Q1.

a) 
\[ \pi_{age}(\pi_{cid}Orders - \pi_{cid}((\sigma_{year \leq 2000} Books) \bowtie Orders)) \bowtie Customers \]

b) 
\[ \pi_{cname}(\pi_{cid}Orders \bowtie (\sigma_{author="EdgarCodd"} Books) - \pi_{cid}((\sigma_{price > 100} Books) \bowtie Orders)) \bowtie Customers \]

c) 
\[ \pi_{zipcode}(\pi_{bid}(\sigma_{author="EdgarCodd"} \bowtie bname="Databases" Books)) \bowtie \sigma_{quantity \geq 20} Orders \bowtie Customers \]

d) 
\[ \rho(B1, Books \bowtie \pi_{bid}Orders) \]
\[ \rho(B2, B1) \]
\[ \pi_{cname.zipcode}(\pi_{bid}B1 - \pi_{B1.bid}(B1 \bowtie (B1.price < B2.price)) B2) \bowtie Orders \bowtie Customers \]

e) 
\[ \rho(C1, Customers) \]
\[ \rho(C2, Customers) \]
\[ \rho(B1, \pi_{bid}(Orders \bowtie \left(\pi_{cid}C1 - \pi_{C1.cid}(C1 \bowtie (C1.age > C2.age) C2)\right)) \bowtie Books) \]
\[ \rho(B2, B1) \]
\[ \pi_{btitle}(\pi_{bid}B1 - \pi_{B1.bid}(B1 \bowtie (B1.price < B2.price) B2)) \bowtie Books) \]
Q2.

a)

SELECT DISTINCT C.zipcode
FROM Customers C WHERE NOT EXISTS(
    SELECT B.year FROM Books B
    MINUS
    SELECT B1.year FROM Orders O, Books B1
    WHERE O.bid=B1.bid AND O.cid = C.cid AND O.quantity >= 1
)

b)

SELECT C.cid, MAX(B.price)
FROM Customers C, Orders O, Books B
WHERE C.cid=O.cid AND O.bid=B.bid
GROUP BY C.cid
HAVING 10,000 <= SUM( O.quantity * B.price )

c)

SELECT DISTINCT C.age
FROM Customers C, Orders O
WHERE C.cid = O.cid AND C.cid NOT IN ( 
    SELECT O1.cid
    FROM Orders O1, Books B
    WHERE O1.bid=B.bid AND NOT B.title LIKE "%Databases%"
)

)
d)
SELECT C.age
FROM Customers C, Orders O, Books B
WHERE C.cid=O.cid AND O.bid=B.bid AND B.price =
    (SELECT MAX(B1.price)
     FROM Books B1, Orders O1
     WHERE B1.bid=O1.bid)

e)
SELECT TMP.cname
FROM    (SELECT C.cname, SUM (O.quantity * B.price) as DollarAmount
         FROM Customers C, Orders O, Books B
         WHERE C.cid=O.cid and O.bid = B.bid
         GROUP BY C.cid, C.cname
         ) TMP
WHERE TMP.DollarAmount = (SELECT MAX(DollarAmount) FROM TMP)