注意：　**(1) 請勿用鉛筆作答 (2) 不可使用任何字典 (3) 手機關機且收藏妥當不得置於桌面**
　　　　(4) 請注意作答文句的通順與完整；詞不達意與作答不完整，會被扣分

1. Which one can be used to hide storage details and present the users with a conceptual view of the DB? (5%)
   (a) DBMS (b) Data model (c) Query language (d) Programming language.

2. The set operations apply only to union compatible relations. What are the conditions of union compatible? (5%)
   (a) The relations must have the same relation name. (b) The relations must have the same attributes. (c) The relations must have the constraints. (d) The attributes must appear in the same order.

3. Define the following terms: (a) valid database state (b) entity integrity constraint (c) foreign key (d) Database management system (DBMS). (20%)

4. In case of integrity violation in update operations on relations, please describe what actions can be taken? (10%)

5. Please describe two methods of view implementation and the advantages and disadvantages of each method? (10%)

6. Please explain why three-schema architecture can support (a) multiple views of the data, and (b) program-data independence. (10%)

7. Given the relational database schema as follows, please write SQL statements for the following queries or updates. (40%)

   EMPLOYEE (FNAME, MINIT, LNAME, <u>SSN</u>, BDATE, ADDRESS, SEX, SALARY, SUPERSSN, DNO)
   DEPARTMENT (DNAME, <u>DNUMBER</u>, MGRSSN, MGRSTARTDATE)
   DEPT_LOCATIONS (<u>DNUMBER, DLOCATION</u>)
   PROJECT (PNAME, <u>PNUMBER</u>, PLOCATION, DNUM)
   WORKS_ON (<u>ESSN, PNO</u>, HOURS)
   DEPENDENT (<u>ESSN, DEPENDENT-NAME</u>, SEX, BDATE, RELATIONSHIP)

   (a) Retrieve the name and address of all employees who work for the 'Research' department.
   (b) Retrieve the name of each employee who has a dependent with the same first name as the employee.
   (c) Retrieve the social security numbers of all employees who work on project number 1, 2, 3, or 4.
   (d) A list of all employee names and also the name of the departments they manage *if they happen to manage a department*
   (e) Please create a view which has the name of each department, the number of employees in each department, and the total salary of each department.
   (f) For each project, retrieve the project number, project name, and the number of **male** employees who work on that project.
   (g) Change the location and controlling department number of project number 10 to 'Bellaire' and 5, respectively.
   (h) Delete the employees who has no supervisor.