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Database Systems

Project Part 2

2. Develop a logical data model based on the following requirements: (11/21/24)

a. Derive relations from the conceptual model.

Clinic(<u>ClinicNo PK</u>, ClinicName, ClinicAddress, ClinicTelephoneNumber,

StaffNo FK)

PetOwner(<u>OwnerNo PK</u>, OwnerName, OwnerAddress, OwnerTelephoneNumber)

Pet(<u>PetNo PK,</u> PetName, PetDOB, AnimalSpecies, Breed, Color, OwnerNo FK,
ClinicNo FK)

Examination(<u>ExamNo PK</u>, ChiefComplaint, Description, DateSeen, ActionTaken,
PetNo FK, StaffNo FK)

Staff(<u>StaffNo PK</u>, StaffName, StaffAddress, StaffTelephoneNumber, StaffDOB,
Position, Salary, ClinicNo FK)

b. Validate the logical model using normalization to 3NF.

Validation of 1NF

- There are no multivalued attributes or repeating groups
- Each attribute contains atomic values
- Each table has a clearly defined primary key

Validation of 2NF
- There are not partial dependencies

Validation of 3NF

Clinic(<u>ClinicNo PK</u>, ClinicName, ClinicAddress, ClinicTelephoneNumber,
StaffNo)

Assumption: ClinicTelephoneNumber is unique

- StaffNo refers to Staff(StaffNo)
- There are no transitive dependencies

PetOwner(<u>OwnerNo PK</u>, OwnerName, OwnerAddress,
OwnerTelephoneNumber)

Assumption: OwnerTelephoneNumber is unique

- All attributes are directly linked to OwnerNo
- There are to transitive dependencies

Pet(<u>PetNo PK,</u> PetName, PetDOB, AnimalSpecies, Breed, Color, OwnerNo FK, ClinicNo FK)

Assumption: A pet is registered only at one clinic

- OwnerNo refers to Owner(OwnerNo)
- ClinicNo refers to Clinic(ClinicNo)
- There are to transitive dependencies

Examination(<u>ExamNo PK</u>, ChiefComplaint, Description, DateSeen, ActionTaken, PetNo FK, StaffNo FK)

- PetNo refers to Pet(PetNo)
- StaffNo refers to Staff(StaffNo)
- There are to transitive dependencies

c. Validate the logical model against 5 user transactions. (Note: These will be then implemented in 3c).

Insert a row into the Clinic Table with details: ClinicNo, ClinicName, ClinicAddress, ClinicTelephoneNumber, StaffNo

(C001, Peanuts Clinic, 2244 James Street, 123-045-6789, P1001, S001)

The row contains no redundancies. The StaffNo foreign key ensures referential integrity by maintaining one staff member as the manager to the Clinic.

Insert a new row into the PetOwner table with details: OwnerNo, OwnerName, OwnerAddress, and OwnerTelephoneNumber

(O101, Charlie Brown, 1770 James Street, 123-456-7890)

The row contains no redundancies

Insert a new row into the Pet table with details: PetNo, PetName, PetDOB, AnimalSpecies, Breed, Color, OwnerNo, CliniNo

(P1001, Snoopy, 08/10/2023, Beagle, White, O101, C001)

The row does not contain any redundancies and ensures there is consistent referential integrity. The OwnerNo Foreign Key ensures the Pet belong to the correct owner and ClinicNo ensures the pet is registered at one clinic

Insert a row into the Examination table with details: ExamNo, ChiefComplaint, Description, DateSeen, ActionTaken, PetNo, StaffNo

(E201, Ear Infection, Owner brought in dog with signs of ear infection, 09/23/2023, Prescribed Ear Drops, P1001, S001)

The row does not contain any redundancies and ensures there is consistent referential integrity. The PetNo Foreign Key ensures that the examination is done on a valid pet and the StaffNo Foreign Key ensures that the examination is done by a valid staff member

Inset a row to the Staff Table with details: StaffNo, StaffName, StaffAddress, StaffTelephoneNumber, StaffDOB, Position, Salary, ClinicNo

(S001, John Smith, 123 Main St, 123-987-0456, 03/19/1989, Lead Examiner, 60000, C001)

The row contains no redundancies and ensures there is consistent referential integrity. The ClinicNo ensures that the staff member works at a valid clinic.

d. Define integrity constraints:

Clinic

i. Primary key constraints.

- Primary Key (ClinicNo) Unique

ii. Referential integrity/Foreign key constraints.

- Foreign Key (StaffNo) Unique

iii. Alternate key constraints (if any)

- Alternate Key ClinicTelephoneNumber UNIQUE

iv. Required data

- ClinicNo NOT NULL
- ClinicName NOT NULL,
- ClinicAddress NOT NULL,
- ClinicTelephoneNumber NOT NULL

- StaffNo NOT NULL

v. Attribute domain constraints

- ClinicNo Char
- ClinicName Char
- ClinicAddress VarChar
- ClinicTelephoneNumber VarChar
- CHECK (ClinicTelephoneNumber LIKE '___-___-____')
- StaffNo Char

vi. General constraints (if any)

- Only one staff member can manager one and only one Clinic

PetOwner

i. Primary key constraints.

- Primary Key(PetOwnerNo) UNIQUE

ii. Referential integrity/Foreign key constraints.

No Foreign Key

iii. Alternate key constraints (if any)

Alternate Key OwnerTelephoneNumber UNIQUE

iv. Required data

- PetOwnerNo NOT NULL
- OwnerName NOT NULL,
- OwnerAddress NOT NULL,
- OwnerTelephoneNumber NOT NULL

v. Attribute domain constraints

- PetOwnerNo VarChar
- OwnerName Char
- OwnerAddress VarChar
- OwnerTelephoneNumber VarChar
- CHECK (OwnerTelephoneNumber LIKE '___-___-____')

Pet

i. Primary key constraints

- Primary Key (PetNo) UNIQUE

ii. Referential integrity/Foreign key constraints

- Foreign Key (OwnerNo)

  Foreign Key OwnerNo REFERENCES to Owner(OwnerNo)

- Foreign Key (ClinicNo)

  Foreign Key ClinicNo REFERENCES Clinic(ClinicNo)

iv. Required data

- PetNo NOT NULL
- PetName NOT NULL
- PetDOB NOT NULL
- AnimalSpecies NOT NULL
- Breed NOT NULL
- Color NOT NULL
- OwnerNo NOT NULL
- ClinicNo NOT NULL

v. Attribute domain constraints

- PetNo VarChar
- PetName Char
- PetDOB Date
- CHECK (PetDOB <= Current date)
- AnimalSpecies Char
- Breed Char
- Color Char
- OwnerNo VarChar
- ClinicNo VarChar

vi. General constraints (if any)

No Pet Can be registered at more than one clinic or have more than one owner. An Owner Can have many pets

Examination

i. Primary key constraints

- Primary Key (ExamNo) UNIQUE

ii. Referential integrity/Foreign key constraints

- Foreign Key (StaffNo)

  Foreign Key PetNo REFERENCES to Pet(PetNo)

- Foreign Key (StaffNo)

  Foreign Key StaffNo REFERENCES to Staff(StaffNo)

iii. Alternate key constraints (if any)

  No Alternate Key Selected

iv. Required data

- ExamNo NOT NULL
- ChiefComplaint NOT NULL
- Description NOT NULL
- DateSeen NOT NULL
- ActionTaken NOT NULL
- PetNo UNIQUE
- StaffNo UNIQUE

v. Attribute domain constraints

- ExamNo Varchar
- ChiefComplaint Char
- Description Char
- DateSeen Date
- ActionTaken Char
- PetNo Varchar
- StaffNo Varchar

vi. General constraints (if any)

No General Constraints

Staff

i. Primary key constraints

- Primary Key (StaffNo) UNIQUE

ii. Referential integrity/Foreign key constraints

- Foreign Key ClinicNo

  Foreign Key ClinicNo REFERENCES to Clinic(ClinicNo)

iii. Alternate key constraints (if any)

- Alternate Key (StaffTelephoneNumber) UNIQUE

iv. Required data

- StaffNo NOT NULL
- StaffName NOT NULL
- StaffAddress NOT NULL
- StaffTelephoneNumber NOT NULL
- StaffDOB NOT NULL
- Position NOT NULL
- Salary NOT NULL
- ClinicNo NOT NULL

v. Attribute domain constraints.

- StaffNo VarChar
- StaffName Char
- StaffAddress VarChar
- Alternate Key StaffTelephoneNumber VarChar
- CHECK (StaffTelephoneNumber LIKE '___-___-____')
- StaffDOB Date
- Position Char
- Salary INT
- ClinicNo VarChar

vi. General constraints (if any)

No General Constraints

e. Generate the E-R diagram for the logical level (contains FKs as attributes).

Clinic

ClinicNo (PK)	VarChar
ClinicName	Char
ClinicAddress	VarChar
ClinicTelephoneNumber	VarChar
StaffNo (FK)	VarChar

PetOwner

OwnerNo (PK)	VarChar
OwnerName	Char
OwnerAddress	VarChar
OwnerTelephoneNumber	VarChar

1...1 Is registered ▲

1...1 has ▼

0...1 1...1

Manages ▲ Has ▼

1...* 1...*

Pet

PetNo (PK)	VarChar
PetName	Char
PetDOB	Date
AnimalSpecies	Char
Breed	Char
Color	Char
OwnerNo (FK)	VarChar
ClinicNo (FK)	VarChar

1...1 1...*

1...1 Undergoes ▼

1...*

Staff

StaffNo (PK)	VarChar
StaffName	Char
StaffAddress	VarChar
StaffTelephoneNumber	VarChar
StaffDOB	Date
Position	Char
Salary	Int
ClinicNo (FK)	VarChar

Examination

ExamNo (PK)	VarChar
ChiefComplaint	Char
Description	Char
DateSeen	Date
ActionTaken	Char
PetNo (FK)	VarChar
StaffNo (FK)	VarChar

1...1 Performs ▶ 1...*