal

1.5 Determine candidate and primary key attributes


Invoice
InvoiceNo
LeaseNo
Semester
PaymentDue
StuName
MatricNo
PlaceNo
RoomNo
Address
firstReminder
secondReminder
methodOfpayment
1:1
generated
Room
PlaceNo
FlatNo
HallNo
RoomNo
MonthlyRentRate
1:1
For
lease
LeaseNo
Duration
DateEnter
DateLeave
Requests
1:1
Hall
HallNo
HallName
Address
TelpNo
ManagerName
RoomNo
PlaceNo
MonthlyRentRate
0:1
Flat
FlatNo
Address
TotalOfRoom
RoomNo
PlaceNo
MonthlyRentRate
1:1
Student
MatricNo
StuName
HomeAddress
DateOfBirth
Category
Sex
Nationality
Smoker
SpecialNeeds
Comment
Status
CourseNo
AdvisorNo
1:1
1:*
AttendBy
StuffName
DateOfInspection
Indication
Comments
inspection
Manages
Staff
StaffNo
StaffName
HomeAddress
DateOfBirth
Sex
Position
Location
1:1
1:1
Has
0:1
NOK
NOKNo
NOKName
Relationship
Address
NOKTelpNo
Course
CourseNo
CourseLeader
InTelpNo
DepartmentName
RoomNo
CourseTitle
1:1

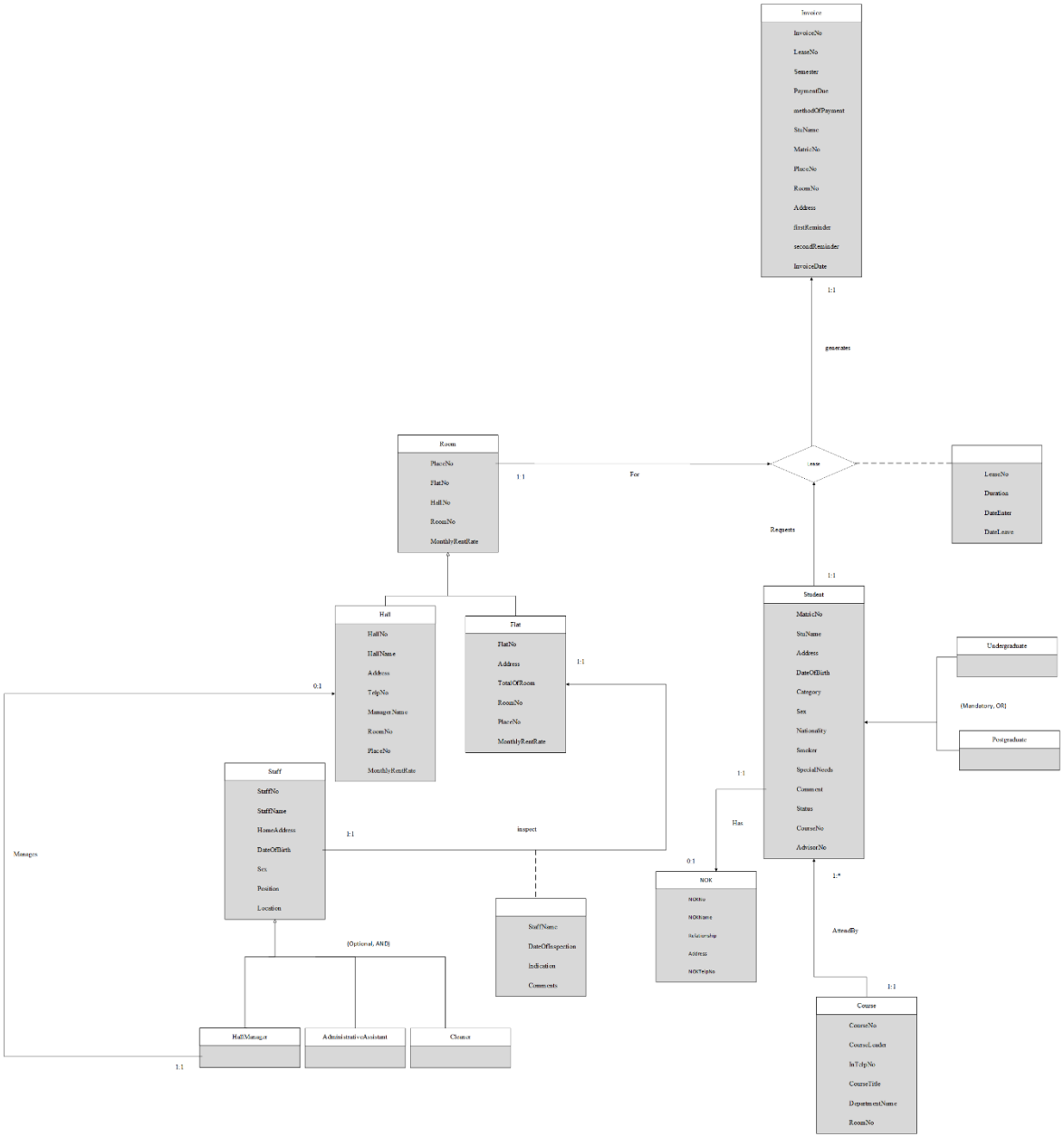
Attributes dengan primary key:

- Student **matricNo**, fname, lname, Address, DOB, category, sex, nationality, smoker, specialNeeds, comment, status, courseTitle, courseNo

- Hall of Residence **hallNo**, hallName, Address, TelNo, managerName, roomNo, placeNo, monthlyRentRate
- Student Flats **flatNo**, Address, totalOfRoom, roomNo, placeNo, monthlyRentRate
- Invoice **invoiceNo**, leaseNo, semester, paymentDue, stuName, matricNo, placeNo, roomNo, Address, firstReminder, secondReminder, paymentMethod

- Accomodation Staff **staffNo**, staffName, Address, DOB, sex, position, location
- Courses **courseNo**, courseLeader, inTelNo, departmentName, roomNo, courseTitle
- Next-of-kin **nokNo**, nokName, relationship, Address, TelNo

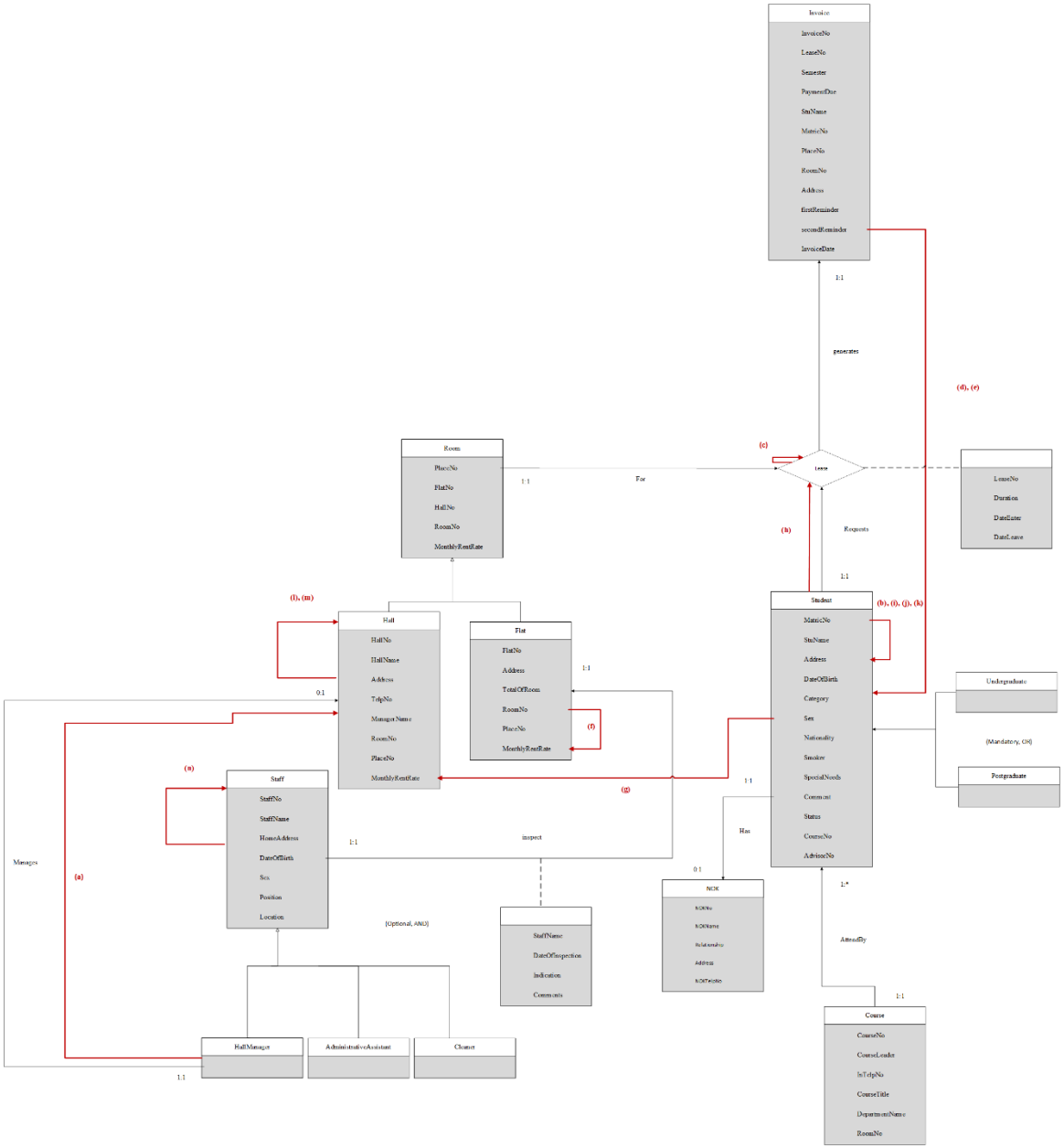
1.6 Consider use of enhanced modeling concepts (optional step)


Invoice
InvoiceNo
LeaseNo
Semester
PaymentDue
methodOfPayment
StuName
MatricNo
PlaceNo
RoomNo
Address
firstReminder
secondReminder
InvoiceDate
1:1
generates
Room
PlaceNo
FlatNo
HallNo
RoomNo
MonthlyRentRate
1:1
For
Lease
LeaseNo
Duration
DateEnter
DateLeave
Requests
1:1
Hall
HallNo
HallName
Address
TelpNo
ManagerName
RoomNo
PlaceNo
MonthlyRentRate
Flat
FlatNo
Address
TotalOfRoom
RoomNo
PlaceNo
MonthlyRentRate
1:1
Student
MatricNo
StuName
Address
DateOfBirth
Category
Sex
Nationality
Smoker
SpecialNeeds
Comment
Status
CourseNo
AdvisorNo
Undergraduate
(Mandatory, OR)
Postgraduate
0:1
Manages
Staff
StaffNo
StaffName
HomeAddress
DateOfBirth
Sex
Position
Location
1:1
inspect
StaffName
DateOfInspection
Indication
Comments
1:1
Has
0:1
NOK
NOKNo
NOKName
Relationship
Address
NOKTelpNo
1:*
AttendBy
1:1
Course
CourseNo
CourseLeader
InTelpNo
CourseTitle
DepartmentName
RoomNo
(Optional, AND)
HallManager
AdministrativeAssistant
Cleaner
1:1

1.7 Check model for redundancy

Tidak ada kerangkapan relationship

1.8 Validate local conceptual model against user transactions


Invoice
InvoiceNo
LeaseNo
Semester
PaymentDue
StuName
MatricNo
PlaceNo
RoomNo
Address
firstReminder
secondReminder
InvoiceDate
1:1
generates
(d), (e)
(c)
Lease
Room
PlaceNo
FlatNo
HallNo
RoomNo
MonthlyRentRate
1:1
For
LeaseNo
Duration
DateEnter
DateLeave
(h)
Requests
1:1
(i), (m)
Hall
HallNo
HallName
Address
TelpNo
ManagerName
RoomNo
PlaceNo
MonthlyRentRate
Flat
FlatNo
Address
TotalOfRoom
RoomNo
PlaceNo
MonthlyRentRate
1:1
(f)
Student
MatricNo
StuName
Address
DateOfBirth
Category
Sex
Nationality
Smoker
SpecialNeeds
Comment
Status
CourseNo
AdviserNo
(b), (i), (j), (k)
Undergraduate
Postgraduate
(Mandatory, OR)
0:1
(n)
Staff
StaffNo
StaffName
HomeAddress
DateOfBirth
Sex
Position
Location
(g)
1:1
Has
1:1
inspect
Manages
(a)
[Optional, AND]
StaffName
DateOfInspection
Indication
Comments
NOK
NOKNo
NOKName
Relationship
Address
NOKTelNo
0:1
1:*
AttendBy
HallManager
AdministrativeAssistant
Cleaner
1:1
Course
CourseNo
CourseLeader
InTelpNo
CourseTitle
DepartmentName
RoomNo

16.8 Derive relations for logical data model

2.1.1. Strong Entity Relation

PaymentMethod : pMethodNo (PK : pMethodNo)

Invoice : invoiceNo (PK : invoiceNo)

Customer : customerNo (PK : customerNo)

Order : orderNo (PK : orderNo)

Employee : employeeNo (PK : employeeNo)

Product : productNo (PK : productNo)

Shipment : shipmentNo (PK : shipmentNo)

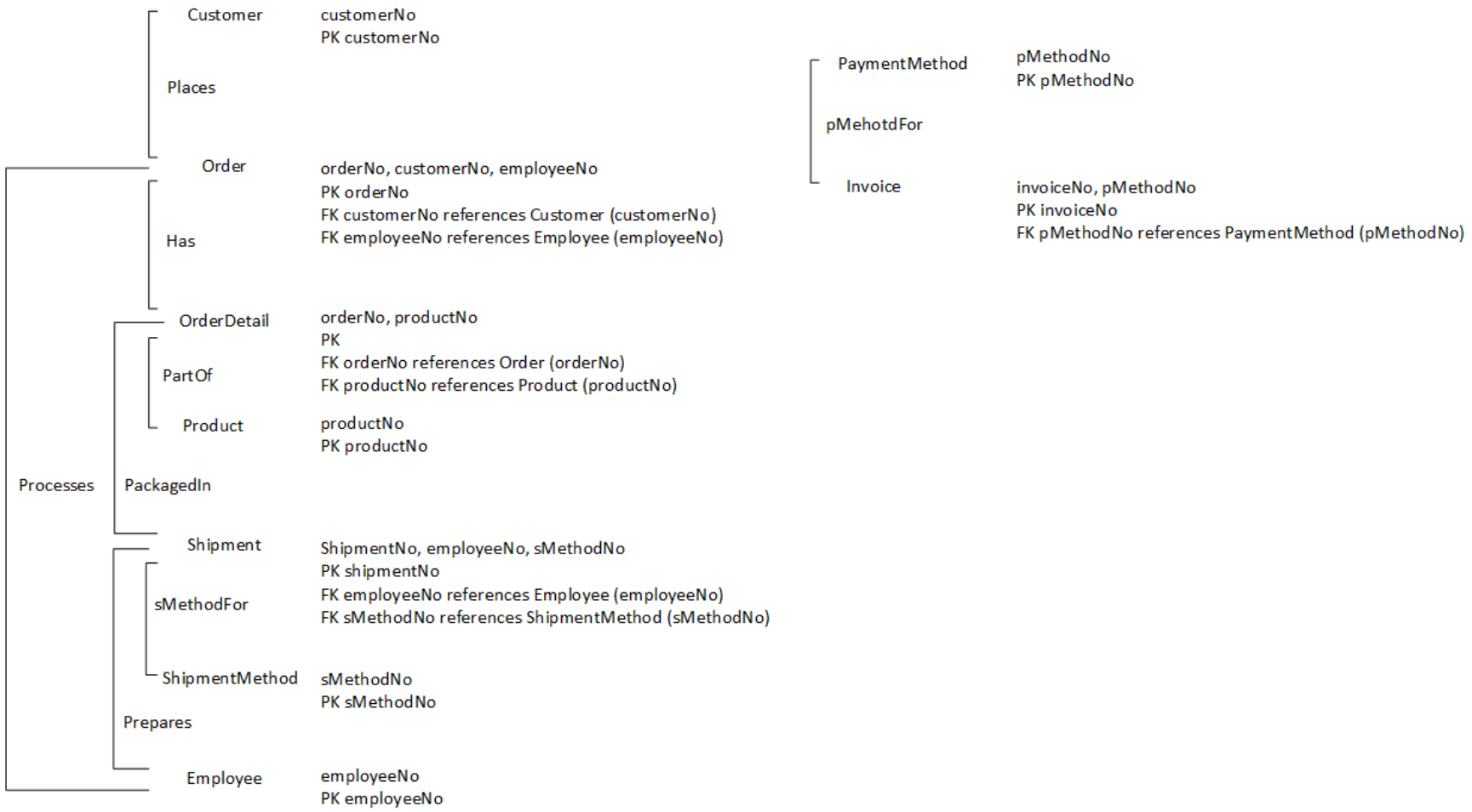
ShipmentMethod : sMethodNo (PK : sMethodNo)

2.1.2. Weak Entity types

OrderDetail : -

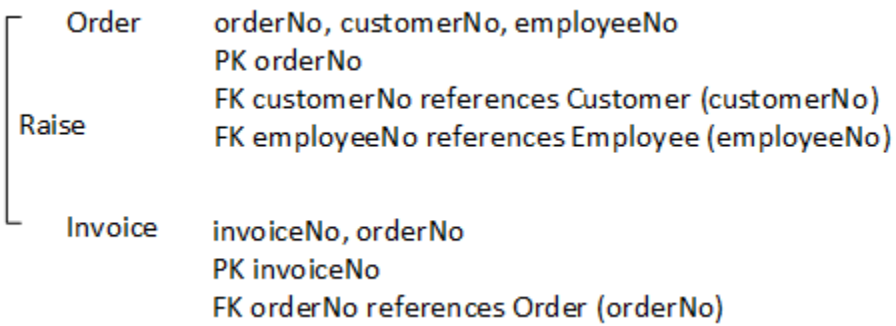
PK : None

2.1.3. 1:* binary relationship types



2.1.4. 1:1 binary relationship types

Mandatory participation on both sides of 1:1 relationship



2.1.5. 1:1 recursive relationships - follow rules for participation for a 1:1 relationship

Tidak dibuat

2.1.6. Superclass/subclass relationship types

Tidak dibuat.

2.1.7. *:* binary relationship types

Tidak dibuat

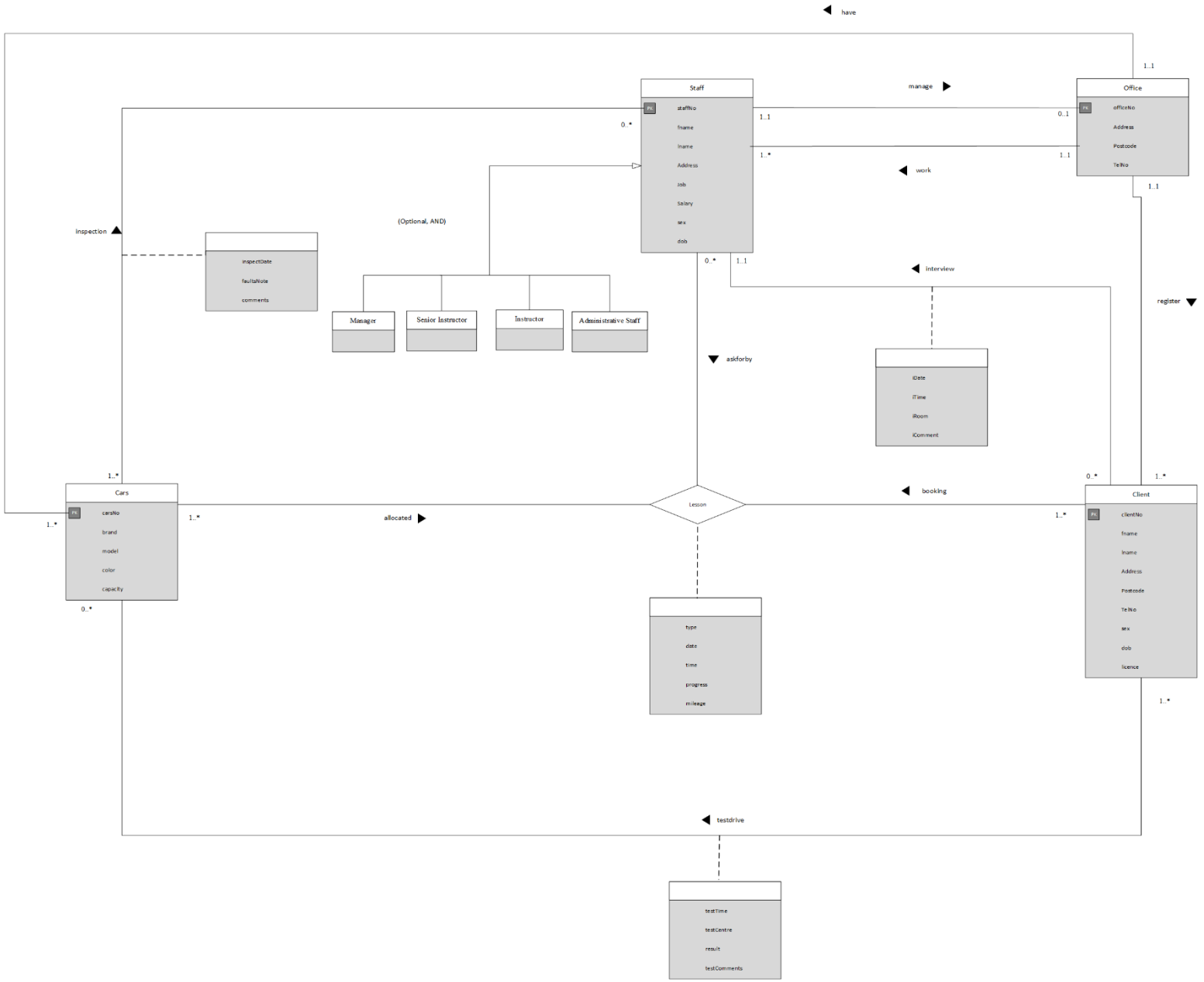
2.1.8. Complex relationship types

Tidak dibuat

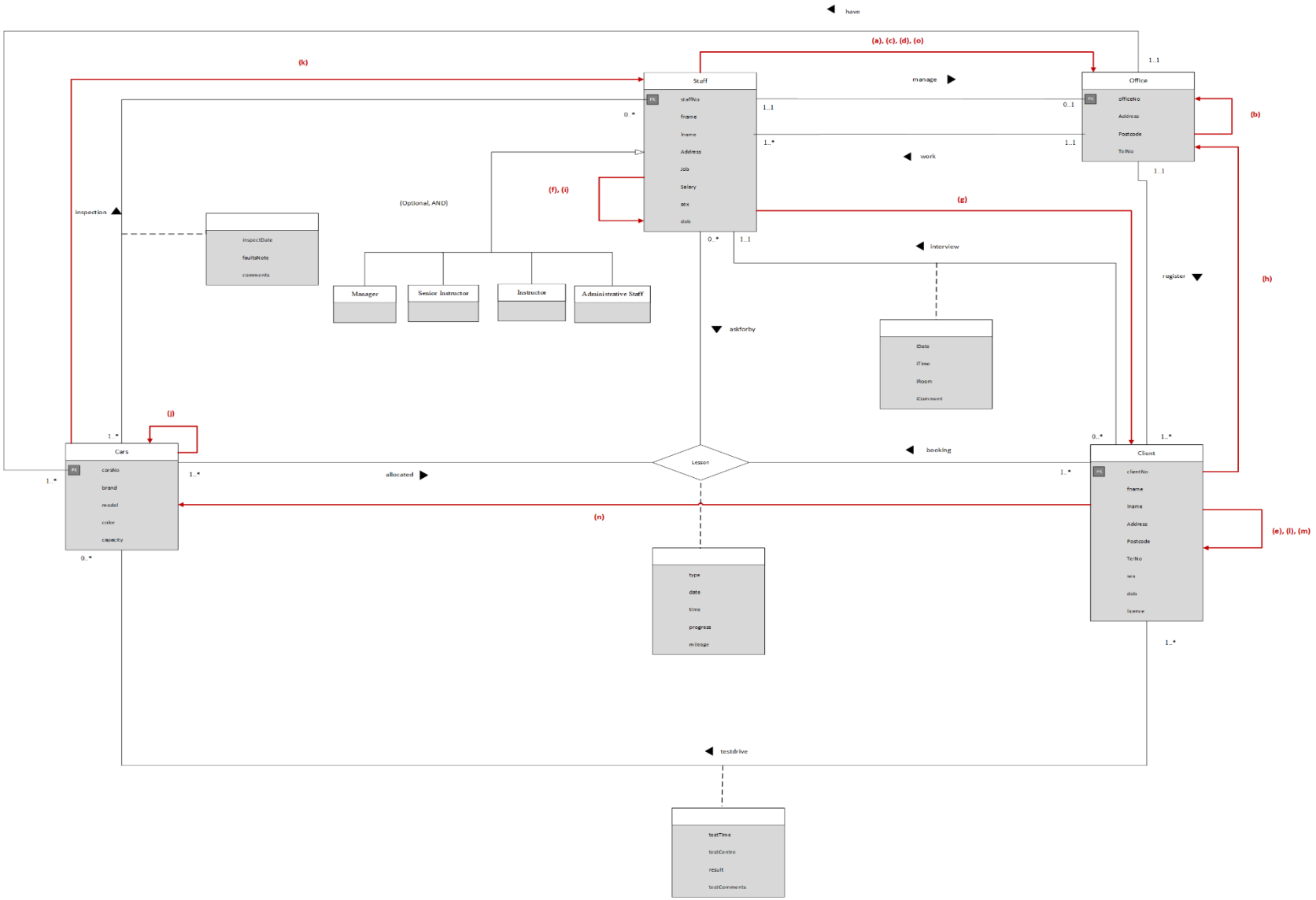
2.1.9. Multi-valued attributes

Tidak dibuat

Step 1.6 Consider use of enhanced modeling concepts (optional step) Tidak diperlukan. – kerjakan sebagai tugas karena staff memiliki jabatan berbeda


have
1..1
Staff
staffNo
fname
lname
Address
Job
Salary
sex
dob
manage
1..1
0..1
Office
officeNo
Address
Postcode
TelNo
0..*
1..*
work
1..1
1..1
Inspection
(Optional, AND)
inspectDate
faultsNote
comments
Manager
Senior Instructor
Instructor
Administrative Staff
0..*
1..1
interview
register
askforby
iDate
iTime
iRoom
iComment
1..*
0..*
1..*
Cars
carsNo
brand
model
color
capacity
1..*
1..*
allocated
Lesson
booking
0..*
1..*
Client
clientNo
fname
lname
Address
Postcode
TelNo
sex
dob
licence
type
date
time
progress
mileage
1..*
testdrive
testTime
testCentre
result
testComments

Step 1.8 Validate conceptual model against user transactions Lakukan seperti pada latihan – kerjakan sebagai tugas –



Concept and Design

ERD

Employee (NIN, fName, lName, address, DOB, sex, salary, taxCode, deptNo)

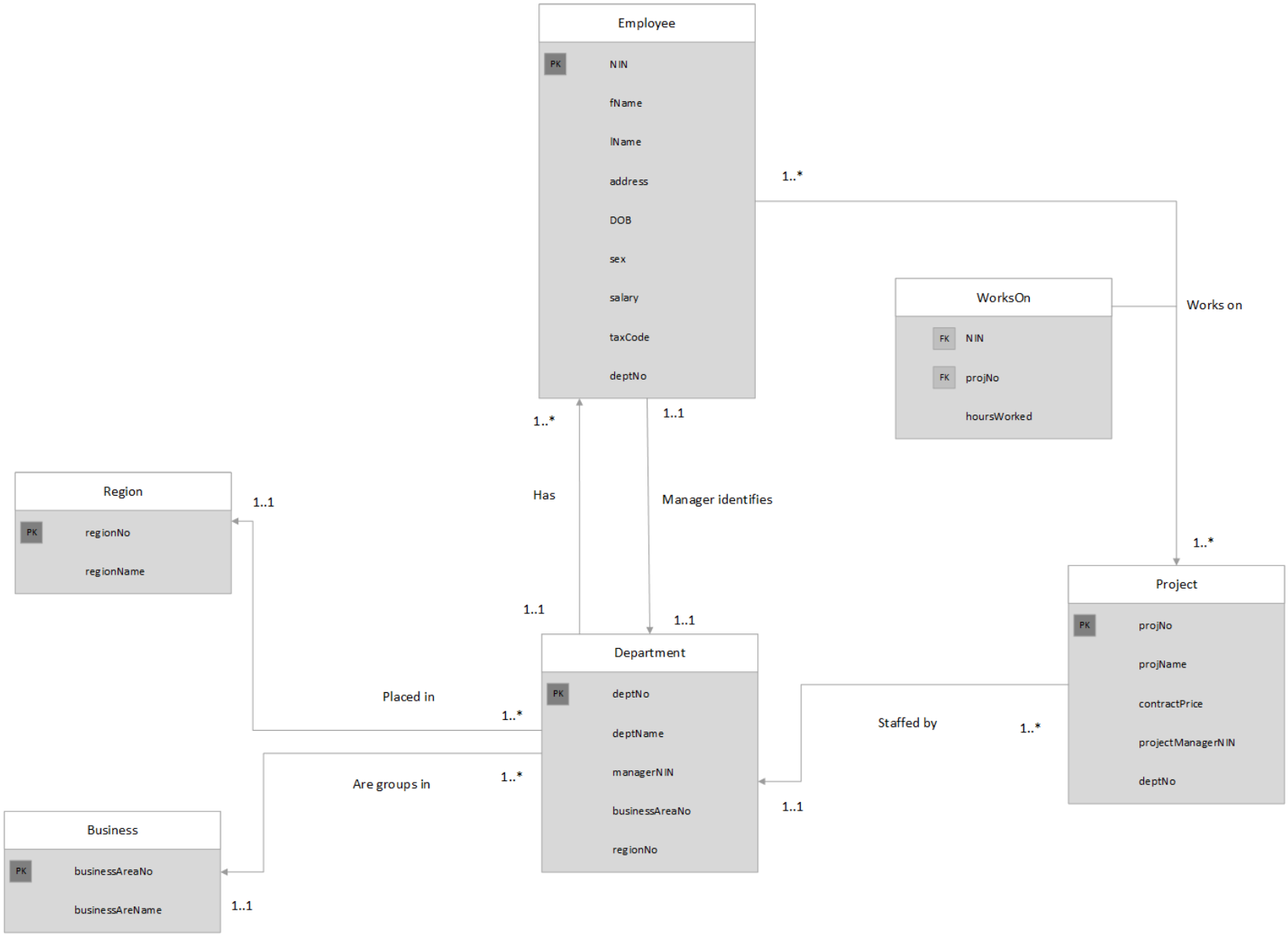
Department (deptNo, deptName, managerNIN, businessAreaNo, regionNo)

Project (projNo, projName, contractPrice, projectManagerNIN, deptNo)

WorksOn (NIN, projNo, hoursWorked)

Business (businessAreaNo, businessAreaName)

Region (regionNo, regionName)


Employee
PK
NIN
fName
lName
address
DOB
sex
salary
taxCode
deptNo
1..*
Works on
WorksOn
FK
NIN
FK
projNo
hoursWorked
1..*
1..1
Has
Manager identifies
1..1
1..1
Region
PK
regionNo
regionName
1..1
Placed in
1..*
Department
PK
deptNo
deptName
managerNIN
businessAreaNo
regionNo
Staffed by
1..*
1..1
Project
PK
projNo
projName
contractPrice
projectManagerNIN
deptNo
Are groups in
1..*
Business
PK
businessAreaNo
businessAreName
1..1

Business

businessAreaNo	businessAreaName
BAN01	Software Engineering
BAN02	Mechanical Engineering
BAN03	Electrical Engineering

Region

regionNo	regionName
RN01	Scotland
RN02	Wales
RN03	England

Employee

NIN	fName	lName	address	DOB	sex	salary	taxCode	deptNo
82519001	Andi	Tjung	111 Chicken Street	11/01/1981	M	1500000	142A	DN01
82519002	Budi	Lorenzo	112 Salmon Street	12/02/1990	M	2000000	256B	DN02
82519003	Charlie	Petersen	113 Jason Street	14/03/1992	M	2000000	374C	DN01
82519004	Dani	Sanky	114 Jewel Street	21/04/1994	M	3000000	485D	DN03
82519005	Elenor	Jeane	115 Jans Street	25/05/1989	F	2500000	582E	DN02

Department

deptNo	deptName	managerNIN	businessAreaNo	regionNo
DN01	Human Resource	82519001	BAN01	RN03
DN02	Marketing	82519002	BAN02	RN02
DN03	Accounting	82519003	BAN01	RN01
DN04	IT	82519004	BAN03	RN03
DN05	Research	82519005	BAN02	RN02

WorksOn

NIN	ProjectNo	hoursWorked
258180001	PN01	24
258180002	PN02	18

258180003	PN04	16
258180004	PN03	32
258180005	PN05	22

Project

projNo	projName	contractPrice	projectManagerNIN	deptNo
PN01	Enhanced Value	200	528170001	DN01
PN02	Asiap Finance	150	528170009	DN03
PN03	Start Sales	350	528170010	DN04
PN04	Pivot Finance	400	528170011	DN02
PN05	Sukses Sales	250	528170017	DN05

Horizontal fragmentation untuk Department

D1 = **σ** regionNo = 'RN01' (Department)

D2 = **σ** regionNo = 'RN02' (Department)

D3 = **σ** regionNo = 'RN03' (Department)

D1

deptNo	deptName	managerNIN	businessAreaNo	regionNo
DN03	Accounting	82519003	BAN01	RN01

D2

deptNo	deptName	managerNIN	businessAreaNo	regionNo
DN02	Marketing	82519002	BAN02	RN02
DN05	Research	82519005	BAN02	RN02

D3

deptNo	deptName	managerNIN	businessAreaNo	regionNo
DN01	Human Resource	82519001	BAN01	RN03
DN04	IT	82519004	BAN03	RN03

Completeness: Setiap tupel dalam relasi muncul di fragmen D1 atau D2 atau D3.

Reconstruction: Relasi businessDept dapat direkonstruksi dari fragmen menggunakan operasi Union:

D1 ∪ D2 ∪ D3 = Department.

Disjointness: Fragmentasi bersifat disjoint; Tidak ada departement yang memiliki region RN01, RN02, dan RN03 disaat bersamaan.

Vertikal Fragmentasi untuk Employee

E1=ΠNIN, fName, lName, address, DOB, sex, deptNo(Employee)

E2=ΠNIN, salary, taxCode (Employee)

E1

NIN	fName	lName	Address	DOB	Sex	deptNo
82519001	Andi	Tjung	111 Chicken Street	11/01/1981	M	DN01
82519002	Budi	Lorenzo	112 Salmon Street	12/02/1990	M	DN02
82519003	Charlie	Petersen	113 Jason Street	14/03/1992	M	DN01

E2

NIN	Salary	taxCode
82519001	1500	142A
82519002	2000	256B
82519003	2000	374C

Completeness: Setiap atribut dalam relasi Employee muncul di Fragment E1 atau E2

Reconstruction: Relasi Employee dapat direkomendasi dari fragmen menggunakan operasi natural join, E1 ⋈ E2 = Employee

Disjointness: Semua fragmentasi bersifat disjoint kecuali primary key, yang penting untuk proses reconstruction.

Derived fragmentation untuk Project

Pi = Project $\triangleright_{\text{deptNo}}$ Si , $1 \leq i \leq 5$

P1

projNo	projName	contactPrice	projectManagerNIN
PN01	Enhanced Value	30000	528170001

P2

projNo	projName	contactPrice	projectManagerNIN
PN02	Asiap Finance	50000	528170009

P3

projNo	projName	contactPrice	projectManagerNIN
PN03	Start Sales	20000	528170010

P4

projNo	projName	contactPrice	projectManagerNIN
PN04	Pivot Finance	39000	528170011

P5

projNo	projName	contactPrice	projectManagerNIN
PN05	Sukses Sales	70000	528170017

Derived fragmentation untuk Works On

Pi = WorksOn $\triangleright_{projNo}$ Si , $1 \leq i \leq 5$

PN1

NIN	HouseWorked
258180001	24

PN2

NIN	HouseWorked
258180002	18

PN3

NIN	HouseWorked
258180003	16

PN1

NIN	HouseWorked
258180004	32

PN5

NIN	HouseWorked
258180005	22

Query Processing

1.b. Salah, karena disini terdapat proses join antara 3 tabel, namun hanya ada penggabungan antar tabel hotel dan booking. tabel guest (g) disini tidak digabungkan.

```
SELECT g.guestNo, g.name
FROM Hotel h, Booking b, Guest g
WHERE h.hotelNo = b.hotelNo AND g.guestNo = b.guestNo AND h.hotelName = 'Grosvenor Hotel';
```

1.c. Salah, karena row yang di select tidak perlu adanya operasi join. hanya dibutuhkan tabel dari room. terdapat pula kontradiksi terhadap hotelNo (h.hotelNo = 'H21' AND b.hotelNo = 'H22')

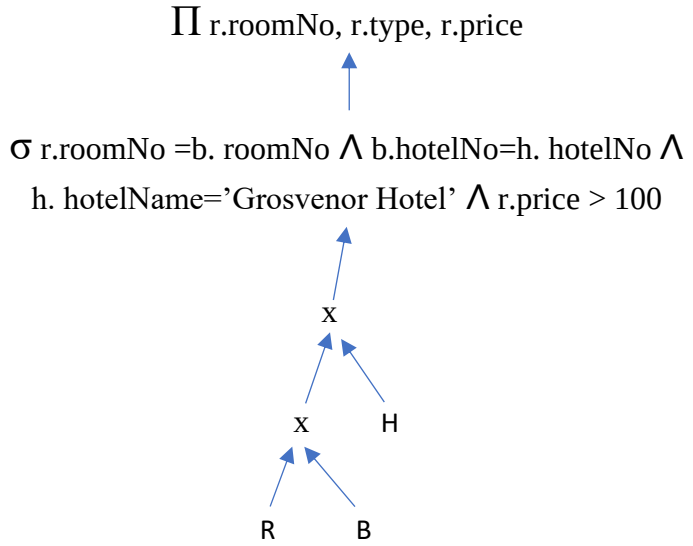
```
SELECT roomNo, hotelNo
FROM Room
WHERE type = 'S' AND hotelNo = 'H21' OR hotelNo = 'H22'
```

2. a.
```
SELECT r.roomNo, r.type, r.price
FROM Room r, Booking b, Hotel h
WHERE r.roomNo = b.roomNo AND b.HotelNo = h.hotelNo AND h.hotelName='Grosvenor Hotel' AND r.price > 100;
```

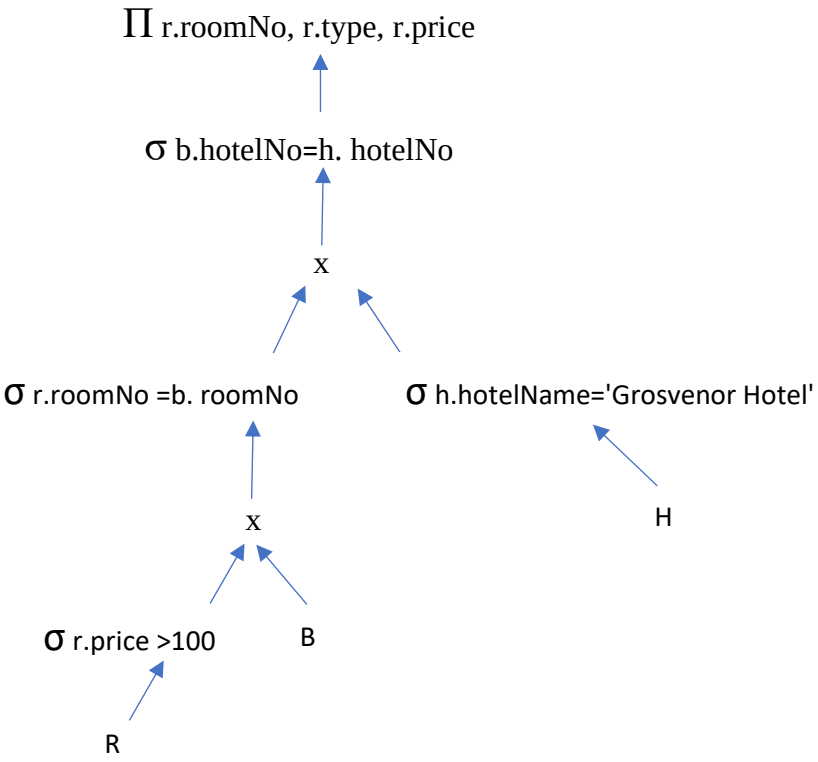
RA :

Π r.roomNo, r.type, r.price (σ r.roomNo = b.roomNo $\wedge$ b.hotelNo = h.hotelNo $\wedge$ h.hotelName='Grosvenor Hotel' $\wedge$ r.price > 100 ((r x b) x h))

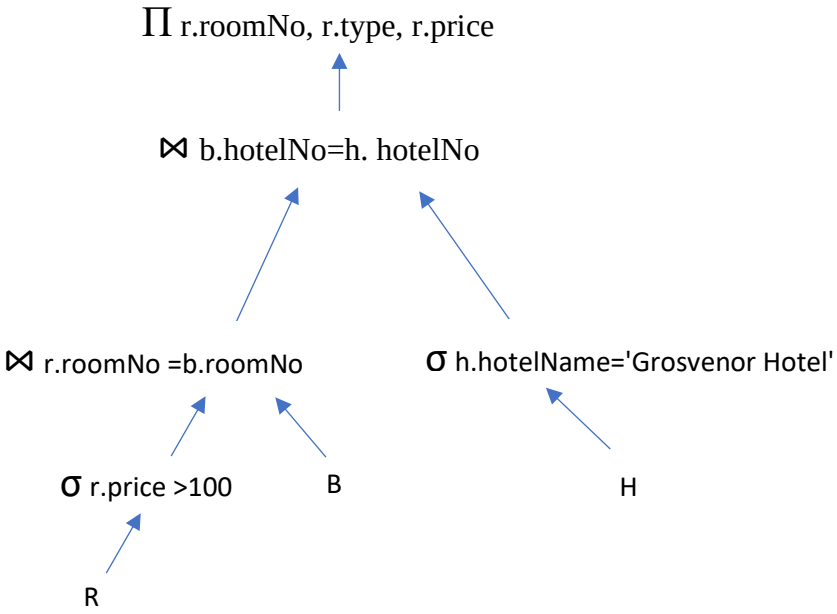
a.



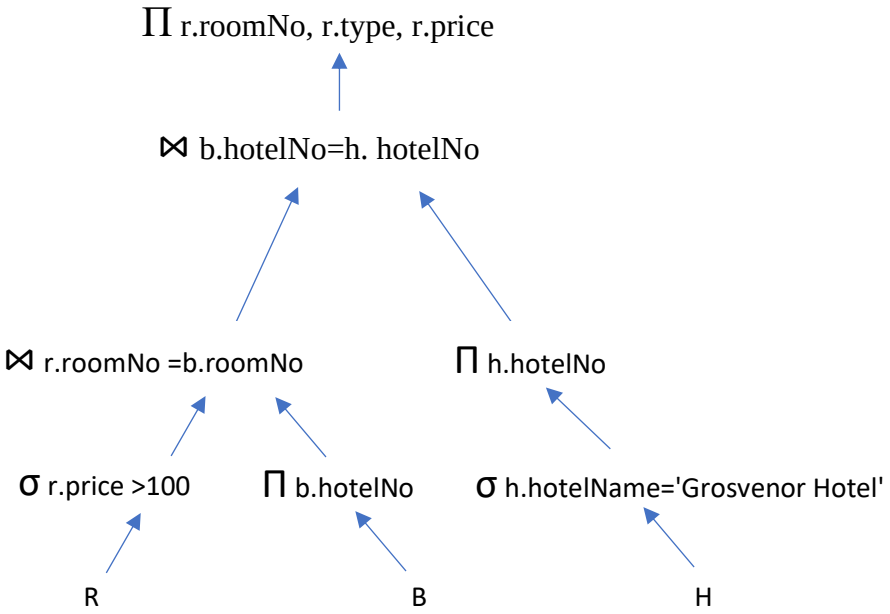
b.
Aturan 1, memisahkan conjunction dari operasi Selection menjadi operasi Selection individual. Aturan 2 dan Aturan 6, susun kembali operasi Selection dan kemudian melakukan perubahan Selections and Cartesian products.



c. Menyederhanakan operasi selection dengan predikat equijoin dan cartesian product



d. Hasil



b. SELECT g.guestNo, g.guestName

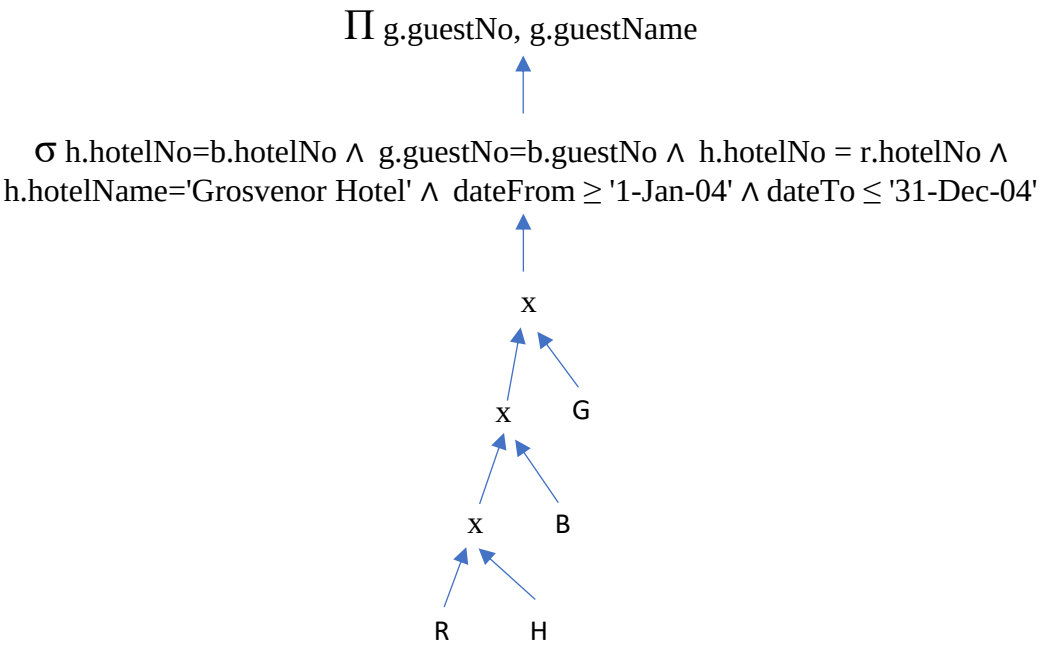
FROM Room r, Hotel h, Booking b, Guest g

WHERE h.HotelNo = b.hotelNo AND g.guestNo = b.guestNo AND h.hotelNo = r.hotelNo AND h.hotelName='Grosvenor Hotel' AND dateFrom ≥ '1-Jan-04' AND dateTo ≤ '31-Dec-04';

RA :

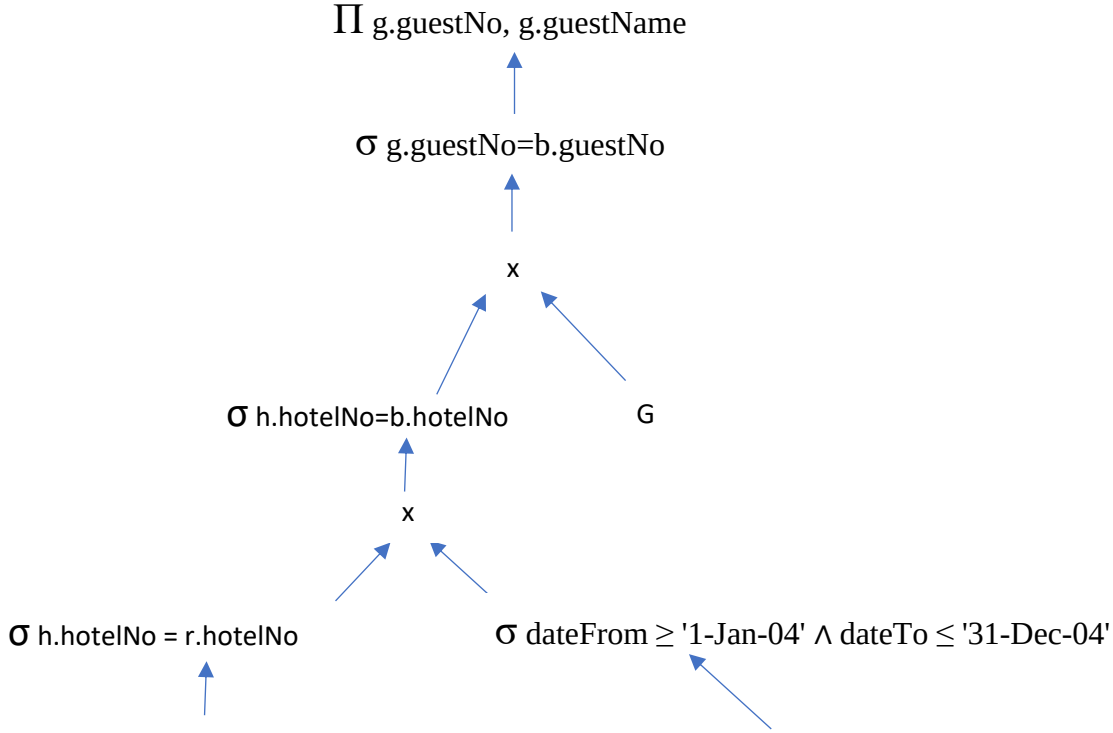
Π g.guestNo, g.guestName (σ h.hotelNo=b.hotelNo ∧ g.guestNo=b.guestNo ∧ h.hotelNo = r.hotelNo ∧ h.hotelName='Grosvenor Hotel' ∧ dateFrom ≥ '1-Jan-04' ∧ dateTo ≤ '31-Dec-04' ((h x b) x r x g))

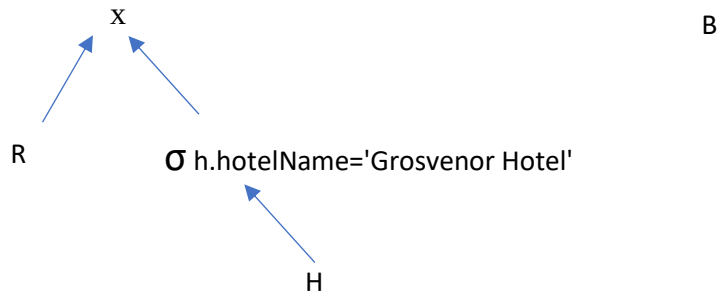
a.



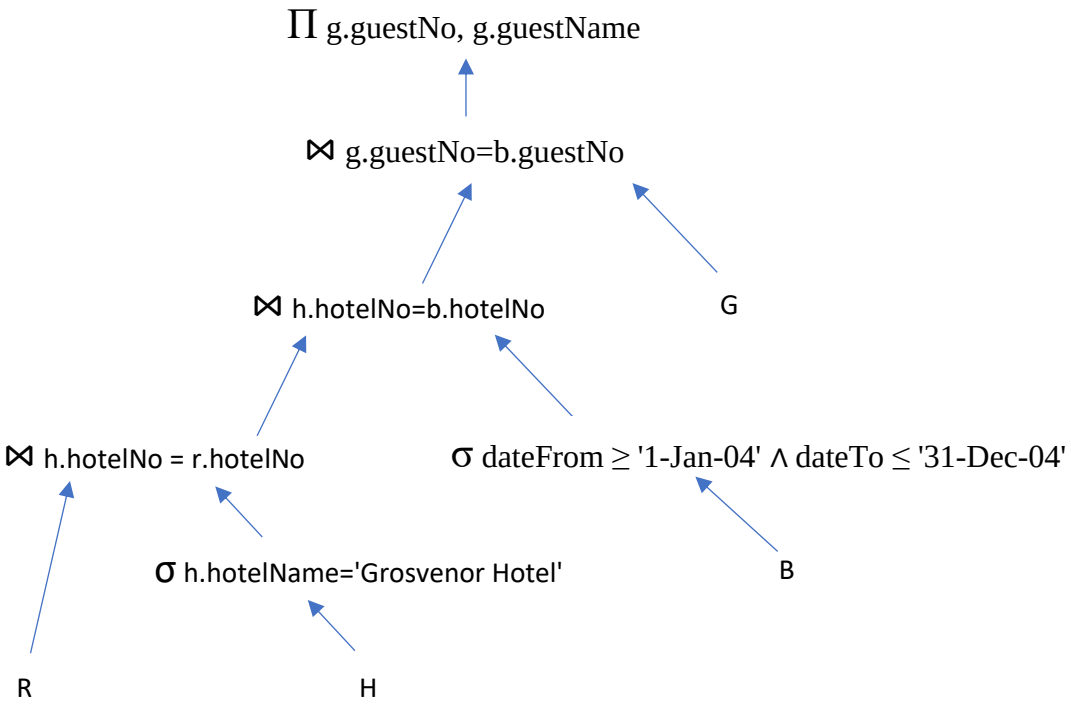
b.

Aturan 1, memisahkan conjunction dari operasi Selection menjadi operasi Selection individual. Aturan 2 dan Aturan 6, susun kembali operasi Selection dan kemudian melakukan perubahan Selections and Cartesian products.

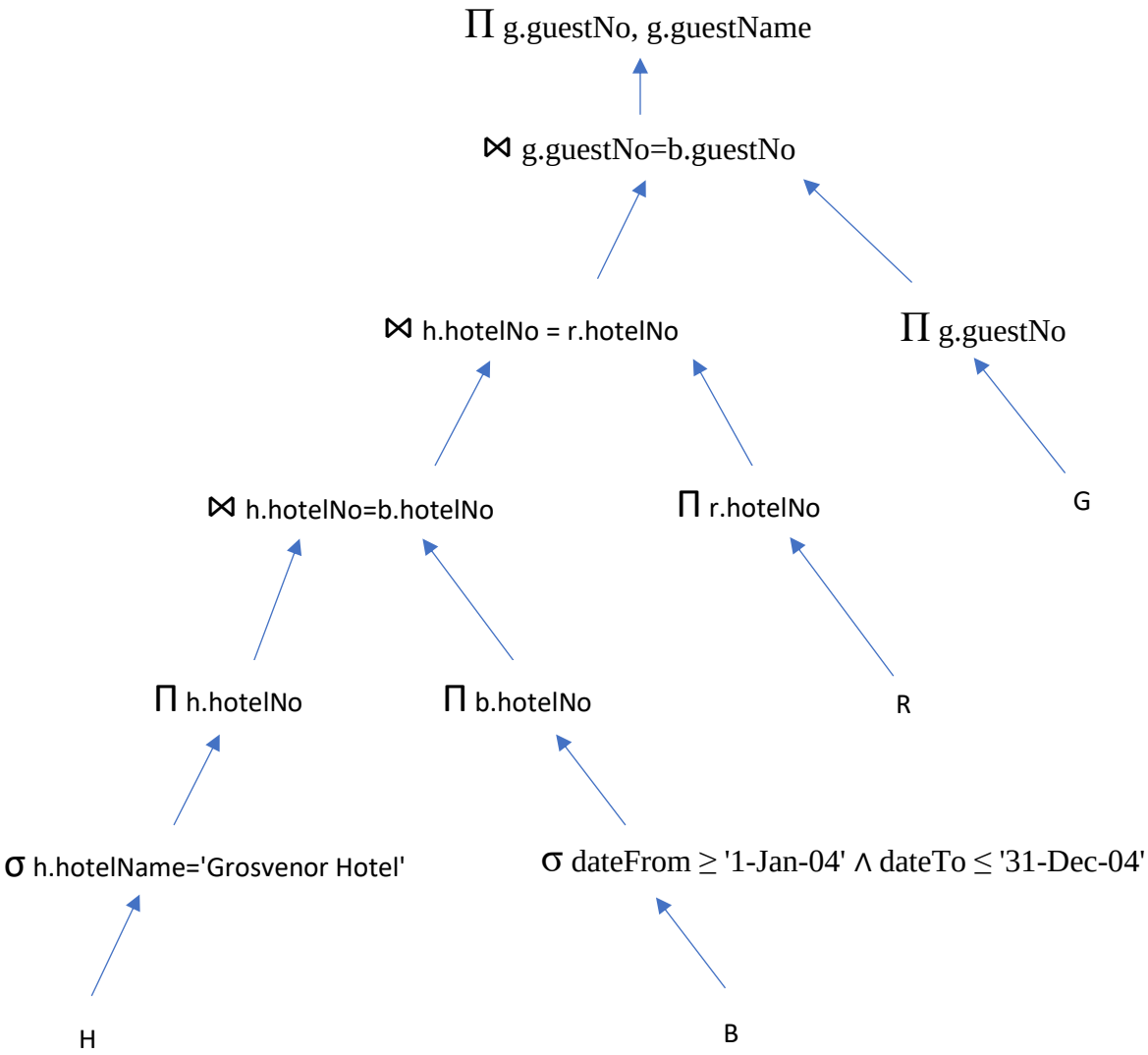




c. . Menyederhanakan operasi selection dengan predikat equijoin dan cartesian product



d.


Π g.guestNo, g.guestName
⋈ g.guestNo=b.guestNo
⋈ h.hotelNo = r.hotelNo
Π g.guestNo
⋈ h.hotelNo=b.hotelNo
Π r.hotelNo
G
Π h.hotelNo
Π b.hotelNo
R
σ h.hotelName='Grosvenor Hotel'
σ dateFrom ≥ '1-Jan-04' ∧ dateTo ≤ '31-Dec-04'
H
B