

2010 Paper 4 Question 6

Databases

- (a) Present **two** advantages and **two** disadvantages of eliminating logical redundancy in database schema design. [4 marks]
- (b) What are NULL values in SQL, and with what problems are they associated? [2 marks]
- (c) We are given a schema $R(\mathbf{X})$ with key $K \in \mathbf{X}$. Suppose that $A, B, C \in \mathbf{X}$ are non-key attributes and we want to verify that the functional dependency $A, B \rightarrow C$ is not violated in our database. Consider the SQL query,

```
select S.K, T.K as K1, K2
from R as S, R as T
where S.A = T.A and S.B = T.B and S.C <> T.C
```

Does this query return all key pairs of records that violate the functional dependency

- (i) when C is not allowed to be NULL? [3 marks]
- (ii) when C is allowed to be NULL? [3 marks]
- (d) Suppose that $R(\mathbf{X}, \mathbf{Y}, \mathbf{Z})$ is a relational schema where \mathbf{X} , \mathbf{Y} , and \mathbf{Z} are disjoint attribute sets. Prove that the following *mixed transitivity* rule holds:

If $\mathbf{X} \twoheadrightarrow \mathbf{Y}$ and $\mathbf{Y} \rightarrow \mathbf{Z}$, then $\mathbf{X} \rightarrow \mathbf{Z}$.

[8 marks]