a. Discuss Normalization - Reduce the following
    i. Three anomalies
        1. Update address – need to update each row…
        2. Insert – New employees haven't assigned department – (if null value is not allowed for Emp_dept)
        3. Deletion – If D3 is deleted, so will James's information…

Emp_id	Emp_name	Emp_address	Emp_dept
100	Liang	Philly	D1
100	Liang	Philly	D2
123	James	Atlanta	D3
101	Paul	NY	D4
101	Paul	NY	D5

b. How to overcome
    i. 1st form of normalization
        1. Each attribute of a table must have 'atomic' or 'single' values

Before 1st NF

Emp_id	Emp_name	Emp_address	phone
100	Liang	Philly	12345678 37394040
100	Oby	Philly	23456000
123	James	Atlanta	79963930
101	Paul	NY	79993683
101	Li	NY	27493033 94048749

After 1stNF

Emp_id	Emp_name	Emp_address	phone
100	Liang	Philly	12345678
100	Liang	Philly	37394040
100	Oby	Philly	23456000
123	James	Atlanta	79963930
101	Paul	NY	79993683
101	Li	NY	27493033
101	Li	NY	94048749

    ii. 2nd FN

Before 2nd NF - see above

Teacher ID	Class	Teacher Age
1	History	47
2	Math	50
2	Algebra	50

3	Music	35
3	Arts	35
4	Biology	30
4	Physics	30

Teacher ID + Class – Candidate Key (combined as PK)
Teacher Age – non prim attribute needs to depend on BOTH attribute; in this case, it only depend on Teacher ID – a violation of 2nd NF

After 2nd NF
Table One:

Teacher ID	Class
1	History
2	Math
2	Algebra
3	Music
3	Arts
4	Biology
4	Physics

Table Two:

Teacher ID	Teacher Age
1	47
2	50
2	50
3	35
3	35
4	30
4	30

iii. 3rd NF

1. Must be in 2nd NF
2. All the attributes in a table are determined only by the candidate keys of that relation and not by any non-prime attributes

Emp_id	Emp_name	Emp_zip	Emp_state	Emp_city	Emp_district

Emp_id - > Primary key

But Emp_state, emp_city & district are depend on emp_zip NOT emp_id -> a violation of 3rd NF

After 3rd NF

Employee table

Emp_id	Emp_name	Emp_zip

Employee_zip table

Emp_zip	Emp_state	Emp_city	Emp_district