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- CSE 414 Databases -

Assignment 1

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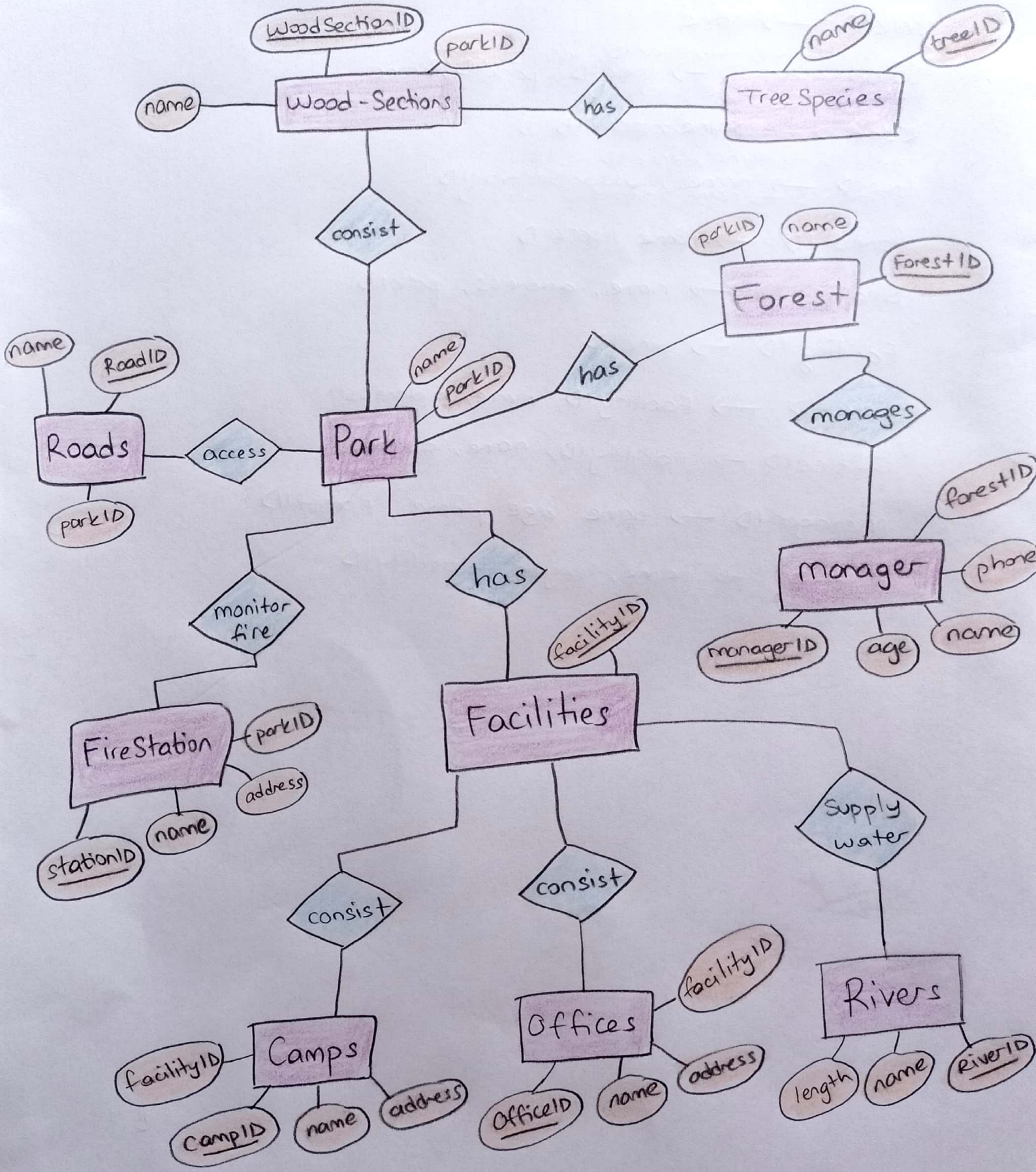
A park consists of a collection of Wood-Sections each has a number of specific species of trees. You can access everywhere by Roads. The forest also has a Manager. There are Fire-Stations in the park. Each one monitors fires in the Park. There are Facilities which consists of camps and offices in the park. There are also Rivers. Each river supply water to a different facility.

Answer the questions using the text above.

(1) Draw the E-R diagram of the park.



(2) Give all the functional dependencies in this question.

ParkID → name

WoodSectionID → treeID, parkID, none

RoadID → name, parkID

treeID → none, WoodsectionID.

forestID → none, parkID

StationID → none, address, parkID

FacilityID → parkID

CompID → FacilityID, none, address

OfficeID → FacilityID, none, address

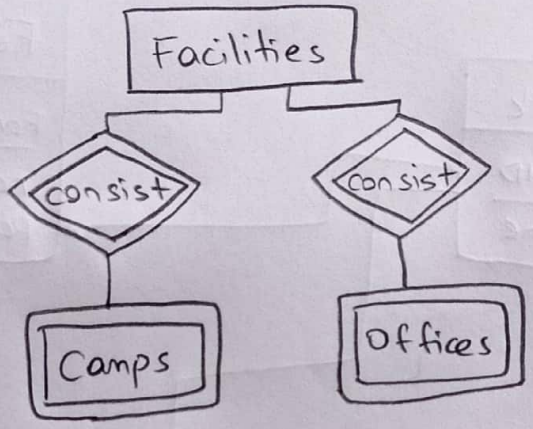
managerID → none, age, phone, ForestID

RiverID → name, length, FacilityID.

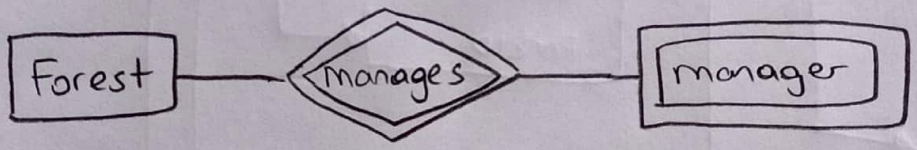
(3) Is there a weak entity in the E-R diagram. If there isn't, modify the question so that there will be a weak entity. Explain every details. Explain why you need a weak entity in both cases.

There are weak entities in my E-R diagram.

➡ Camps and offices are weak entities. Because they depend on Facilities. If facilities does not exist then camps and offices can not exist on their own.

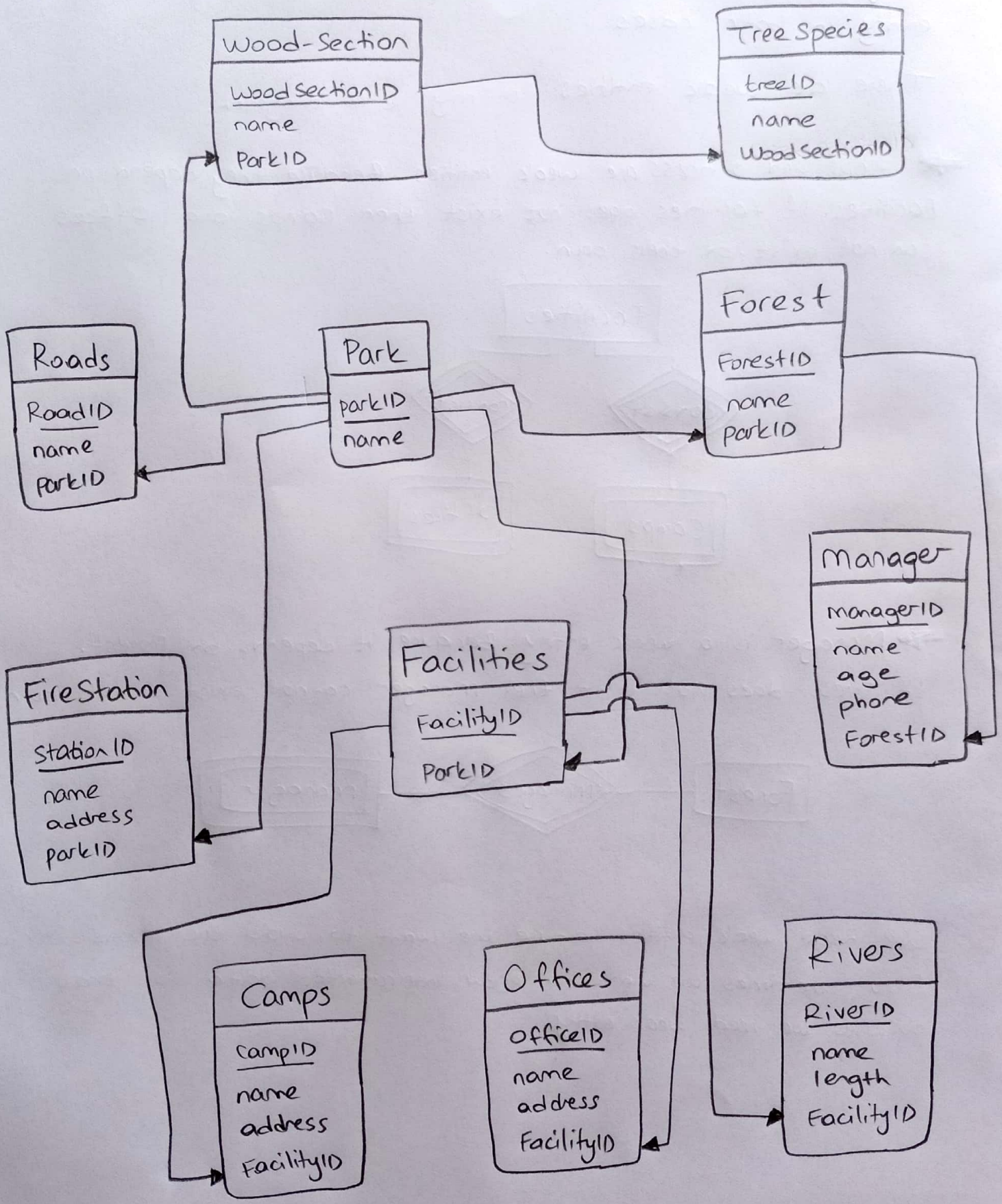


➡ Manager is a weak entity. Because it depends on Forest. If Forest does not exist then manager can not exist on its own.



We need weak entities because we want to avoid the inconsistencies. Also sometimes we want to show interconnected data, for that purposes we need weak entity.

(4) Create tables for your E-R diagram. (Do not forget that you should consider the effect of type of relationships to the tables.)



(5) Give 2 relations. Show if they hold or does not the criteries of 3NF and Boyce-Codd Normal Form. Explain why they are (or not) in 3NF and Boyce-Codd Normal Form, give your reasons and proofs in details.

3NF (3nd Normal Form)

- It should be in 2nd normal form
- And it should not have transitive dependency.

Boyce-Codd Normal Form (BCNF)

- It should be in the 3rd normal form
- For any dependency $A \rightarrow B$, A should be a super key.

➡ First relation : Forest → manager

- This relation is already 2NF, because data not dependent on every part primary key.
- So now we can look for 3NF. This relation is 3NF, because there are no transitive dependency. (There is no intermediate functional dependency.)
- This relation holds Boyce-Codd Normal Form criteries too. Because it holds 3NF, also for ony dependency ForestID is a super key.

➡ Second relation : Wood-Sections → TreeSpecies

- This relation is already 2NF, Because data not dependent on every part primary key
- So now we can look for 3NF. This relation is 3NF, because there are no transitive dependency. (There is no intermediate functional dependency)
- This relation holds Boyce-Codd Normal Form criteries too. Because it holds 3NF, also for ony dependency WoodSectionID is a super key.

(6) Create database schema where the relations must hold Boyce-Codd Normal Form or 3NF after the Normalization steps.

I think, I design my database schema by looking at normalization rules. So I think my table is also holds Boyce-Codd NORMAL FORM and 3NF.

Because my schema already in 2NF. And if we look transitive dependency, there is no transitive dependent attribute.

$(A \xrightarrow{\text{depends}} B \xrightarrow{\text{depends}} C)$

For that reasons schema holds 3NF.

IF we look at Boyce-Codd Normal Form; for any dependency $A \rightarrow B$, A should be a super key. It also holds this criteries. For example ForestID_ ManagerID relation. ForestID is a super key.