Assignment 1

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Question 14:

$$\{p.pid, p.pname \mid Person(p) \wedge hasManager(hm) \wedge worksFor(w) \wedge \\ p.pid = w.pid \wedge p.pid = hm.pid \wedge p.city = \text{'Bloomington'} \wedge w.salary > 30000\}$$

Question 15:

$$\{p.pid, p.pname \mid \exists \in Person \wedge (\forall hm \in hasManager \wedge p.pid = hm.eid \\ \wedge m.pid = hm.mid \rightarrow p.city \neq m.city\}$$

Question 16:

$$\{p.pid, p.pname, w.salary | hasManager(hm) \wedge personSkill(ps) \wedge worksFor(w) \wedge Person(p) \\ \wedge p.pid = hm.eid \wedge w.pid = hm.eid \wedge hm.mid = ps.pid \wedge \\ hm.eid \in \{hm2.eid | hasManager(hm2) \wedge personSkill(ps2) \wedge hm.eid = hm2.eid \\ \wedge hm.mid \neq hm2.mid \wedge ps2.skill = ps.skill \wedge ps.skill \neq' Networks'\}\}$$

Question 17:

$$\{w.cname, w.salary \mid \exists w \in worksFor \wedge \neg \exists f \in worksFor \\ \wedge (w.cname = f.cname) \rightarrow (w.salary < f.salary)\}$$

Question 18:

$$\forall p \in Person \rightarrow (\exists w \in worksFor \wedge w.pid = p.pid) \wedge \\ (\exists ps1, ps2 \in personSkill \wedge p.pid = ps1.pid \wedge p.pid = ps2.pid \wedge ps1.skill \neq ps2.skill))$$

Equivalently,

$$\neg \exists p \in Person \wedge \neg \exists (wf \in worksFor \wedge p.pid = wf.pid) \\ \wedge \neg \exists (ps1 \in personSkill, ps2 \in personSkill \wedge p.pid = ps1.pid \\ \wedge p.pid = ps2.pid \wedge \wedge ps1.skill \neq ps2.skill)$$

Question 19:

$$\exists (w \in worksFor) \rightarrow \exists (hm \in hasManager \wedge hm.eid = w.pid \wedge \\ (\forall w2 \in worksFor \wedge w2.pid = hm.mid \wedge w.salary > w2.salary)$$

Question 20:

$$\neg \exists (hm \in hasManager) \rightarrow \neg \exists (w1 \in worksFor, w2 \in worksFor \wedge hm.eid = w1.pid \\ \wedge hm.mid = w2.pid \wedge w1.cname = w2.cname)$$