Nolan McCarter

CSC 423 - Database Systems

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Project: Part 2

2a).

Relations for Pawsome Pets:

Clinic (clinicNo, name, address, telephoneNo, staffNo) Primary Key: clinicNo Foreign Key: staffNo **references** Staff(staffNo)
Staff (staffNo, name, address, telephoneNo, DOB, position, salary, clinicNo) Primary Key: staffNo Foreign Key: clinicNo **references** Clinic(clinicNo)
PetOwner (ownerNo, name, address, telephoneNo, clinicNo) Primary Key: ownerNo Foregin Key: clinicNo **references** Clinic(clinicNo)
Pet (petNo, name, DOB, species, breed, color, ownerNo, clinicNo) Primary Key: petNo Foreign Keys: ownerNo **references** Owner(ownerNo) and clinicNo **references** Clinic(clinicNo)
Examination (examNo, chiefComplaint, description, dateSeen, actionsTaken, staffNo, petNo) Primary Key: examNo Foregin Keys: staffNo **references** Staff(staffNo) and petNo **references** Pet(petNo)

Clinic Has Staff:

1:* relationship
Entity on ‘one side’ - Clinic → parent entity
Entity on ‘many side’ Staff → child entity
Copy the primary key of parent entity (clinicNo) to the child entity (Staff) → acts as a FK of the child entity - clinicNo is a FK of Staff

Staff Manages Clinic:

1:1 relationship with Mandatory participation on Clinic side of relation
Staff → parent entity
Clinic → child entity
Primary key of the parent entity → foreign key in the child entity - staffNo FK in Clinic

PetOwner Owns Pet:

1:* relationship
Entity on 'one side' - PetOwner → parent entity
Entity on 'many side' Pet → child entity
Copy the primary key of parent entity (ownerNo) to the child entity (Pet) → acts as a FK of the child entity - ownerNo is a FK of Pet

Pet RegisteredBy Clinic:

1:* relationship
Entity on 'one side' - Clinic → parent entity
Entity on 'many side' Pet → child entity
Copy the primary key of parent entity (clinicNo) to the child entity (Pet) → acts as a FK of the child entity - clinicNo is a FK of Pet

Clinic ContactedBy PetOwner: ***Assuming that a PetOwner in the DB must be registered with

a clinic

1:* relationship
Entity on 'one side' - Clinic → parent entity
Entity on 'many side' PetOwner → child entity
Copy the primary key of parent entity (clinicNo) to the child entity (PetOwner) → acts as a FK of the child entity - clinicNo is a FK of PetOwner

Pet Undergoes Examination:

1:* relationship
Entity on 'one side' - Pet → parent entity
Entity on 'many side' Examination → child entity

Copy the primary key of parent entity (petNo) to the child entity (Examination) → acts as a FK of the child entity - petNo is a FK of Examination

Staff ParticipatesIn Examination:

1:* relationship
Entity on ‘one side’ - Staff → parent entity
Entity on ‘many side’ Examination → child entity
Copy the primary key of parent entity (staffNo) to the child entity (Examination) → acts as a FK of the child entity - staffNo is a FK of Examination

2.b)

Partial Dependencies: There are no partial dependencies in the logical model because each primary key is a unique single attribute to identify the other attributes of the entity.

Transitive Dependencies: There are no transitive dependencies in the logical model because each primary key uniquely identifies all attributes of the entity and no non-key attribute determines any attributes.

Therefore the logical model is indeed in 3NF form.

2.c)

- List all staff numbers and names of those with the position ‘Manager’as with their corresponding clinic numbers and names.

Would check that Staff.position = “Manager” in the Staff entity, select those Staff.staffNo and Staff.name then use foreign key staffNo to join relations Clinic and Staff relations to select Clinic.clinicNo and Clinic.name.

- List the names and phone numbers of owners of pets with the breed ‘Husky’.

Would check that Pet.breed = “Husky” in the Pet entity then use foreign key ownerNo to join the relations and list the satisfying PetOwner.name and their PetOwner.telephoneNo attributes.

- List all staff that work in the Coral Gables clinic and have a salary greater than $50,000.

Would check that Clinic.name = “Coral Gables” and using foreign key clinicNo join Clinic and Staff entities then filter by Staff.salary > 50,000.

- List all pets belonging to John Smith including their species, breed and color.

Would join Pet and PetOwner tables using foreign key ownerNo, check that PetOwner.name = “John Smith” and select Pet.name, Pet.species, Pet.breed and Pet.color.

- List all the cats that underwent an examination on November, 15 2022.

Would check that Examination.dateSeen = “2022-11-15” and then using the petNo foreign key would join Examination and Pet entities. Next it must check Pet.species = “Cat” and select the Pet.petNo and Pet.name attributes.

2.d)

i). Primary Key constraints:

clinicNo → name, address, telephoneNo, staffNo

staffNo → name, address, telephoneNo, DOB, position, salary, clinicNo

ownerNo → name, address, telephoneNo, clinicNo

petNo → DOB, species, breed, color, ownerNo, clinicNo

examNo → chiefComplaint, description, dateSeen, actionsTaken, staffNo, petNo

By definition primary keys cannot be null and must be unique.

There are no other dependencies so there are no partial or transitive dependencies

ii). Referential Integrity/Foreign Key Constraints:

- Foreign Key staffNo in Clinic **references** Staff(staffNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foreign Key clinicNo in Staff **references** Clinic(clinicNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foreign Key clinicNo in PetOwner **references** Clinic(clinicNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foreign Key ownerNo in Pet **references** Owner(ownerNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foreign Key clinicNo in Pet **references** Clinic(clinicNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foregin Key staffNo in Examination **references** Staff(staffNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION
- Foreign Key petNo in Examination **references** Pet(petNo)
    - ON UPDATE CASCADE ON DELETE NO ACTION

iii). Alternate Key Restraints

Although there are no obvious alternate keys in this logical model, if we assume that each Clinic has a unique landline number telephoneNo in Clinic would be an Alternate Key. However this assumption would not work for Staff or PetOwner because it is possible the PetOwner is a member of Staff and there would be duplicate telephone numbers.

Candidate Keys for Clinic
clinicNo - Primary Key
telephoneNo - Alternate Key

iv). Required Data:

All foreign keys listed in (ii) cannot be null, which is redundant because they are all primary keys of other entities.

v). Attribute Domain Constraints:

X - represents an arbitrary number

- clinicNo
    - Should be in the format of CXXX - the first clinic has a clinicNo = C001
- staffNo
    - Should be in the format of SXXX - the first staff member has a staffNo = S001
- ownerNo
    - Should be in the format of OXXX - the first owner has an ownerNo = O001
- petNo
    - Should be in the format of PXXX - the first pet has a petNo = P001
- examNo
    - Should be the format of EXXX - the first examination has an examNo = E001
- telephoneNo in Clinic, Staff and PetOwner
    - Should be 10 digits in the form of XXXXXXXXXX
- DOB in Staff and Pet as well as dateSeen in Examination
    - Should be in the following format YYYY-MM-DD where year is represented in full 4 digits, month in 2 digits and day in 2 digits - (03) for the 3rd day of a month

vi). General Constraints:

- Examination
    - dateSeen <= Current Date

Logical Model

Entity 1	Relationship	Entity 2	Participation (min)	Cardinality (max)	Multiplicity	Type of Relationship
Clinic	Has	Staff	1	*	1..*	1:*
Staff	IsPartOf	Clinic	1	1	1..1	
Staff	Manages	Clinic	0	1	0..1	1:1
Clinic	ManagedBy	Staff	1	1	1..1	
PetOwner	Owns	Pet	1	*	1..*	1:*
Pet	OwnedBy	PetOwner	1	1	1..1	
Pet	RegisteredBy	Clinic	1	1	1..1	1:*
Clinic	Registers	Pet	1	*	1..*	
Clinic	ContactedBy	PetOwner	1	*	1..*	1:*
PetOwner	Contacts	Clinic	1	1	1..1	
Pet	Undergoes	Examination	1	1	1..1	1:*
Examination	DoneOn	Pet	1	*	1..1	
Staff	ParticipatesIn	Examination	1	*	1..*	1:*
Examination	PerformedBy	Staff	1	1	1..1	

e). E-R Diagram for the Logical Level