

ECS 165A Homework 1

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1. (a)

$$\Pi_{(model)} (\sigma_{city>30} (Car))$$

(b)

$$\Pi_{(model)} (\sigma_{towing>15000 \text{ AND } highway>18} (Pickup))$$

(c)

$$\begin{aligned} C(make) &:= \Pi_{(make)} (Car \bowtie_{Car.model=Product.model \text{ AND } price<20000} Product) \\ P(make) &:= \Pi_{(make)} (Pickup \bowtie_{Pickup.model=Product.model \text{ AND } price<20000} Product) \\ E(make) &:= \Pi_{(make)} (EV \bowtie_{EV.model=Product.model \text{ AND } price<20000} Product) \\ C'(make) &:= \Pi_{(make)} (Car \bowtie_{Car.model=Product.model \text{ AND } price>50000} Product) \\ P'(make) &:= \Pi_{(make)} (Pickup \bowtie_{Pickup.model=Product.model \text{ AND } price>50000} Product) \\ E'(make) &:= \Pi_{(make)} (EV \bowtie_{EV.model=Product.model \text{ AND } price>50000} Product) \\ C''(make) &:= (C \bowtie C') \cup (C \bowtie P') \cup (C \bowtie E') \\ P''(make) &:= (P \bowtie C') \cup (P \bowtie P') \cup (P \bowtie E') \\ E''(make) &:= (E \bowtie C') \cup (E \bowtie P') \cup (E \bowtie E') \\ Ans(make) &:= C'' \cup P'' \cup E'' \end{aligned}$$

(d)

$$\begin{aligned} C(model, passengers) &:= \Pi_{(model, passengers)} (Car) \\ C'(model, passengers) &:= \Pi_{(model, passengers)} (Car) \\ CC(passengers) &:= \Pi_{(passengers)} (C \bowtie_{C.passengers=C'.passengers \text{ AND } C.model \neq C'.model} C') \\ E(model, passengers) &:= \Pi_{(model, passengers)} (EV) \\ E'(model, passengers) &:= \Pi_{(model, passengers)} (EV) \\ EE(passengers) &:= \Pi_{(passengers)} (E \bowtie_{E.passengers=E'.passengers \text{ AND } E.model \neq E'.model} E') \\ P(model, passengers) &:= \Pi_{(model, passengers)} (Pickup) \\ P'(model, passengers) &:= \Pi_{(model, passengers)} (Pickup) \\ PP(passengers) &:= \Pi_{(passengers)} (P \bowtie_{P.passengers=P'.passengers \text{ AND } P.model \neq P'.model} P') \\ CE(passengers) &:= \Pi_{(passengers)} (Car \bowtie_{Car.passengers=EV.passengers} EV) \\ CP(passengers) &:= \Pi_{(passengers)} (Car \bowtie_{Car.passengers=Pickup.passengers} Pickup) \\ PE(passengers) &:= \Pi_{(passengers)} (Pickup \bowtie_{Pickup.passengers=EV.passengers} EV) \\ Ans(passengers) &:= CC \cup EE \cup PP \cup CE \cup CP \cup PE \end{aligned}$$

(e)

$$\begin{aligned} C(city, highway, model) &:= \Pi_{(city, highway, model)} (\text{Car}) \\ C'(city, highway, model) &:= \Pi_{(city, highway, model)} (\text{Car}) \\ C''(city, highway, model) &:= C \bowtie_{C.city*0.55+C.highway*0.45 > C'.city*0.55+C'.highway*0.45} C' \\ C'''(city, highway, model) &:= C - C'' \\ P(city, highway, model) &:= \Pi_{(city, highway, model)} (\text{Pickup}) \\ P'(city, highway, model) &:= \Pi_{(city, highway, model)} (\text{Pickup}) \\ P''(city, highway, model) &:= P \bowtie_{P.city*0.55+P.highway*0.45 > P'.city*0.55+P'.highway*0.45} P' \\ P'''(city, highway, model) &:= P - P'' \\ Both(model) &:= \Pi_{(model)} (C''' \bowtie_{C''' .city*0.55+C''' .highway*0.45 \geq P''' .city*0.55+P''' .highway*0.45} P''') \\ Both'(model) &:= \Pi_{(model)} (P''' \bowtie_{P''' .city*0.55+P''' .highway*0.45 \geq C''' .city*0.55+C''' .highway*0.45} C''') \\ Ans(make) &:= \Pi_{(make)} ((Both \cup Both') \bowtie \text{Product}) \end{aligned}$$