1. a.

1

N

PLACES

ORDER

CUSTOMER

1. b.

**CUSTOMER**

Total\_amount

\_date

Order\_date

Orderer\_id

**ORDER**

Order\_id

Birth\_date

Lname

Fname

Customer\_id

1. Using 8A. Multiple relations—superclass and subclasses. We will get this.

**ENGINEER**

SSN

EmpID

**EMPLOYEE**

Fname

Lname

Birth\_Date

Lang

EmpID

EmpID

Eng\_Type

**SECRETARY**

WPM

EmpID

**PROGRAMMER**

Birth\_Date

**PROGRAMMER**

SSN

Lname

Fname

EmpID

WPM

Eng\_Type

Lang

Birth\_Date

**ADMIN**

SSN

Lname

Fname

EmpID

Birth\_Date

**ENGINEER**

SSN

Lname

Fname

EmpID

Fname, Lname, SSN and Birth\_Date of John are repeated in 3 different places. His ID is also the same in all 3 tables. Subclass-Specific attributes are repeated only one time in this case. In case we need to modify any of the “common” attributes, we must change the value in all 3 entities. In case of forgetting to do so, we will have many inconsistencies. For example, if we don’t change the birth\_date in Admin entity, we will get different birth\_date of the same employee if we get the row info from Programmer table vs if we get it from the Admin table. This option is also creating space issues, because, as mentioned above, we keep 3x data needed. If, for example, Fname is taking 5 bytes, in this case it will take 15bytes instead (3 x 5).

It is usually suggested to use 8B method in case of disjointedness constraint, not in case of having overlaps.

True Statements are the following ones.

1. Redundancy encourages inconsistency and we should always avoid redundancy
2. Redundancy uses additional space unnecessarily
3. We should not use option 8B when we don’t have additionally the disjointedness constraint