Class Test-1

Marks-50

Time: 1.5 Hours

ER Diagram (30 points)

a) Draw an ER diagram based on the following description: Suppose we have two entity sets, People and Email. Suppose we also use a relationship Owns, which connects these two entities. A person may own multiple email accounts, but an email account can only be owned by a single person. You do not have to draw the attributes for the entities. (5 Points)

b) Draw an ER diagram based on the following description: Suppose we have three entity sets, Customers, Accounts, and Branch. Suppose we also use a relationship Has that connects these three entities. For every combination of a customer and a branch, there is a single account. For every combination of a customer and an account, there is a single branch. You do not have to draw the attributes for the entities. (5 Points)

c) Drawn an ER diagram based on the following description: Suppose we have two entity sets, Account and Checking Account. Accounting has two attributes AccountID and Balance. AccountID uniquely identifies Account. Checking Account has one attribute Overdraft.
Checking Account is a subclass of Account. (5 Points)

d) Based on the diagram you drew in part c), convert this ER diagram into a set of relations using the following approaches: (5 Points)

e) Figure 1 shows an ER diagram.

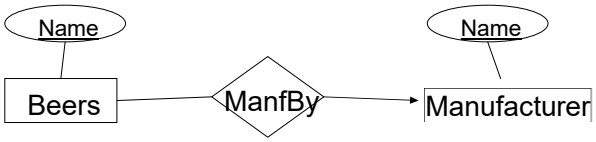

Figure 1: Problem 2f

1. Explain why this is not a good design. (5 Points)
2. Convert this ER diagram into a good design. (5 Points)

Functional Dependencies and Keys (20 points)

a) Consider the relation Treatment and FDs below. Describe, with examples, two different types of anomalies that can arise. (5 points)
Treatment (doctorID, doctorName, patientID, diagnosis)
doctorID → *doctorName*
doctorID, patientID → *diagnosis*

b) Prove that every two-attribute relation is in BCNF. (5 points)

c) Prove that if relation R is in 3NF and every key is simple (i.e., a single attribute), then R is in BCNF. (5 points)

d) Given a relation R(A,B,C,D,E) and FDs $D \rightarrow B$, $DE \rightarrow A$, $C \rightarrow AD$, decompose R into BCNF. (5 points)