

## 2<sup>η</sup> Σειρά Ασκήσεων

Όνοματεπώνυμο: Ηρακλής Στρατήγης

AM: 5313

- Books (BookId, Title, Author, Publisher, Genre, Format)
- Customers (CustomerId, Name, Email, Age, MembershipStatus, Balance)
- Orders (OrderId, CustomerId, BookId, OrderDate, Quantity)
- Reviews (ReviewId, BookId, CustomerId, Rating, Comment)

i) Βρείτε τους τίτλους των βιβλίων που έχουν γραφτεί από τον George Orwell και είναι διαθέσιμα σε format “Hardcover” ή “eBook”.

1.  $T1 := \sigma_{Publisher="George\ Orwell"} \wedge Format = "Hardcover" \vee Format = "eBook" (Books)$   
 $T2 := \pi_{Title}(T1)$
2.  $\{x_2 \mid \exists(x_1, x_3, x_5, x_6) Books(x_1, x_2, x_3, George\ Orwell, x_5, x_6) \wedge (x_6 = "Hardcover" \vee x_6 = "eBook")\}$
3.  $\{t^{(1)} \mid \exists(b^{(6)})(Books(b) \wedge (t[1] = c[2]) \wedge (c[4] = "George\ Orwell") \wedge ((c[6] = "Hardcover" ) \vee (c[6] = "eBook"))))\}$
4. SELECT Title  
FROM Books  
WHERE Author = “George Orwell” AND (Format = “Hardcover” OR Format = “eBook”);

ii) Βρείτε τους τίτλους των βιβλίων που δεν έχουν ποτέ παραγγελθεί από πελάτες που έχουν ενεργή συνδρομή (MembershipStatus = 'Active').

1.  $T1 := \sigma_{MembershipStatus="Active"}(Customers)$   
 $T2 := T1 \bowtie Orders$   
 $T3 := \pi_{BookId}(T2)$   
 $T4 := \pi_{BookId}(Books)$   
 $T5 := T4 - T3$   
 $T6 := T5 \bowtie Books$   
 $T7 := \pi_{Title}(T6)$
2.  $\{(x_2) \mid \exists(x_1, x_3, x_4, x_5, x_6) Books(x_1, x_2, x_3, x_4, x_5, x_6) \wedge \neg(\exists(y_1, y_2, y_3, y_4, y_6, z_1, z_4, z_5) Customers(y_1, y_2, y_3, y_4, "Active", y_6) \wedge Orders(z_1, y_1, x_1, z_4, z_5))\}$
3.  $\{t^{(1)} \mid \exists(b^{(6)})(Books(b) \wedge (t[1] = b[2]) \wedge \neg(\exists(o^{(5)}, c^{(6)})(Orders(o) \wedge Customers(c) \wedge (c[5] = "Active") \wedge (o[2] = c[1]) \wedge (o[3] = b[1]))))\}$
4. SELECT Title  
FROM Books  
WHERE BookId NOT IN (  
SELECT DISTINCT BookId  
FROM Orders  
JOIN Customers ON Orders.CustomerId = Customers.CustomerId  
WHERE Customers.MembershipStatus = 'Active');

- iii) Βρείτε τα ονόματα των πελατών που έχουν παραγγείλει όλα τα βιβλία του εκδοτικού οίκου "Penguin Books".
1.  $T1 := \sigma_{Publisher="Penguin Books"}(Books)$   
 $T2 := \pi_{CustomerId}(Orders \div T1)$
  2.  $\{o_2 \mid \forall(y_1, y_2, y_3, y_4, y_5, y_6)(Books(y_1, y_2, y_3, y_4, y_5, "Penguin Books")) \rightarrow \exists(o_1, o_4, o_5)Orders(o_1, o_2, y_1, o_4, o_5)\}$
  3.  $\{t^{(1)} \mid \exists(b^{(6)}, o^{(5)})(Customers(t) \wedge \forall b(Books(b) \wedge b[4] = Penguin\ Books \rightarrow \exists o(Orders(o) \wedge t[1] = o[2] \wedge o[3] = b[1])))\}$
  4. SELECT c.CustomerId  
 FROM Customers c  
 WHERE NOT EXISTS (  
 SELECT b.BookId  
 FROM Books b  
 WHERE b.Publisher = 'Penguin Books'  
 AND NOT EXISTS (  
 SELECT o.OrderId  
 FROM Orders o  
 WHERE o.CustomerId = c.CustomerId AND o.BookId = b.BookId));
- iv) Βρείτε τον πελάτη με τη δεύτερη μεγαλύτερη οφειλή (Balance) στο βιβλιοπωλείο.
1.  $C1 := Customers$   
 $C2 := Customers$   
 $T1 := \sigma_{C1.Balance < C2.Balance}(C1 \times C2)$   
 $MAX1 := \pi_{CustomerId, Balance}(Customers) - \pi_{C1.CustomerId, C1.Balance}(T1)$   
 $NC := \pi_{CustomerId, Balance}(Customers) - MAX1$   
 $NC1 = NC$   
 $NC2 = NC$   
 $T2 := \sigma_{NC.Balance < NC2.Balance}(NC1 \times NC2)$   
 $MAX2 := \pi_{CustomerId}(NC) - \pi_{NC1.CustomerId}(T2)$
  2.  $\{c_1 \mid \exists(c_2, c_3, c_4, c_5, c_6)(Customers(c_1, c_2, c_3, c_4, c_5, c_6) \wedge (\forall(x_1, x_2, x_3, x_4, x_5, x_6)((Customers(x_1, x_2, x_3, x_4, x_5, x_6) \wedge \neg(\forall(y_1, y_2, y_3, y_4, y_5, y_6)(Customers(y_1, y_2, y_3, y_4, y_5, y_6) \rightarrow y_6 \leq x_6))) \rightarrow x_6 \leq c_6))))\}$
  3.  $\{t^{(1)} \mid \exists c^{(6)}(Customers(c) \wedge (\forall(x^{(6)})(Customers(x) \wedge \neg(\forall(y^{(6)})(Customers(y) \rightarrow y[6] \leq x[6]))) \rightarrow x[6] \leq c[6])) \wedge t[1] = c[1])\}$
  4. SELECT C1.CustomerId  
 FROM Customers C1  
 WHERE C1.Balance IN(  
 SELECT MAX(C2.Balance)  
 FROM Customers C2  
 WHERE C2.Balance NOT IN (  
 SELECT MAX(C3.Balance)  
 FROM Customers C3));

v) Βρείτε τα ζεύγη ονομάτων πελατών που είναι μεταξύ 25 και 35 ετών και έχουν παραγγείλει τουλάχιστον δύο βιβλία του ίδιου συγγραφέα.

1.  $T1 := \sigma_{Age > 25 \wedge Age < 35}(Customers)$   
 $T2 := Orders \bowtie Books$   
 $T3 := T2 \bowtie T1$   
 $T4 := \pi_{OrderId, Name, CustomerId, Author}(T3)$   
 $C1 := T4$   
 $C2 := T4$   
 $T5 := C1 \times C2$   
 $T6 := \sigma_{C1.CustomerId \neq C2.CustomerId \wedge C1.Author = C2.Author}(T5)$   
 $T7 := \gamma_{C1.Name, C2.Name, C1.CustomerId, C2.CustomerId, C1.Author, C2.Author; COUNT(*) \rightarrow Count}(T6)$   
 $T8 := \sigma_{Count \geq 2}(T7)$   
 $T9 := \pi_{C1.Name, C2.Name}(T8)$   
 $T10 := \sigma_{C1.Name < C2.Name}(T9)$
2.  $\{(n_1, n_2) \mid \exists(a, o_1, o_2, c_1, c_2) Customers(c_1, n_1, e_1, a_1, m_1, b_1) \wedge Customers(c_2, n_2, e_2, a_2, m_2, b_2) \wedge (25 < a_1 < 35) \wedge (25 < a_2 < 35) \wedge c_1 \neq c_2 \wedge Orders(o_1, c_1, b_1, d_1, q_1) \wedge Orders(o_2, c_2, b_2, d_2, q_2) \wedge Books(b_1, t_1, a, p_1, g_1, f_1) \wedge Books(b_2, t_2, a, p_2, g_2, f_2)\}$
3.  $\{n^{(2)} \mid \exists(b_1^{(6)}, b_2^{(6)}, o_1^{(5)}, o_2^{(5)}, c_1^{(6)}, c_2^{(6)}) Customers(c_1) \wedge Customers(c_2) \wedge (25 < c_1[4] < 35) \wedge (25 < c_2[4] < 35) \wedge c_1[1] \neq c_2[1] \wedge Orders(o_1) \wedge Orders(o_2) \wedge o_1[2] = c_1[1] \wedge o_2[2] = c_2[1] \wedge Books(b_1) \wedge Books(b_2) \wedge o_1[3] = b_1[1] \wedge b_2[3] = b_2[1] \wedge b_1[3] = b_2[3] \wedge n[1] = c_1[2] \wedge n[2] = c_2[2]\}$
4. 

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SELECT DISTINCT C1.Name AS Customer1, C2.Name AS Customer2
FROM Customers C1
JOIN Orders O1 ON C1.CustomerId = O1.CustomerId
JOIN Books B1 ON O1.BookId = B1.BookId
JOIN Customers C2 ON C2.CustomerId != C1.CustomerId
JOIN Orders O2 ON C2.CustomerId = O2.CustomerId
JOIN Books B2 ON O2.BookId = B2.BookId
WHERE C1.Age BETWEEN 25 AND 35
AND C2.Age BETWEEN 25 AND 35
AND B1.Author = B2.Author
GROUP BY C1.Name, C2.Name, B1.Author
HAVING COUNT(DISTINCT B1.BookId) >= 2;
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vi) Βρείτε τους τίτλους των βιβλίων που έχουν μέση αξιολόγηση (Rating) μεγαλύτερη από 4 και έχουν παραγγελθεί τουλάχιστον πέντε φορές από διαφορετικούς πελάτες.

1.  $T1 := Orders \bowtie Books$   
 $T2 := \pi_{CustomerId, BookId}(T1)$   
 $T3 := \gamma_{BookId; Count(*) \rightarrow Count}(T2)$   
 $T4 := \sigma_{Count \geq 5}(T3)$   
 $T5 := Reviews \bowtie T4$   
 $T6 := \gamma_{BookId; Avg(*) \rightarrow Avg}(T5)$   
 $T7 := \sigma_{Avg > 4}(T6)$   
 $T8 := T7 \bowtie Books$   
 $T9 := \pi_{Title}(T8)$

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4. SELECT DISTINCT b.Title
FROM Books b
JOIN (
  SELECT o.BookId
  FROM Orders o
  JOIN (
    SELECT BookId, COUNT(DISTINCT CustomerId) AS Count
    FROM Orders
    GROUP BY BookId
    HAVING COUNT(DISTINCT CustomerId) >= 5
  ) AS booksordered5
  ON o.BookId = booksordered5.BookId
  JOIN Reviews r ON r.BookId = frequent_books.BookId
  GROUP BY o.BookId
  HAVING AVG(r.Rating) > 4
) AS ratedover4
ON b.BookId = ratedover4.BookId;
```