




Normalization Questions

Each of the below questions deals with normal forms and data modeling, and should serve as examples for what sorts of questions might appear on the exam.

1. Is the following table in 1st normal form? If not, what is wrong with it?

 student_id	student_name	subject	grade
1	Alice	Math, Science, English	A, B, A
2	Bob	English, History	C, B
3	Charlie	Math, Art	B, A
4	Diana	Science, Math	A, B
5	Eve	History, Science	B, A
6	Frank	English, Science, History	B, A, C

2. Is the following table in 2nd normal form? If not, what is wrong with it?

 EmployeeID	 DepartmentID	DepartmentName	EmployeeName	HourlyWage
1	101	Sales	John	15
2	102	Marketing	Sarah	18
3	101	Sales	Tom	15
4	103	IT	Kate	20
5	104	HR	Linda	17
6	101	Sales	Mike	15

3. What normal form is this table in? Explain your reasoning for full points.

OrderID	ProductID	ProductName	SupplierID	SupplierName
101	1	Widget	5001	Widgets Co.
101	2	Gadget	5002	Gadgets Inc.
102	1	Widget	5001	Widgets Co.
102	3	Doohickey	5003	Doohickey Ltd
102	4	Thingamajig	5004	Things Corp.
103	2	Gadget	5002	Gadgets Inc.

4. What normal form is this table in? Explain your reasoning for full points.


RegistrationID	StudentID	StudentName	CourseID	CourseName	InstructorID	InstructorName
1	1	Alice	100	Math	10	Dr. Smith
2	2	Bob	101	Science	11	Dr. Jones
3	1	Alice	101	Science	11	Dr. Jones
4	3	Charlie	102	Art	12	Dr. Brown
5	4	Diana	103	History	13	Dr. Green
6	5	Eve	101	Science	11	Dr. Jones

5. Below is the ERD of a table and the accompanying unnormalized JSON data that should be placed into said table. What normal form is this table currently in? Explain yourself for full points.

supplier_order	
 OrderID	<i>INT</i>
 ProductID	<i>INT</i>
QuantityOrdered	<i>INT</i>
PricePerUnit	<i>NUMERIC(5,2)</i>
TotalCost	<i>NUMERIC(8,2)</i>

```
[
  {
    "OrderID": 1,
    "ProductID": "A123",
    "QuantityOrdered": 10,
    "PricePerUnit": 15,
    "TotalCost": 150
  },
  {
    "OrderID": 2,
    "ProductID": "B456",
    "QuantityOrdered": 5,
    "PricePerUnit": 25,
    "TotalCost": 125
  },
  {
    "OrderID": 3,
    "ProductID": "A123",
    "QuantityOrdered": 12,
    "PricePerUnit": 15,
    "TotalCost": 180
  }
]
```

6. Below is the ERD of a table and a sample of the accompanying unnormalized JSON data that should be placed into said table. What normal form is this table currently in? Explain yourself for full points.

customer_accounts	
 account_id	<i>INT</i>
customer_name	<i>TEXT</i>
annual_fee	<i>INT</i>
discount_rate	<i>NUMERIC(5,2)</i>
discounted_fee	<i>NUMERIC(8,2)</i>

```
[
  {
    "AccountID": 101,
    "CustomerName": "Jane_Doe",
    "AnnualFee": 200,
    "DiscountRate": 0.10,
    "DiscountedFee": 180
  },
  {
    "AccountID": 102,
    "CustomerName": "John_Smith",
    "AnnualFee": 300,
    "DiscountRate": 0.15,
    "DiscountedFee": 255
  },
  {
    "AccountID": 103,
    "CustomerName": "Sarah_Brown",
    "AnnualFee": 200,
    "DiscountRate": 0.20,
    "DiscountedFee": 160
  }
]
```