CSCI 425 Homwork #3

14.19.

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| Student | | | | | | | | | | | | |
| Student Name | Student Number (PK) | Current Address | Current Phone Number | Permanent Address | Permanent Phone Number | Birth Date | Sex | Class | Major | Minor | Degree Program | Social Security Number |

FD 1: Social Security Number → Student Name, Student Number, Birth Date, Sex, Current Address, Current Phone Number, Permanent Address, Permanent Phone Number, Class, Major, Minor, Degree Program

FD 2: Student Number → Social Security Number, Student Name, Birth Date, Sex, Current Address, Current Phone Number, Permanent Address, Permanent Phone Number, Class, Major, Minor, Degree Program

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| --- | --- | --- | --- | --- |
| Department | | | | |
| Department Name (PK) | Department Code | Office Number | Office Phone | Department College |

FD 1: Department Code → Department College, Department Name, Office Number, Office Phone

FD 2: Department Name → Office Number, Office Phone, Department College, Department Code

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| --- | --- | --- | --- | --- | --- |
| Course | | | | | |
| Course Name | Course Description | Course Number (PK) | Credit Hours | Course Level | Course Department |

FD 1: Course Number → Course Name, Course Description, Credit Hours, Course Level, Course Department

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| --- | --- | --- | --- | --- |
| Section | | | | |
| Instructor Name | Semester (PK) | Year (PK) | Course Number (PK) (FK) | Section Number (PK) |

FD 1: {Semester, Course Number, Section Number, Year} → Instructor Name

|  |  |  |  |
| --- | --- | --- | --- |
| Grade Record | | | |
| Student Social Security Number (FK) (PK) | Course Number (FK) (PK) | Section Number (FK) (PK) | Grade |

FD 1: {Student Social Security Number, Course Number, Section Number} → Grade

14.21

Using restrictive interpretations of normal form the LOTS schema is in 2NF when considering only the primary key because the primary key does not have any partial dependencies. The LOTS schema wouldn’t be in 3NF because the primary key has transitive dependencies (Property\_id# → County\_name, County\_name → Tax\_rate) (Property\_id# → Area, Area → Price). Using general definitions of normal form the LOTS schema would only be in 1NF because the other candidate key, County\_name and Lot#, has a partial dependency Tax\_rate depends on the County\_name.

14.26

a. The dependency A → B can not hold because tuple #1 10 → b1 but in tuple #2 10 → b2. The dependency B → C can hold. The dependency C → B can not hold because tuple #1 c1 → b1 but in tuple #3 c1 → b4. The dependency C → A can not hold because tuple #1 c1 → 10 but in tuple #3 c1 → 11.

b. The relation does not have a potential candidate key because although given B you can find C there is nothing unique that would make back to A therefore none of these would be able to give you a candidate key that would be able to map to all the other columns.

14.28

The set of attributes that form the keys of R would be {Course\_no, Sec\_no, Semester, Year} because with these attributes you can find all the missing information for the relationship. There isn’t anything that the functional dependency {Room\_no, Days\_hours, Semester, Year} will find that {Course\_no, Sec\_no, Semester, Year} would not be able to find. To normalize this relationship you would get rid of the functional dependency (Course\_no → Offering\_dept, Credit\_hours, Course\_level). You would break that off into a separate relation that just contained Course\_no, Offering\_dept, Credit\_hours, and Course\_level.

14.30

Since the primary key is {Car#, Salesperson#} then this relation would be in 1NF because there is a functional dependency in the primary key (Salesperson# → Commission%). To get to 2NF you would get rid of this functional dependency by putting (Salesperson#, Commission%) in a separate relation. Then to get it to 3NF you would get rid of the transitive dependency (Date\_sold → Discount\_amt) by putting (Date\_sold, Discount\_amt) in a separate relation.

14.32

a. {Manufacturer, Serial\_number} → {Model, Batch, Capacity, Retailer}

b. {Model} → {Manufacturer}

c. {Batch} → {Model}

d. {Model, Manufacturer} → {Capacity}