Exercise 1:

a) Two different examples of an attribute that we can deduce are not a candidate key are name and age, separately.
b) We can't deduce what the candidate key is in this instance of the Students relation. However, possible candidate keys are sid or login

Exercise 2:

a)
   i) Enrolled:
      1) foreign key (sid) references Students
      2) foreign key (cid) references Courses
   ii) Teaches:
      1) foreign key (fid) references Faculty
      2) foreign key (cid) references Courses
   iii) Meets_In:
      1) foreign key (cid) references Courses
      2) foreign key (rno) references Rooms

b)
   1. Courses that meet at the same time in the same room
   2. Professor that teaches different courses that meet at the same time
   3. Courses held in rooms with number of students greater than the room capacity

Exercise 3:

Professor(prof_ssn: varchar(11), age: int, rank: varchar(20), specialty: varchar(30), primary key (prof_ssn))

Dept(dno: int, dname: varchar(30), office: varchar(30), prof_ssn: varchar(11), primary key (dno), foreign key (prof_ssn) references Professor not null)

Work_dept(prof_ssn: varchar(11), dno: int, pc_time: int, primary key (prof_ssn, dno), foreign key (prof_ssn) references Professor, foreign key (dno) references Dept)

Project(pid: int, sponsor: varchar(20), start_date: date, end_date: date, budget: int, prof_ssn: varchar(11), primary key (pid), foreign key (prof_ssn) references Professor not null)

Graduate(senior_ssn: varchar(11), dno: int, grad_ssn: varchar(11), age: int, deg_prog: varchar(20), name: varchar(20), primary key (grad_ssn), foreign key (senior_ssn) references Graduate not null, foreign key (dno) references Dept not null)

Work_proj(prof_ssn: varchar(11), pid: int, grad_ssn: varchar(11), ssn: varchar(11), primary key (pid, grad_ssn), foreign key (grad_ssn) references Graduate, foreign key (pid) references Project, foreign key (prof_ssn) references Professor not null)

Work_In(pid: int, prof_ssn: varchar(11), primary key (prof_ssn, pid), foreign key (prof_ssn) references Professor, foreign key (pid) references Project)

Constraints:

1. The project - work_in - professor relational can't capture the cardinality constraint of at least one project by the relational schema
2. The dept - work_dept - professor relational can't capture the cardinality constraint of at least one professor by the relational schema

Exercise 4:

Patient(patient_ssn: varchar(11), patient_name: varchar(20), age: int, address: varchar(50), phy_ssn: varchar(11), primary key (patient_ssn), foreign key (phy_ssn) references Doctor not null)

Doctor(phy_ssn: varchar(11) primary key, phy_name: varchar(20), specialty: varchar(30), exp_years: int)

Pharmacy(pharmacy_name: varchar(20), address: varchar(50), phone_num: varchar(12), primary key (pharmacy_name))

Pharm_co(company_name: varchar(20), phone_num: varchar(12), primary key (company_name))

Drug(company_name: varchar(20), trade_name: varchar(20), formula: varchar(20), primary key (company_name, trade_name), foreign key (company_name) references Pharm_co)

Sell(pharmacy_name: varchar(20), company_name: varchar(20), trade_name: varchar(20), price: double, primary key (pharmacy_name, company_name, trade_name), foreign key (pharmacy_name) references Pharmacy, foreign key (company_name, trade_name) references Drug)

Prescription(patient_ssn: varchar(11), phy_ssn: varchar(11), company_name: varchar(20), trade_name: varchar(20), date: date, quantity: int, primary key (patient_ssn, phy_ssn, company_name, trade_name), foreign key (patient_ssn) references Patient, foreign key (phy_ssn) references Doctor, foreign key (company_name, trade_name) references Drug)

Contract(pharmacy_name: varchar(20), company_name: varchar(20), start_date: date, end_date: date, text: varchar(30), supervisor: varchar(30), primary key (pharmacy_name,

company_name), foreign key (pharmacy_name) references Pharmacy, foreign key (company_name) references Pharm_co)