Q6:

(1) SELECT   E.FNAME, E.LNAME, P.PNAME

    FROM   EMPLOYEE AS E, DEPARTMENT AS D, PROJECT AS P

             WORKS_ON AS W

    WHERE   W.ESSN = E.SSN   AND   W.PNO = P.PNUMBER

             AND P.DNUM = D.DNUMBER   AND D.NAME = `Research`

(2) SELECT   E.FNAME, E.LNAME, E.SALARY, D.DNAME

    FROM   EMPLOYEE AS E, DEPARTMENT AS D, DEPENDENT AS DE

    WHERE   E.SSN = DE.ESSN   AND E.DNO = D.DNUMBER

    GROUP BY   E.FNAME, E.LNAME

    HAVING   COUNT (*) > 2

(3) SELECT   D.DNAME, SUM(E.SALARY), COUNT(*)

    FROM   DEPARTMENT AS D JOIN EMPLOYEE AS E

             ON D.DNUMBER = E.DNO

    GROUP BY D.DNAME

    HAVING   COUNT(*) > 5

(4) SELECT   E.FNAME, E.LNAME, M.FNAME, M.LNAME

    FROM   EMPLOYEE AS E, EMPLOYEE AS M,

             WORKS_ON AS W, PROJECT AS P

    WHERE   E.SUPERSSN = M.SSN   AND   E.SSN = W.ESSN

             AND W.PNO = P.PNUMBER

             AND P.NAME = `Mountain Travel`

             AND E.SALARY > M.SALARY

(5) SELECT   P.PNUMBER , P.NAME , COUNT (*)

FROM   PROJECT AS P , EMPLOYEE AS E ,

        WORKS_ON AS W

WHERE   P.PNUMBER IN (SELECT W.PNO

                WHERE P.LOCATION='Hitachi'   FROM WORKS_ON AS W, PROJECT AS P

                P.NUMBER = W.PNO   GROUP BY W.PNO

                            HAVING COUNT(*) >10)

        AND   E.SEX = `Male'

        AND   W.ESSN = E.SSN

        AND   P.NUMBER = W.PNO

(6) SELECT   E.FNAME , E.LNAME , M.FNAME , M.LNAME

FROM   EMPLOYEE AS E , EMPLOYEE AS M , DEPARTMENT AS D

WHERE   NOT EXISTS (SELECT *

                FROM   WORKS_ON AS W , EMPLOYEE AS EP

                WHERE W.ESSN = EP.SSN)

            AND

            (SELECT *

                FROM   DEPENDENT AS D , EMPLOYEE AS EP

                WHERE D.ESSN = EP.SSN)

      AND

      E.DNO = P.DNUMBER   AND

      D.MGRSSN = M.SSN

(7)

```
SELECT      E.FNAME,  E.LNAME,  D.DNAME
FROM        EMPLOYEE AS E    JOIN  DEPARTMENT AS  D
            ON  D.DNUMBER =  E.DNO
            JOIN  WORK_ON  AS  W  ON  W.ESSN = E.SSN

WHERE      NOT  EXISTS  ( SELECT  *
                          FROM    DEPENDENT AS DP , EMPLOYEE AS EP
                          WHERE   DP. ESSN = EP.SSN )
GROUP BY   E.SSN
HAVING     COUNT (*)  >  ALL ( SELECT   COUNT (*)
                               FROM    EMPLOYEE AS E,
                                       WORKS_ON  AS  W
                               WHERE   E.DNO = 5    AND
                                       E. SSN = W. ESSN
                               GROUP BY  E.SSN )
```

(8)

```
SELECT   E. FNAME,  E.LNAME , E.SALARY
FROM     EMPLOYEE AS E , DEPARTMENT AS D
WHERE    ( SELECT   COUNT (*)
           FROM     EMPLOYEE AS P
           WHERE    P. SUPERSSN = E.SSN    AND
                    E. SSN = D.MGRSSN     AND
                    D. DNAME = `R&D' )   > 5
```

(9)

(a)
```
WITH    JSWORK (PNUMBER)   AS
        ( SELECT   PNUMBER
          FROM     PROJECT AS P , EMPLOYEE AS E,
                   WORKS_ON AS W
          WHERE    P.NUMBER = W.PNO    AND
                   W.ESSN = E.SSN      AND
                   E.FNAME = `John'    AND
                   E.LNAME = `Smith' )
SELECT   E.FNAME , E.LNAME
FROM     EMPLOYEE AS E , WORKS_ON AS W
WHERE    E.SSN = W.ESSN      AND
         W.PNO   IN    JSWORK
GROUP BY   ENAME , E.LNAME
HAVING     COUNT (#) = ( SELECT    COUNT (#)
                         FROM      JSWORK )
```
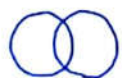
(b)

JSmith PNOs set → J

Emp PNOs set → E

① ② ③ ④

① J E (intersects)

② J E (no intersection)

③ (E) J   J ⊃ E

④ (J) E   J ⊂ E

NOT EXISTS (J EXCEPT E)

⇒ { if J ⊃ E ⇒ 回傳 J−E 之元素集合 ⇒ NOT EXISTS = FALSE
    if J ⊂ E ⇒ 回傳 NULL ⇒ NOT EXISTS = TRUE

故可由 NOT EXISTS 和 EXCEPT 檢驗 J ⊂ E 之情形

(10)

```
WITH RECURSIVE  SUP_EMP ( SupSsn, EmpSsn ) AS

    ( SELECT  E.SUPERSSN, E.SSN

        FROM  EMPLOYEE AS E, PROJECT AS P, WORKS_ON AS W

        WHERE  P.PNUMBER = W.PNO  AND

            W.ESSN = E.SSN  AND

            P.PNAME = `AI'

    UNION

        SELECT  S.SUPERSSN, E.SSN

        FROM  EMPLOYEE AS E, SUP_EMP AS S

        WHERE  E.SUPERSSN = S.EMPSSN )

SELECT  E.FNAME, E.LNAME, M.FNAME, M.LNAME

FROM  EMPLOYEE AS E, EMPLOYEE AS M, SUP_EMP AS S

WHERE  E.SSN = S.EmpSSN  AND

    M.SSN = S.Sup SSN  AND  ( SELECT  COUNT (*)
                                FROM  SUP_EMP
                                GROUP BY  SupSSN ) > 2
```