

### Scenario: Park

- A Park consists of a collection of Wood-Sections.
- Each Wood-Section has a number of specific species of trees.
- You can access everywhere by roads.
- The Forest also have a Manager.
- There are Fire-Stations in the Park.
- Each Fire-Station monitors fires in the Park.
- There are Facilities.
- Facilities consist 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-(8pts) Draw the E-R diagram of the Park.

2-(5pts) Give all the Functional Dependencies in the question.

3-(10pts) Give 2 relations

- a) That holds the criterias of Boyce-Codd Normal Form, if there is any.  
Explain why they are in BCNF.
- b) That does not hold the criterias of Boyce-Codd Normal Form, if there is any.  
Explain why they are not in BCNF.

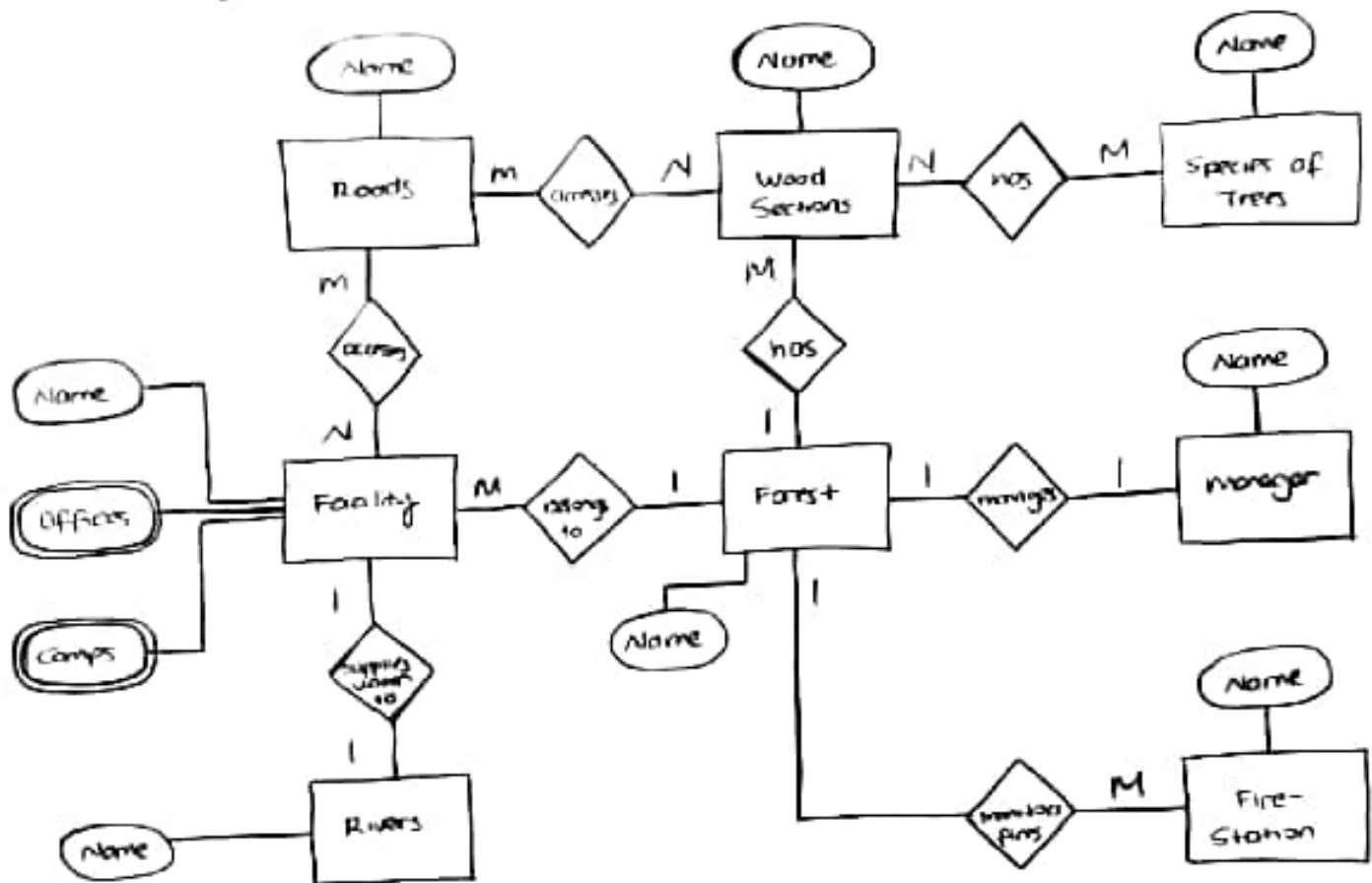
4-(10pts) Give 2 relations

- a) That holds the criterias of 3 Normal Form, if there is any.  
Explain why they are in 3NF.
- b) That does not hold the criterias of 3 Normal Form, if there is any.  
Explain why they are not in 3NF.

Give your reasons and proof in details.

If there is not any one of them, then just write it.

1- ER Diagram of the Park:



2- Functional Dependencies :

- Forest : Name  $\rightarrow$  WoodSection : Name
- Forest : Name  $\rightarrow$  Facility : Name
- Forest : Name  $\rightarrow$  Manager : Name
- Forest : Name  $\rightarrow$  Firestation : Name
- Facility : Name  $\rightarrow$  Rivers : Name
- Facility : Name  $\rightarrow$  Roads : Name
- Facility : Name  $\rightarrow$  Forest : Name
- Roads : Name  $\rightarrow$  Facility : Name
- Roads : Name  $\rightarrow$  WoodSection : Name
- Species of Trees : Name  $\rightarrow$  WoodSections : Name
- Firestation : Name  $\rightarrow$  Forest : Name
- Manager : Name  $\rightarrow$  Forest : Name
- WoodSection : Name  $\rightarrow$  Roads : Name
- WoodSection : Name  $\rightarrow$  Forest : Name
- WoodSection : Name  $\rightarrow$  Species of Trees : Name

### 3-2 Relations

a) That hold the criteria of BCNF:

- Supplies water to

Facility Name	River Name
A	X
B	Y

"Each river supplies water a different facility."  
So each two columns would be different.  
The columns are unique and candidate key.

- manages

Forest Name	Manager Name
A	X
B	Y

"The forest have a manager."

So there is one-to-one relationship between Forest and Manager.  
Both columns are unique and candidate key.

b) That does not hold the criteria of BCNF:

- Accesses

Road Name	Facility Name
A	X
A	Y

"You can access everywhere by roads."

One road can access more than one facilities.  
Columns are not candidate key.

- Has

Location Name	Species of Trees Name
Fruit	Apple
Fruit	Pear

"Each location has a number specific species of trees."

The first column defines which species it is.  
Columns are not candidate key.

## Q-2 Relations

a) That hold the criteria of 3NF:

- Road Address - Locality
- Road Address - Intersection

Both of them have the Locality column it defines the current row also  
the road can go to more than one place.

So the columns are not candidate key.

They hold the criteria of 3NF.

b) That does not hold the criteria of 3NF:

- There is no relations that does not hold the criteria of 3NF.