國 立 臺 北 科 技 大 學

一百零四學年第一學期電機系博士班資格考試

資料庫 試題

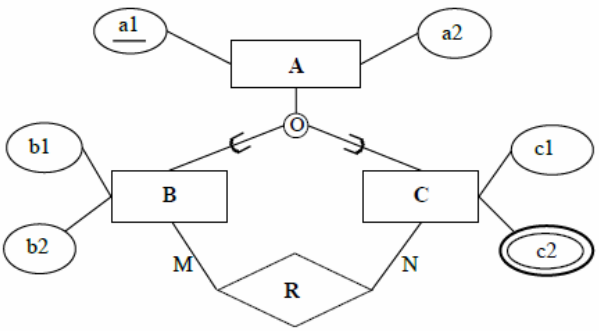
注意事項：

1. 本試題共【6】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間:二小時。

1. Consider the relation schema R={A, B, C, D} and the set of functional dependencies F={ABD→C, C→A} on R.

   (a) R has two candidate keys. What are they? (5 points)
   (b) R is not in BCNF, but it is in 3NF. Why? (5 points)
   (c) Consider the decomposition of R into R1={A, B, D} and R2={A, C}. Is this a valid decomposition into BCNF? Explain your answer. (5 points)
   (d) Does the decomposition in question (c) have the dependency preservation property? Explain your answer. (5 points)
   (e) Does the decomposition in question (c) have the lossless join property? Explain your answer. (5 points)

2. Map the following EER diagram into a relational schema. Specify all primary keys and foreign keys. (10 points)



3. Consider the following relations with underlined primary keys.

EMPLOYEE (Ssn, Ename, Sex)

PROJECT (Pno, Pname)

WORKS_ON (Ssn, Pno)

Here an employee can work on several projects and a project can have several employees.

(a) Specify the following queries in **relational algebra**
   (i) List the names of the employees who work on all projects. (5 points)
   (ii) List the Pno of projects that the employee 'John Smith' **does not** work on. (5 points)

(b) Specify the following queries in **SQL**.
   (i) List the names of the employees who work on exactly two project. (5 points)
   (ii) List the names of the employees who **do not** work on the project name 'ProductX'. (5 points)

4. Explain the following terms.

   (a) Two phase locking protocol. (5 points)
   (b) Serial schedule. (5 points)
   (c) Serializable schedule. (5 points)
   (d) Cascading rollback. (5 points)
   (e) Lost update problem. (5 points)
   (f) Dirty read problem. (5 points)

5. Describe three methods for hash table to resolve collision. (5 points)

6. Insert elements with keys 14, 18, and 10 (in the given order) into the following B-tree of order=3. Show the resulting B-tree following each insert. (10 points)