Winter 2003 CSC343 INTRODUCTION TO DATABASES

Test 1 - Sample Solutions

2.A

$R_1 = \pi_{W1.eID=W2.eID}(\sigma_{W1.prID=W2.prID \wedge W1.eID \neq W2.eID}(\rho(W1, WorksOn) \times \rho(W2, WorksOn)))$

Answer $= \pi_{eID}(Employee) - \pi_{W3.eID}(\pi_{W3.eID,W4.eID}(\rho(W3, Employee)(W4, Employee)) - R_1)$

2.B

Answer =

$\pi_{R.prID}(\sigma_{R1.eID=R2.eID \wedge R2.prID=R3.prID \wedge R3.prID=R5.prID \wedge R5.eID=R6.eID \wedge R1.salary>R4.salary \wedge R6.salary>R4.salary}($
$\rho(R1, Employee) \times \rho(R2, WorksOn) \times \rho(R3, Project) \times \rho(R4, Employee) \times \rho(R5, WorksOn) \times \rho(R6, Employee))))$

2.C

$R = Project \bowtie WorksON \bowtie Employee \bowtie WorksIn \bowtie Department$

Answer $= \gamma_{cID,AVG(No\_of\_projects)}(\pi_{cID,eID,\gamma_{cID,eID,COUNT(prID)\rightarrow No\_of\_projects}}(R))$

3.A

$\{t | \exists c, d, Department(d) \wedge Company(c) \wedge c.cID = d.cID \wedge\ (\forall d1, (Department(d1) \wedge d.cID = c.cID) \rightarrow d1.budget > d.budget)\ \wedge t.deptID = d.deptID \wedge t.cID = c.cID\}$

3.B

$\{p | \exists e, w, u, d, Project(p) \wedge Employee(e) \wedge WorksOn(w) \wedge WorksIn(u), Department(d)\ \wedge p.prID = w.prID \wedge e.eID = d.deptID \wedge\ \not\exists u1, d1, WorksIn(u1) \wedge Department(d1) \wedge u1.eID = e.eID \wedge u1.deptID = d1.deptID \wedge d.cID \neq d1.cID)\}$

3.C

$\exists e, p, Project(p) \wedge Employee(e) \wedge p.prMng = e.eID \wedge (\forall e1, (Employee(e1) \wedge \exists w, WorksOn(w) \wedge e.eID \neq e1.eID \wedge e1.eID = w.eID \wedge w.prID = p.prID) \rightarrow e.salary < e1.salary))$

4

Set semantics

Answer(B, D) $= \{\}$

Bag semantics

Answer(B, D) $= \{(1, 2)\}$