## 5.1 Solve:

1.

```
SELECT DISTINCT S.Sname
FROM Student S, Class C, Enrolled E, Faculty F
WHERE S.snum = E.snum AND E.cname = C.name AND C.fid = F.fid AND F.fname = 'I.Teach'
        AND S.level = 'JR'
```

2.

```
SELECT MAX(S.age)
FROM Student S
WHERE (S.major = 'History')
        OR S.snum IN (SELECT E.snum
                FROM Class C, Enrolled E, Faculty F
                WHERE E.cname = C.name AND C.fid = F.fid AND F.fname = 'I.Teach' )
```

3.

```
SELECT C.name
FROM Class C
WHERE C.room = 'R128'
        OR C.name IN (SELECT E.cname
                    FROM Enrolled E
                    GROUP BY E.cname
                    HAVING COUNT (*) >= 5)
```

4.

```
SELECT DISTINCT S.sname
FROM Student S
WHERE S.snum IN (SELECT E1.snum
                FROM Enrolled E1, Enrolled E2, Class C1, Class C2
                WHERE E1.snum = E2.snum AND E1.cname <> E2.cname AND E1.cname = C1.name
                 AND E2.cname = C2.name AND C1.meets at = C2.meets at)
```

5.

```
SELECT DISTINCT F.fname
FROM Faculty F
WHERE NOT EXISTS (( SELECT *
                        FROM Class C )
                        EXCEPT
                        (SELECT C1.room
                        FROM Class C1
                        WHERE C1.fid = F.fid ))
```

6.

```
SELECT DISTINCT F.fname
FROM Faculty F
WHERE 5 > (SELECT COUNT (E.snum)
            FROM Class C, Enrolled E
            WHERE C.name = E.cname AND C.fid = F.fid)
```

7.

```
SELECT S.level, AVG(S.age)
FROM Student S
GROUP BY S.level
```

8.

```
SELECT S.level, AVG(S.age)
FROM Student S
WHERE S.level <> 'JR'
GROUP BY S.level
```

9.

```
SELECT F.fname, COUNT(*) AS CourseCount
FROM Faculty F, Class C
WHERE F.fid = C.fid
GROUP BY F.fid, F.fname
HAVING EVERY ( C.room = 'R128' )
```

10.

```
SELECT DISTINCT S.sname
FROM Student S
WHERE S.snum IN (SELECT E.snum
                 FROM Enrolled E
                 GROUP BY E.snum
                   HAVING COUNT (*) >= ALL (SELECT COUNT (*)
                                            FROM Enrolled E2
                                            GROUP BY E2.snum ))
```

11.

```
SELECT DISTINCT S.sname
FROM Student S
WHERE S.snum NOT IN (SELECT E.snum
                     FROM Enrolled E )
```

12.

```
SELECT S.age, S.level
FROM Student S
GROUP BY S.age, S.level,
HAVING S.level IN (SELECT S1.level
                 FROM Student S1
                 WHERE S1.age = S.age
                 GROUP BY S1.level, S1.age
                 HAVING COUNT (*) >= ALL (SELECT COUNT (*)
                                          FROM Student S2
                                          WHERE s1.age = S2.age
                                          GROUP BY S2.level, S2.age))
```

## 5.2 Solve:

1.

```
SELECT DISTINCT P.pname
FROM Parts P, Catalog C
WHERE P.pid = C.pid
```

2.

```
SELECT S.sname
FROM Suppliers S
WHERE NOT EXISTS (( SELECT P.pid
                    FROM Parts P )
                    EXCEPT
                    ( SELECT C.pid
                    FROM Catalog C

                    WHERE C.sid = S.sid ))
```

3.

```
SELECT S.sname
FROM Suppliers S
WHERE NOT EXISTS (( SELECT P.pid
                    FROM Parts P
                    WHERE P.color = ‘Red’ )
                    EXCEPT
                    ( SELECT C.pid
                    FROM Catalog C, Parts P
                    WHERE C.sid = S.sid AND C.pid = P.pid AND P.color = ‘Red’ ))
```

4.

```
SELECT P.pname
FROM Parts P, Catalog C, Suppliers S
WHERE P.pid = C.pid AND C.sid = S.sid AND S.sname = ‘Acme Widget Suppliers’
        AND NOT EXISTS ( SELECT *
                        FROM Catalog C1, Suppliers S1
                        WHERE P.pid = C1.pid AND C1.sid = S1.sid
                            AND S1.sname <> ‘Acme Widget Suppliers’ )
```

5.

```
SELECT DISTINCT C.sid
FROM Catalog C
WHERE C.cost > ( SELECT AVG (C1.cost)
                FROM Catalog C1
                WHERE C1.pid = C.pid )
```

6.

```
SELECT P.pid, S.sname
FROM Parts P, Suppliers S, Catalog C
WHERE C.pid = P.pid AND C.sid = S.sid AND C.cost = (SELECT MAX (C1.cost)
                                                    FROM Catalog C1
                                                    WHERE C1.pid = P.pid)
```

7.

```
SELECT DISTINCT C.sid
FROM Catalog C
WHERE NOT EXISTS ( SELECT *
                    FROM Parts P
                    WHERE P.pid = C.pid AND P.color <> ‘Red’ )
```

8.

```
SELECT DISTINCT C.sid
FROM Catalog C, Parts P
WHERE C.pid = P.pid AND P.color = ‘Red’
INTERSECT
SELECT DISTINCT C1.sid
FROM Catalog C1, Parts P1
WHERE C1.pid = P1.pid AND P1.color = ‘Green’
```

9.

```
SELECT DISTINCT C.sid
FROM Catalog C, Parts P
WHERE C.pid = P.pid AND P.color = ‘Red’
UNION
SELECT DISTINCT C1.sid
FROM Catalog C1, Parts P1
WHERE C1.pid = P1.pid AND P1.color = ‘Green’
```

10.

```
SELECT S.sname, COUNT(*) as PartCount
FROM Suppliers S, Parts P, Catalog C
WHERE P.pid = C.pid AND C.sid = S.sid
GROUP BY S.sname, S.sid
HAVING EVERY (P.color=’Green’)
```

11.

```
SELECT S.sname, MAX(C.cost) as MaxCost
FROM Suppliers S, Parts P, Catalog C
WHERE P.pid = C.pid AND C.sid = S.sid
GROUP BY S.sname, S.sid
HAVING ANY ( P.color=’green’ ) AND ANY ( P.color = ’red’ )
```

## 5.3 Solve:

1.

```
SELECT DISTINCT A.aname
FROM Aircraft A
WHERE A.Aid IN (SELECT C.aid
            FROM Certified C, Employees E
            WHERE C.eid = E.eid AND
            NOT EXISTS ( SELECT *
                        FROM Employees E1
                        WHERE E1.eid = E.eid AND E1.salary < 80000 ))
```

2.

```
SELECT C.eid, MAX (A.cruisingrange)
FROM Certified C, Aircraft A
WHERE C.aid = A.aid
GROUP BY C.eid
HAVING COUNT (*) > 3
```

3.

```
SELECT DISTINCT E.ename
FROM Employees E
WHERE E.salary < ( SELECT MIN (F.price)
                   FROM Flights F
                   WHERE F.from = 'Los Angeles' AND F.to = 'Honolulu' )
```

4.

```
SELECT Temp.name, Temp.AvgSalary
FROM ( SELECT A.aid, A.aname AS name, AVG (E.salary) AS AvgSalary
        FROM Aircraft A, Certified C, Employees E
        WHERE A.aid = C.aid AND C.eid = E.eid AND A.cruisingrange > 1000
        GROUP BY A.aid, A.aname ) AS Temp
```

5.

```
SELECT DISTINCT E.ename
FROM Employees E, Certified C, Aircraft A
WHERE E.eid = C.eid AND C.aid = A.aid AND A.aname LIKE 'Boeing%'
```

6.

```
SELECT A.aid
FROM Aircraft A
WHERE A.cruisingrange > ( SELECT MIN (F.distance)
                         FROM Flights F
                         WHERE F.from = 'Los Angeles' AND F.to = 'Chicago' )
```

7.

```
SELECT DISTINCT F.from, F.to
FROM Flights F
WHERE NOT EXISTS ( SELECT *
                   FROM Employees E
                   WHERE E.salary > 100000
                   AND
                   NOT EXISTS (SELECT *
                               FROM Aircraft A, Certified C
                               WHERE A.cruisingrange > F.distance
                               AND E.eid = C.eid AND A.aid = C.aid) )
```

8.

```
SELECT DISTINCT E.ename
FROM Employees E
WHERE E.eid IN ( ( SELECT C.eid
                   FROM Certified C
                   WHERE EXISTS ( SELECT A.aid
                                  FROM Aircraft A
                                  WHERE A.aid = C.aid AND A.cruisingrange > 3000 )
                                  AND
                                  NOT EXISTS ( SELECT A1.aid
                                               FROM Aircraft A1
                                               WHERE A1.aid = C.aid
                                                   AND A1.aname LIKE 'Boeing%' ))
```

9.

```
SELECT F.departs
FROM Flights F
WHERE F.flno IN ( ( SELECT F0.flno
                      FROM Flights F0
                    WHERE F0.from = 'Madison' AND F0.to = 'New York'
                      AND F0.arrives < '18:00' )
                    UNION
                    ( SELECT F0.flno
                        FROM Flights F0, Flights F1
                        WHERE F0.from = 'Madison' AND F0.to <> 'New York'
                        AND F0.to = F1.from AND F1.to = 'New York'
                          AND F1.departs > F0.arrives AND F1.arrives < '18:00' )
                    UNION
                    ( SELECT F0.flno
                        FROM Flights F0, Flights F1, Flights F2
                        WHERE F0.from = 'Madison' AND F0.to = F1.from AND F1.to = F2.from
                            AND F2.to = 'New York' AND F0.to <> 'New York'
                            AND F1.to <> 'New York' AND F1.departs > F0.arrives
                            AND F2.departs > F1.arrives AND F2.arrives < '18:00' ))
```

10.

```
SELECT Temp1.avg - Temp2.avg
FROM (SELECT AVG (E.salary) AS avg
        FROM Employees E
        WHERE E.eid IN (SELECT DISTINCT C.eid
                        FROM Certified C )) AS Temp1,
                        (SELECT AVG (E1.salary) AS avg
                            FROM Employees E1 ) AS Temp2
```

11.

```
SELECT E.ename, E.salary
FROM Employees E
WHERE E.eid NOT IN ( SELECT DISTINCT C.eid
                     FROM Certified C )
                     AND E.salary > ( SELECT AVG (E1.salary)
                                      FROM Employees E1
                                      WHERE E1.eid IN
                                      ( SELECT DISTINCT C1.eid
                                      FROM Certified C1 ) )
```

12.

```
SELECT E.ename
FROM Employees E, Certified C, Aircraft A
WHERE C.aid = A.aid AND E.eid = C.eid
GROUP BY E.eid, E.ename
HAVING EVERY (A.cruisingrange > 1000)
```

13.

```
SELECT E.ename
FROM Employees E, Certified C, Aircraft A
WHERE C.aid = A.aid AND E.eid = C.eid
GROUP BY E.eid, E.ename
HAVING EVERY (A.cruisingrange > 1000) AND COUNT (*) > 1
```

14.

```
SELECT E.ename
FROM Employees E, Certified C, Aircraft A
WHERE C.aid = A.aid AND E.eid = C.eid
GROUP BY E.eid, E.ename
HAVING EVERY (A.cruisingrange > 1000) AND ANY (A.aname = 'Boeing')
```