SFWRENG 3DB3 Assignment 2 - ii. Relational Algebra

Nov 2021

q1

$R_{q1} := \Pi_{FirstName,LastName,DateofBirth}(\sigma_{Date='07/22/2020' \ AND \ (Date-18 \ years) \geq DateofBirth}(Order))$

q2

$R_{21} := ((\rho_{OC}(OrderContains) \bowtie_{OC.OrderID=Order.OrderID} (Order)) \bowtie_{OC.ProductID=BT.ProductID} \rho_{(BT)}(BelongsTo)$

$R_{22} := R_{21} \bowtie_{BT.ProductCategoryID=Cate.ProductCategoryID} \rho_{Cate}(ProductCategory)$

$R_{q2} := \delta(\Pi_{OC.ProductID,Cate.Name}(\sigma_{Year(Order.Date-Order.DateofBirth) \geq 20 \ AND \ Year(Order.Date-Order.DateofBirth) \leq 35}(R_{22})))$

q3

$R_{31} := \gamma_{FirstName,LastName,DateofBirth,COUNT(*) \rightarrow freq}(WriteReview)$

$R_{32} := \gamma_{FirstName,LastName,DateofBirth,MAX(freq) \rightarrow maxfreq}(R_{31})$

$R_{33} := \Pi_{FirstName,LastName,DateofBirth}(\delta(\sigma_{(R_{31}.freq=maxfreq)}(R_{31})))$

$R_{34} := \rho_p(Person) \bowtie_{p.FirstName=R_{33}.FirstName \ AND \ p.LastName=R_{33}.LastName \ AND \ p.DateofBirth=R_{33}.DateofBirth} (R_{33})$

$R_{q3} := \Pi_{FirstName,LastName,DateofBirth,City,Country}(R_{34})$

q4a

$R_{4a1} := \gamma_{COUNT(TrackingNumber) \rightarrow C1}(HasShipment)$

$R_{4a2} := \gamma_{COUNT(TrackingNumber) \rightarrow C2}(\delta(HasShipment))$

$R_{q4a} := C1 - C2$

q4b

$R_{4b1} := \Pi_{TrackingNumber,OrderID}(\sigma_{freq>2}(\gamma_{TrackingNumber,OrderID,COUNT(TrackingNumber) \rightarrow freq}(HasShipment)))$

$R_{4b2} := \rho_o(Order) \bowtie_{o.FirstName=p.FirstName \ AND \ o.LastName=p.LastName \ AND \ o.DateofBirth=p.DateofBirth \ AND \ C_4} (\rho_p(Person))$

$R_{4b3} := \Pi_{TrackingNumber}(\sigma_{h.TrackingNumber=R_{4b1}.TrackingNumber \ AND \ h.OrderID=o.OrderID}(R_{4b1} \times \rho_h(HasShipment) \times R_{4b2}))$

* $C_4=p.Country='Canada' \ AND \ p.PostalCode \ LIKE \ 'M\%'$

q5

$R_{q5} := \prod_{ProductID} (\sigma_{times=1}(\gamma_{ProductID,COUNT(ProductID) \to times}(BelongsTo)))$

q6a

$R_{6a1} := \prod_{Brand} (\sigma_{t1=1}(\gamma_{Brand,COUNT(ProductID) \to t1}(Product)))$

$R_{q6a} := \prod_{Product.ProductID,Product.Name,R_{6a1}.Brand} (R_{6a1} \bowtie_{Product.Brand=R_{6a1}.Brand} (Product))$

q6b

$R_m := \prod_{oc.OrderID,oc.Quantitu*pro.price \to RDR1} (\rho_{oc}(orderContains) \bowtie_{oc.ProductID=pro.ProductID} (\rho_{pro}(Product)))$

$R_{m1} := \gamma_{OrderID,SUM(RDR1) \to Sales}(R_m)$

$R_{m2} := \gamma_{MAX(Sales) \to maxsales}(R_{m1})$

$R_{q6b} := \sigma_{Sales \geq maxsales}(R_{m1})$

q7

$R_{71} := (\rho_{pro}(Product)) \bowtie_{oc.ProductID=pro.ProductID} (\rho_{oc}(orderContains)) \bowtie_{oc.OrderID=or.OrderID} (\rho_{or}(Order))$

$R_{72} := \sigma_{Date \geq '07/01/2020' \ AND \ Date \leq '07/31/2020'}(R_{71})$

$R_{73} := \prod_{oc.OrderID,oc.ProductID,pro.Price*oc.quantity \to LineSales,pro.StoreID} (R_{72})$

$R_{74} := \prod_{R_{73}.StoreID,R_{73}.LineSales,Store.Description,Store.StartDate} (R_{73} \bowtie_{R_{73}.StoreID=Store.StoreID} (Store))$

$R_{75} := \tau_{Revenue \ ASC}(\prod_{StoreID,Description,StartDate,Revenue} (\gamma_{StoreID,Description,StartDate,SUM(LineSales) \to Revenue}(R_{74})))$

q8a

$R_{8a1} := \prod_{ProductID} (Product) - \delta(\prod_{ProductID} (OrderContains))$

$R_{q8a} := \prod_{Product.ProductID,Product.Name,Product.Brand} (R_{8a1} \bowtie_{R_{8a1}.ProductID=Product.ProductID} (Product))$

q8b

$R_{q8b} := \prod_{R_{q8a}.ProductID} (R_{q8a} \bowtie_{R_{q8a}.ProductID=Promotion.ProductID} (Promotion))$

q9a

$R_{9a1} := \prod_{ProductCategoryID,CountPID} (\gamma_{ProductCategoryID,COUNT(ProductID) \to CountPID}(BelongsTo))$

$R_{9a2} := \delta(\rho_{bt}(BelongsTo) \bowtie_{bt.ProductID=hs.ProductID} (\rho_{hs}(HasWarranty)))$

$R_{9a3} := \prod_{ProductCategoryID,CountWarr} (\gamma_{ProductCategoryID,Count(ProductID) \to CountWarr}(R_{9a2}))$

$R_{9a4} := \prod_{ProductCategoryID} (R_{9a1} \bowtie_{R_{9a1}.CountPID=R_{9a3}.CountWarr \ AND \ R_{9a1}.ProductCategoryID=R_{9a3}.ProductCategoryID} R_{9a3})$

$R_{9a} := \prod_{R_{9a4}.ProductCategoryID,pc.Name} (R_{9a4} \bowtie_{R_{9a4}.ProductCategoryID=pc.ProductCategoryID} (\rho_{pc}(ProductCategory)))$

q9b

$R_{9b1} := \gamma_{p.StoreID,p.ProductCategoryID,COUNT(p.ProductID)\rightarrow CSt}(\rho_p(Product) \bowtie_{p.ProductID=bt.ProductID} (\rho_{bt}(BelongsTo)))$

$R_{9b2} := \prod_{p.StoreID,p.ProductCategoryID,Cst} (R_{9b1})$

$R_{9b3} := \prod_{R_{9b2}.StoreID} (R_{9a4} \bowtie_{R_{9a4}.ProductcategoryID=R_{9b2}.ProductcategoryID \ AND \ R_{9a4}.CountPID=R_{9b2}.Cst} (R_{9b2}))$

q10a

$R_{10a1} := \prod_{w.ProductID,w.Star} (\rho_w(WriteReview) \bowtie_{w.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$

$R_{10a2} := \prod_{ProductID,AvgStar} (\gamma_{ProductID,AVG(Star)\rightarrow AvgStar}(R_{10a1}))$

$R_{10a3} := \prod_{R_{10a2}.ProductID,R_{10a2}.AvgStar,bt.ProductCategoryID} (R_{10a2} \bowtie_{R_{10a2}.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$

$R_{10a4} := \prod_{w.ProductID,bt.ProductCategoryID} (\rho_w(WriteReview) \bowtie_{w.ProductID=bt.ProductID} \rho_{bt}(BelongsTo))$

$R_{10a5} := \prod_{bt.ProductCategoryID,AvgRe,CountStar} (\gamma_{ProductCategoryID,AVG(Star)\rightarrow AvgRe,COUNT(Star)\rightarrow CountStar}(R_{10a4}))$

$R_{10a6} := \prod_{x1.ProductID,x1.AvgStar,y1.AvgRe,y1.CountStar} (\rho_{x1}(R_{10a3}) \bowtie_{x1.ProductCategoryID=y1.ProductCategoryID} \rho_{y1}(R_{10a5}))$

$R_{10a7} := \prod_{ProductID,AvgStar,AllRe} (\gamma_{ProductID,AvgStar,SUM(AvgRe*CountStar)/SUM(CountStar)\rightarrow AllRe}(R_{10a6}))$

$R_{10a} := \prod_{T.ProductID,p.Name,p.ModelNumber} (\sigma_{T.AvgStar>T.AllRe}(\rho_T(R_{10a7}) \bowtie_{T.ProductID=p.ProductID} (\rho_p(Product))))$

q10b

$R_{10b1} := \prod_{ProductID} (R_{10a})$

$R_{10b2} := \delta(\prod_{R_{10b1}.ProductID,p.Price} (R_{10b1} \bowtie_{R_{10b1}.ProductID=p.ProductID} (\rho_p(Product))))$

$R_{10b3} := \prod_{ProductID,TotalQuan} (\gamma_{ProductID,SUM(quantity)\rightarrow TotalQuan}(OrderContains))$

$R_{10b} := \tau_{Revenue \ DESC}(\prod_{A1.ProductID,A1.Price*A2.Quantity\rightarrow Revenue} ((\rho_{A1}(R_{10b2})) \bowtie_{A1.ProductID=A2.ProductID} (\rho_{A1}(R_{10b3}))))$