Q1.

a) 
\[ \pi_{\text{age}}((\sigma_{\text{year}=2010} Books) \bowtie Orders \bowtie Customers) \]

b) 
\[ \pi_{\text{author}}(\pi_{\text{bid}}(Books \bowtie Orders) - \pi_{\text{bid}}(\sigma_{\text{age}>20}(Customers \bowtie Orders))) \bowtie Books \]

c) --

d) 
\[ \rho(TMP1, Books \bowtie Orders) \]
\[ \rho(TMP2, TMP1) \]
\[ \rho(TM3, \pi_{\text{bid}} TMP1 - \pi_{\text{bid}} TMP1 (TMP1 \bowtie (TMP1,price<TMP2,price)) \bowtie TMP2)) \]
\[ \pi_{\text{cname,zipcode}}(TMP3 \bowtie Orders \bowtie Customers) \]

e) 
\[ \rho(TMP1, Customers) \]
\[ \rho(TMP2, TMP1) \]
\[ \rho(LEFT, \pi_{\text{TMP1,sid}}(TMP1 \bowtie (TMP1,age<TMP2,age) \bowtie TMP2)) \]
\[ \rho(TM3, \pi_{\text{bid,year}}((\pi_{\text{sid}} Customers - \pi_{\text{sid}} LEFT) \bowtie Orders \bowtie Books)) \]
\[ \rho(TMP4, TMP3) \]
\[ \rho(TM5, \pi_{\text{bid}} TMP4 - \pi_{\text{bid}} TMP3 (TMP3 \bowtie (TMP3,year<TMP4,year) \bowtie TMP4)) \]
\[ \pi_{\text{bid, bname}} TMP5 \bowtie Books \]
Q2.

a)

SELECT B.price
FROM Books B WHERE NOT EXISTS(
    SELECT C.zipcode from Customers C
    MINUS
    SELECT C1.zipcode FROM Orders O, Customers C1
    WHERE C1.cid=O.cid and O.bid=B.bid
)

b)

SELECT O.cid, MAX(B.price)
FROM Orders O, Books B
WHERE O.bid=B.bid
GROUP BY O.ccid
HAVING 10 <= (SELECT (COUNT(*) FROM ORDERS O1, BOOKS B1
    WHERE O1.BID=B1.BID AND B1.PRICE>=100 AND O1.CID=O.CID)

c)

SELECT C.AGE
FROM Books B, Orders O, Customers C
WHERE B.bid=O.bid and C.cid=O.cid and B.bname LIKE "%Databases%"

d)

SELECT B.AUTHOR
FROM BOOKS B
WHERE B.BID NOT IN (
    SELECT O.BID
FROM ORDERS O, CUSTOMERS C
WHERE O.CID=C.CID AND C.CID > 20
)
e)

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