4 (a) Required RA is P ∩ Q where:

P: πw1.cname, w1.pid, w1.salary(W1 – σw3.pid = w4.pid ∧ w3.salary ≤ w4.salary (W3⋈ W4))

Q: πw2.cname, w2.pid, w2.salary(W2⋈w2.pid = k.pid1K⋈k.pid2 = ps.pid⋈ πps.pid (σskill = ‘OperatingSystems’(pS))

5 (a) Required RA is P ∩ Q where:

P: πw1.cname, w1.pid, w1.salary(σw1.pid = p1.pid(W1⋈ P1) – σw3.pid = w4.pid ∧ w3.salary < w4.salary (W3⋈ W4) ⋈ σw3.pid = p2.pid (P2))

Q: πp1.pname, w1.salary, p1.city(σw1.pid = p1.pid(W1⋈ P1) – σw3.pid = p2.pid(W3⋈ P2⋈p2.pid = ps.pid πps.pid (σps.skill = ‘Networks’(pS))))

6 (a) Required RA is P:

P: π c1.cname, c2.cname((σp1.city ≠ ‘Chicago’ ∧ p2.city ≠ ‘Chicago’(C1⋈c1.cname ≠ c2.cnameC2⋈c1.cname = w1.cname W1⋈c1.cname = w2.cname W2⋈w1.pid = p1.pid P1⋈w2.pid = p1.pidP2))

7 πpid(P) ⊆ πp1.pid(P1⋈p1.pid=h.eidH ⋈h.mid=p2.pid(P2)) ∩ πp1.pid(P1) ⋈p1.pid=k.pid1K ⋈k.pid2=p2.pid(P2))

8 *(Everyone at amazon knows at least 3 people)*

πp.pid(σw.cname = ‘Amazon’(W)) – (πp.pid(P⋈p.pid = k1.pid1K1⋈ p.pid = k2.pid1 ∧ k1.pid2≠k2.pid2K2⋈ p.pid = k2.pid1 ∧ k1.pid2≠k3.pid2K3)) = ∅

9 πpid(P) ⊈ πw1.pid(W1⋈w1.cname = cl.cname (σcl.city = ‘Cupertino’(cL))) ∩ πw2.pid(W2⋈w2.salary < wl.salaryW3⋈w3.pid <> ps.pid(pS))