5 Databases (TGG)

(a) Consider the following Entity-Relationship (ER) diagram.

Suppose we wish to implement this diagram in a relational database using three tables, $S(sid, A)$, $T(tid, C)$, and $R(\cdot \cdot \cdot)$. Describe the schema you would use for $R$ depending on the cardinality of the relationship.

(i) When $R$ is a many-to-many relationship between $S$ and $T$. [2 marks]

(ii) When $R$ is a one-to-many relationship between $S$ and $T$. [2 marks]

(iii) When $R$ is a many-to-one relationship between $S$ and $T$. [2 marks]

(iv) When $R$ is a one-to-one relationship between $S$ and $T$. [2 marks]

(b) Suppose $R$ is a many-to-one relationship. Rather than implementing a new table for $R$, can we modify one of the tables representing $S$ or $T$ to implement this relationship? Discuss the advantages and disadvantages of such a representation. [4 marks]

(c) Suppose that we add the following diagram to our ER model.

Note that this implicitly defines a relationship between $S$ and $U$ resulting from the composition of relationships $R$ and $Q$. Discuss the difficulties that you might encounter in attempting to implement this derived relationship directly in a table $W$. For example, would the results of evaluating this SQL

```
select sid, tid, B, D
from R
join Q on R.tid = Q.tid
```

always be equivalent to the contents of such a $W$? [8 marks]