

Q1.

a)

$$\pi_{btitle} \left(\left(\pi_{bid}(Orders) - \pi_{bid}(\sigma_{quantity < 100}(Orders)) \right) \bowtie Books \right)$$

b)

$$\pi_{author}((\sigma_{price \leq 40} Books) \bowtie Orders \bowtie (\sigma_{zipcode=12345} Customers))$$

c)

$$\pi_{cname} \left(\left(\left(\pi_{cid}((\sigma_{year=2000} Books) \bowtie Orders) \cap \pi_{cid}(\sigma_{quantity \geq 10 \wedge price > 100}(Books \bowtie Orders)) \right) \right) \bowtie Customers \right)$$

d)

$$\rho(TMP1, Orders)$$

$$\rho(TMP2, TMP1)$$

$$\rho(TMP3, \pi_{TMP1.bid}(TMP1 \bowtie_{(TMP1.bid=TMP2.bid) \wedge (TMP1.cid <> TMP2.cid)} TMP2))$$

$$\pi_{author}(TMP3 \bowtie Books)$$

e)

$$\rho(TMP1, Customers)$$

$$\rho(TMP2, TMP1)$$

$$\rho(twoormore, \pi_{TMP1.cid}(TMP1 \bowtie_{(TMP1.cid <> TMP2.cid) \wedge (TMP1.zipcode=TMP2.zipcode)} TMP2))$$

$$\pi_{btitle}((\pi_{sid} Customers - \pi_{sid} twoormore) \bowtie Orders \bowtie Books)$$

Q2.

a)

```
SELECT B.AUTHOR
FROM BOOKS B, ORDERS O
WHERE B.BID=O.BID AND B.BID NOT IN (
    SELECT O1.BID
    FROM ORDERS O1, CUSTOMERS C
    WHERE O1.CID=C.CID AND C.ZIPCODE <> '02125'
)
```

b)

```
SELECT C.zipcode
FROM Books B, Orders O, Customers C
WHERE B.bid=O.bid and C.cid=O.cid and O.quantity >=10 and B.author LIKE "Cod%"
```

c)

```
SELECT C.cname, MAX(B.price)
FROM Orders O, Books B, Customer C
WHERE C.cid=O.cid and O.bid=B.bid and B.year=1990
GROUP BY C.cid, C.cname
HAVING 5 <= (SELECT (COUNT(*) FROM ORDERS O1, BOOKS B1
    WHERE O1.BID=B1.BID AND O1.CID=C.CID)
```

d)

```
SELECT B.btitle
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
)
```

e)

```
SELECT C.cname, SUM (O.quantity * B.price)
FROM Customers C, Orders O, Books B
WHERE O.bid=B.bid and C.cid=O.cid and C.zipcode='02125'
GROUP BY C.cid, C.cname
```

f)

```
SELECT TMP.zip
FROM      (SELECT C.zipcode AS zip, 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.zipcode
          ) TMP
WHERE TMP.TotalAmount = (SELECT MAX(TotalAmount) FROM TMP)
```