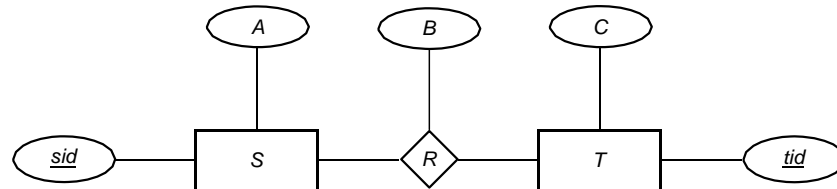


1 Databases (TGG)

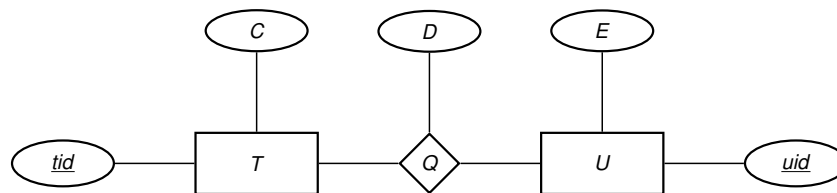
(a) Consider the following Entity-Relationship (ER) diagram.



Suppose we wish to implement this diagram in a relational database using three tables,  $S(\underline{sid}, A)$ ,  $T(\underline{tid}, C)$ , and  $R(\dots)$ . 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]