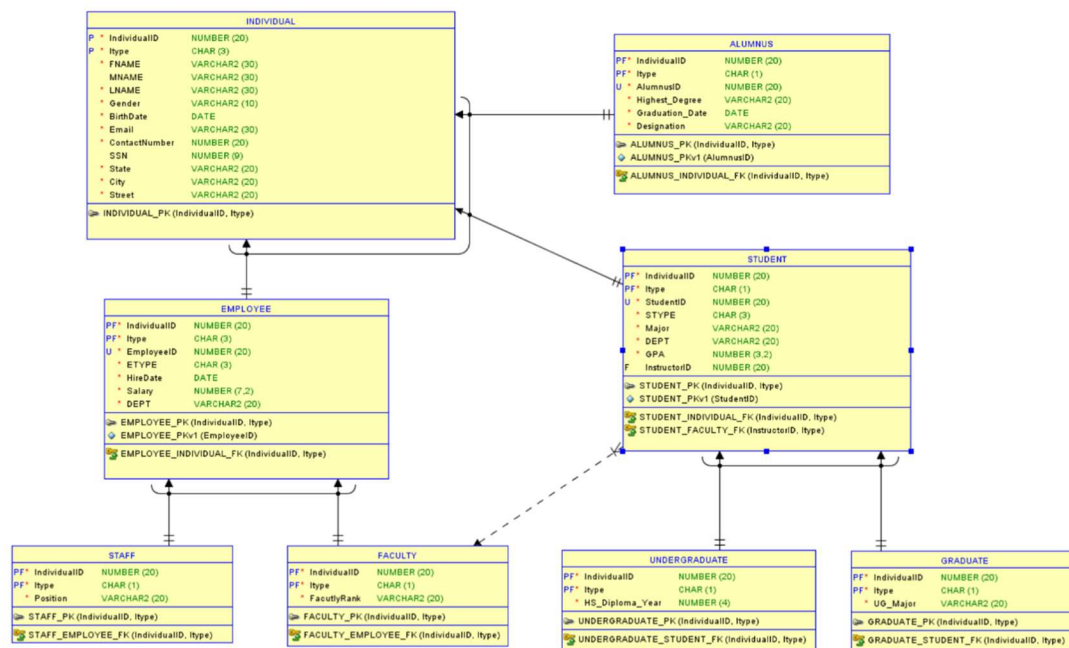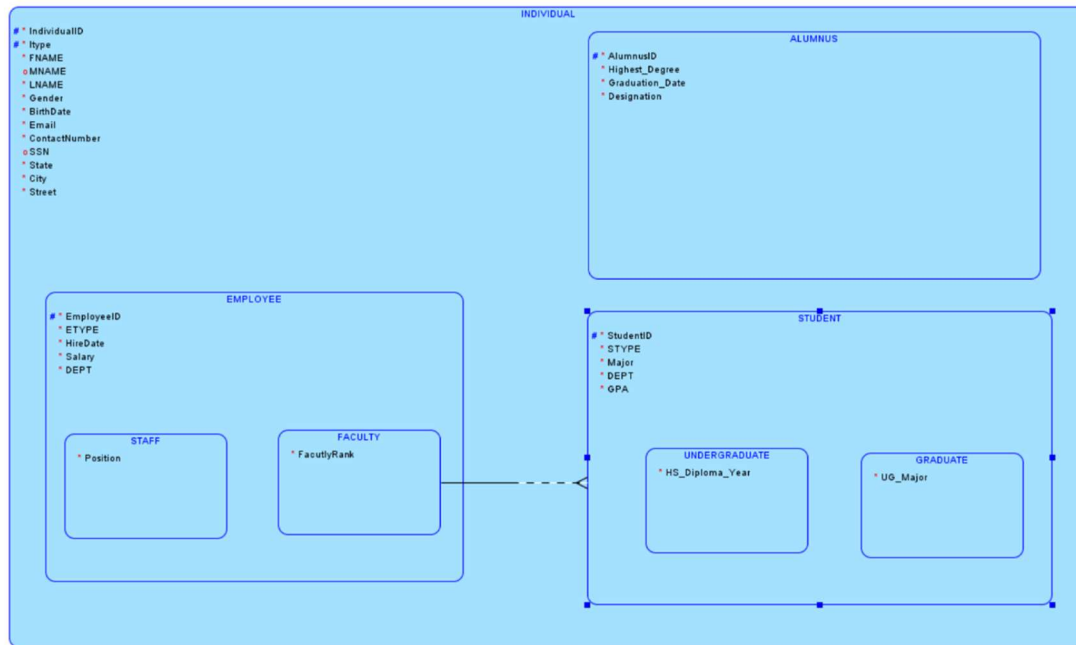# Q1

Additional Assumption: 1) each individual will be assigned a unique number called individualID; 2) each alumnus has an unique alumnusID; 3) a student may or may not have an instructor; 4) a faculty member must have one or more students; 5) an employee can be a faculty or staff or neither, but not both.

INDIVIDUAL
- # * IndividualID
- # * Itype
- * FNAME
- o MNAME
- * LNAME
- * Gender
- * BirthDate
- * Email
- * ContactNumber
- o SSN
- * State
- * City
- * Street

ALUMNUS
- # * AlumnusID
- * Highest_Degree
- * Graduation_Date
- * Designation

EMPLOYEE
- # * EmployeeID
- * ETYPE
- * HireDate
- * Salary
- * DEPT

STUDENT
- # * StudentID
- * STYPE
- * Major
- * DEPT
- * GPA

STAFF
- * Position

FACULTY
- * FacutlyRank

UNDERGRADUATE
- * HS_Diploma_Year

GRADUATE
- * UG_Major

INDIVIDUAL

P	* IndividualID	NUMBER (20)
P	* Itype	CHAR (3)
	* FNAME	VARCHAR2 (30)
	MNAME	VARCHAR2 (30)
	* LNAME	VARCHAR2 (30)
	* Gender	VARCHAR2 (10)
	* BirthDate	DATE
	* Email	VARCHAR2 (30)
	* ContactNumber	NUMBER (20)
	SSN	NUMBER (9)
	* State	VARCHAR2 (20)
	* City	VARCHAR2 (20)
	* Street	VARCHAR2 (20)

- INDIVIDUAL_PK (IndividualID, Itype)

ALUMNUS

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
U	* AlumnusID	NUMBER (20)
	* Highest_Degree	VARCHAR2 (20)
	* Graduation_Date	DATE
	* Designation	VARCHAR2 (20)

- ALUMNUS_PK (IndividualID, Itype)
- ALUMNUS_PKv1 (AlumnusID)
- ALUMNUS_INDIVIDUAL_FK (IndividualID, Itype)

EMPLOYEE

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (3)
U	* EmployeeID	NUMBER (20)
	* ETYPE	CHAR (3)
	* HireDate	DATE
	* Salary	NUMBER (7,2)
	* DEPT	VARCHAR2 (20)

- EMPLOYEE_PK (IndividualID, Itype)
- EMPLOYEE_PKv1 (EmployeeID)
- EMPLOYEE_INDIVIDUAL_FK (IndividualID, Itype)

STUDENT

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
U	* StudentID	NUMBER (20)
	* STYPE	CHAR (3)
	* Major	VARCHAR2 (20)
	* DEPT	VARCHAR2 (20)
	* GPA	NUMBER (3,2)
F	InstructorID	NUMBER (20)

- STUDENT_PK (IndividualID, Itype)
- STUDENT_PKv1 (StudentID)
- STUDENT_INDIVIDUAL_FK (IndividualID, Itype)
- STUDENT_FACULTY_FK (InstructorID, Itype)

STAFF

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
	* Position	VARCHAR2 (20)

- STAFF_PK (IndividualID, Itype)
- STAFF_EMPLOYEE_FK (IndividualID, Itype)

FACULTY

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
	* FacutlyRank	VARCHAR2 (20)

- FACULTY_PK (IndividualID, Itype)
- FACULTY_EMPLOYEE_FK (IndividualID, Itype)

UNDERGRADUATE

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
	* HS_Diploma_Year	NUMBER (4)

- UNDERGRADUATE_PK (IndividualID, Itype)
- UNDERGRADUATE_STUDENT_FK (IndividualID, Itype)

GRADUATE

PF	* IndividualID	NUMBER (20)
PF	* Itype	CHAR (1)
	* UG_Major	VARCHAR2 (20)

- GRADUATE_PK (IndividualID, Itype)
- GRADUATE_STUDENT_FK (IndividualID, Itype)

Q2
A)
i) There are 5 entities: CUSTOMER, ORDER, PRODUCT, INVOICE and PAYMENT.

ii) Some information cannot be recorded:
    1) a new product which has not been ordered by any customer yet, will not be recorded in this dataset;
    2) a new customer which has not made any order yet, will not be recorded in this dataset.

iii) The same information can be recorded on multiple rows. A partly successful update will result in logical inconsistencies. For example: if customer *Value Furniture* changed its name to *Value Furnitures*, we need to change all *Value Furniture* into *Value Furnitures*. Even if we only miss one, there will be problems.

iv) For example, If we want to delete all of the invoices about customer *Value Furniture*, then all the information about customer *Value Furniture* will be deleted as well.

v) This dataset is not normalized.

B)
Additional Assumption: 1) a new customer may not have orders; 2) a new invoice may not have payment to it; 3) a product may not have corresponding orders.

CUS

#	*	CUS_ID
	*	CUS_FNAME
	o	CUS_MNAME
	*	CUS_LNAME
	*	CITY
	*	STATE
	*	COUNTRY

ORD

#	*	ORD_ID
	*	ORD_DATE

INVOICE

#	*	INVOICE_ID
	*	INVOICE_DATE
	*	INVOICE_AMOUNT

ORD_PRO

	*	QUANTITY

PAYMENT

#	*	PAY_ID
	*	PAYMENT_DATE
	*	PAYMENT_AMOUNT
	*	PAYMENT_METHOD
	*	ACCOUNT_NAME

PRO

#	*	PRO_ID
	*	PRO_DES
	o	PRO_FIN
	*	PRO_PRI

CUS

P	*	CUS_ID	NUMBER (20)
	*	CUS_FNAME	VARCHAR2 (20)
		CUS_MNAME	VARCHAR2 (20)
	*	CUS_LNAME	VARCHAR2 (20)
	*	CITY	VARCHAR2 (20)
	*	STATE	VARCHAR2 (20)
	*	COUNTRY	VARCHAR2 (20)

CUS_PK (CUS_ID)

ORD

P	*	ORD_ID	NUMBER (20)
	*	ORD_DATE	DATE
F	*	CUS_ID	NUMBER (20)

ORD_PK (ORD_ID)

ORD_CUS_FK (CUS_ID)

INVOICE

P	*	INVOICE_ID	NUMBER (20)
	*	INVOICE_DATE	DATE
	*	INVOICE_AMOUNT	NUMBER (15,2)
F	*	ORD_ID	NUMBER (20)

INVOICE_PK (INVOICE_ID)

INVOICE_ORD_FK (ORD_ID)

INVOICE__IDX (ORD_ID)

ORD_PRO

	*	QUANTITY	NUMBER (3)
PF	*	ORD_ID	NUMBER (20)
PF	*	PRO_ID	NUMBER (20)

ORD_PRO_PK (ORD_ID, PRO_ID)

ORD_PRO_ORD_FK (ORD_ID)

ORD_PRO_PRO_FK (PRO_ID)

PAYMENT

P	*	PAY_ID	NUMBER (20)
	*	PAYMENT_DATE	DATE
	*	PAYMENT_AMOUNT	NUMBER (15,2)
	*	PAYMENT_METHOD	VARCHAR2 (20)
	*	ACCOUNT_NAME	VARCHAR2 (20)
F	*	INVOICE_ID	NUMBER (20)

PAYMENT_PK (PAY_ID)

PAYMENT_INVOICE_FK (INVOICE_ID)

PRO

P	*	PRO_ID	NUMBER (20)
	*	PRO_DES	VARCHAR2 (30)
		PRO_FIN	VARCHAR2 (30)
	*	PRO_PRI	NUMBER (10,2)

PRO_PK (PRO_ID)