

(6) Supplier (sid: integer, sname: string, address string)
 Part (pid: integer, pname: string, colour: string)
 Catalogue (sid: integer, pid: integer, cost: real)

(a) $\pi_{\text{sname}}(\pi_{\text{sid}}((\pi_{\text{pid}} \sigma_{\text{color}='red'} \text{Part}) \bowtie \text{Catalogue}) \bowtie \text{Supplier})$

(b) $\pi_{\text{sid}}(\pi_{\text{pid}}(\sigma_{\text{color}='red' \vee \text{color}='green'} \text{Part}) \bowtie \text{Catalogue})$

(c) $\rho(R1, \pi_{\text{sid}}((\pi_{\text{pid}} \sigma_{\text{color}='red'} \text{Part}) \bowtie \text{Catalogue}))$
 $\rho(R2, \pi_{\text{sid}}(\sigma_{\text{address}='Shopping Center IITK'} \text{Supplier}))$
 $R1 \cup R2$

(d) $\rho(R1, \pi_{\text{sid}}((\pi_{\text{pid}} \sigma_{\text{color}='red'} \text{Part}) \bowtie \text{Catalogue}))$
 $\rho(R2, \pi_{\text{sid}}((\pi_{\text{pid}} \sigma_{\text{color}='green'} \text{Part}) \bowtie \text{Catalogue}))$
 $R1 \cap R2$

(e) $(\pi_{\text{sid, pid}} \text{Catalogue}) / (\pi_{\text{pid}} \text{Part})$

(f) $(\pi_{\text{sid, pid}} \text{Catalogue}) / (\pi_{\text{pid}} \sigma_{\text{color}='red'} \text{Part})$

(g) $(\pi_{\text{sid, pid}} \text{Catalogue}) / (\pi_{\text{pid}} \sigma_{\text{color}='red' \vee \text{color}='green'} \text{Part})$

(h) $\rho(R1, ((\pi_{\text{sid, pid}} \text{Catalogue}) / (\pi_{\text{pid}} \sigma_{\text{color}='red'} \text{Part})))$
 $\rho(R2, ((\pi_{\text{sid, pid}} \text{Catalogue}) / (\pi_{\text{pid}} \sigma_{\text{color}='green'} \text{Part})))$
 $R1 \cup R2$

(i) $\rho(R1, \text{catalogue})$
 $\rho(R2, \text{catalogue})$

$$\pi_{R1.sid, R2.sid} (\sigma_{R1.pid = R2.pid \wedge R1.sid \neq R2.sid \wedge R1.cost > R2.cost} (R1 \times R2))$$

$$\pi_{R1.sid, R2.sid} (\sigma_{R1.pid = R2.pid \wedge R1.sid \neq R2.sid \wedge R1.cost > R2.cost} (R1 \times R2))$$

(j) $\rho(R1, \text{catalogue})$

$\rho(R2, \text{catalogue})$

$$\pi_{R1.pid} (\sigma_{R1.pid = R2.pid \wedge R1.sid \neq R2.sid} (R1 \times R2))$$

(k) $\rho(R1, \pi_{sid} \sigma_{sname = 'Tata'} \text{Suppliers})$

$\rho(R2, R1 \bowtie \text{catalogue})$

$\rho(R3, R2)$

$$\rho(R4(1 \rightarrow sid, 2 \rightarrow pid, 3 \rightarrow cost), \sigma_{R3.cost < R2.cost} (R3 \times R2))$$

$$\pi_{pid} (R2 - \pi_{sid, pid, cost} R4)$$

(l) $\pi_{sid}(\text{Suppliers}) \rightarrow R1$

$\pi_{sid, pid} (\sigma_{cost \leq 200}(\text{catalogue})) \rightarrow R2$

$R2/R1 \rightarrow \text{Answer}$

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$$F = (A_1, A_2, \dots, A_n)$$

$$R/S = \pi_F(R) - \pi_F((\pi_F(R) \times S) - R)$$