Solutions for Tutorial -3 (TRC) CS3700 - Sep 2021.

1. List the courseId(s) of courses with no prerequisites.
   $\{c.courseId \mid course(c) \land (\neg ((\exists p) (preRequisite(p) \land p.courseId = c.courseId)))\}$

2. List Id of the courses of CSE dept that are being taught in the current semester
   $\{c.courseId \mid course(c) \land$
   $(\exists d)(\exists t)(department(d) \land teaching(t) \land c.deptNo = d.deptId \land$
   $d.name = \text{'CSE'} \land c.courseId = t.courseId \land t.sem = 2 \land$
   $t.year = 2021\}$

3. Find the name and roll no. of the student(s) who are enrolled for courses offered by a department which is not his/her parent department in the current semester.
   $\{s.name, s.rollNo \mid student(s) \land$
   $(\exists c)(\exists e) (course(c) \land enrollment(e) \land s.rollNo = e.rollNo \land$
   $e.year = 2021 \land e.sem = 2 \land s.deptNo \neq c.deptNo \land$
   $c.courseId = e.courseId)\}$

4. List the rollNo and name of student(s) who have enrolled for at least one course offered by their advisor.
   $\{s.rollNo, s.name \mid student(s) \land$
   $(\exists e)(\exists t)(enrollment(e) \land teaching(t) \land s.rollNo = e.rollNo \land$
   $e.courseId = t.courseId \land e.sem = t.sem \land e.year = t.year \land$
   $s.advisor = t.empId\}$

5. Find the name and rollNo of all the CSE students who never scored a grade lower than C.
   (Assume that a student enrolls for at least one course)
   $\{s.name, s.rollNo \mid student(s) \land$
   $((\exists d) (department(d) \land d.deptId = s.deptNo \land d.name = \text{'CSE'})) \land$
   $((\forall e) ((enrollment(e) \land e.rollNo = s.rollNo) \rightarrow$
   $\neg (e.grade = \text{'D'} \lor e.grade = \text{'E'} \lor e.grade = \text{'F'})))\}$

6. Find the name(s) of the CSE professors in pairs who joined the department in the same year.
   $\{p_1.name, p_2.name \mid professor(p_1) \land professor(p_2) \land$
   $(\exists d) (department(d) \land d.name = \text{'CSE'} \land p_1.deptNo = d.deptId \land$
   $p_2.deptNo = d.deptId \land p_1.empId \neq p_2.empId \land p_1.startYear = p_2.startYear)\}$

7. Find the list of roll numbers of students who got S grade in all the prerequisites of CS6700.
   (Assume that CS6700 has at least one pre-requisite)
   $\{s.rollNo \mid student(s) \land (\forall p) ((preRequisite(p) \land p.courseId = \text{'CS6700'}) \rightarrow$
   $(\exists e)(enrollment(e) \land e.rollNo = s.rollNo \land e.courseId = p.preReqCourse)\}$

8. List the name, Id of the department(s) with the senior most professor(s) of the institute.
   $\{ d.name, d.deptId \mid department(d) \land$
   $(\exists p_1) (professor(p_1) \land p_1.deptNo = d.deptId \land$
   $(\forall p_2)(professor(p_2) \rightarrow p_2.startYear >= p_1.startYear))\}$

Example Relational Scheme with RICs shown

student (rollNo, name, degree, year, sex, deptNo, advisor)

department (deptId, name, hod, phone)

professor (empId, name, sex, startYear, deptNo, phone)

course (courseId, cname, credits, deptNo)

enrollment (rollNo, courseId, sem, year, grade)

teaching (empId, courseId, sem, year, classRoom)

preRequisite (preReqCourse, courseId)