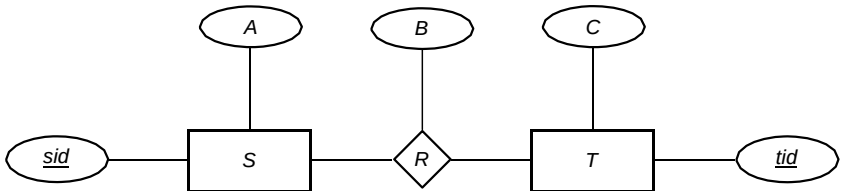
COMPUTER SCIENCE TRIPOS Part IA – 2017 – Paper 3

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 $R(\cdots)$. 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]

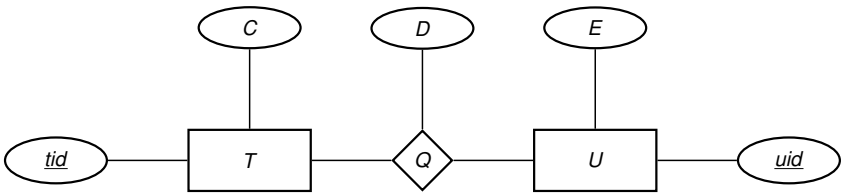
(*ii*) When R is a one-to-many relationship between S and T. [2 marks]

(*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]