**CSE 370 – Database Systems**

**Theory Section 15/16 | Assignment 02 | Sample Solution**

**Spring 2024**

**Question 1 [CO1] : 20 Points**

Suppose that each of the following Update operations (a-j) is applied directly to the database state shown in Figure A2\_1. **Consider each operation independent of each other. Each operation will be performed in the same state of Figure A2\_1.** Discuss all integrity constraints violated by each operation (check Figure A2\_2 for Referential integrity constraints on the database of Figure A2\_1), if any, and the different ways of enforcing these constraints.

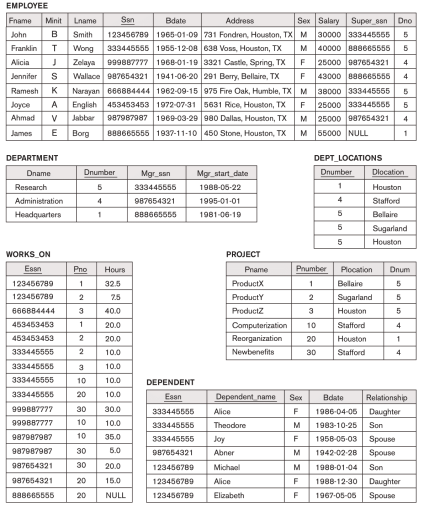
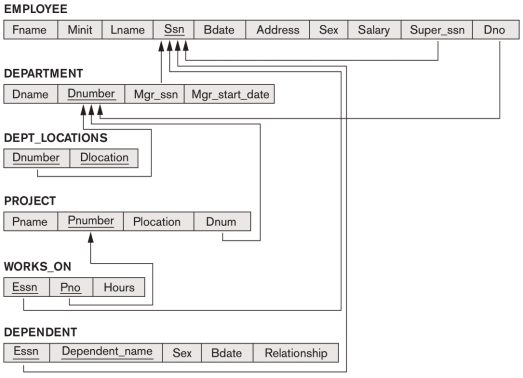


Figure A2\_1 : COMPANY database.

Figure A2\_2 : Referential integrity constraints on the COMPANY database of Figure A2\_1.

| **a.** Modify the HOURS attribute of the WORKS\_ON tuple with ESSN= '999887777' and PNO= 10 to '5.0'.  **Answer:**  No constraint violations. |
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| **b.** Insert <'ProductA', 4, 'Bellaire', 2> into PROJECT.  **Answer:**  Violates referential integrity because Dnum=2 and there is no tuple in the DEPARTMENT relation with Dnumber=2. We may enforce the constraint by: (i) rejecting the insertion of the new PROJECT tuple, (ii) changing the value of Dnum in the new PROJECT tuple to an existing Dnumber value in the DEPARTMENT relation, or (iii) inserting a new DEPARTMENT tuple with Dnumber=2. |

**c.** Insert <'Production', 5, '987987989', '2007-10-01'> into DEPARTMENT. **Answer:**

Violates both the key constraint and referential integrity. Violates the key constraint because there already exists a DEPARTMENT tuple with Dnumber=5. We may enforce this constraint

| by: (i) rejecting the insertion, or (ii) changing the value of Dnumber in the new DEPARTMENT tuple to a value that does not violate the key constraint. Violates referential integrity because Mgr\_ssn='987987989' and there is no tuple in the EMPLOYEE relation with Ssn='987987989'. We may enforce the constraint by: (i) rejecting the insertion, (ii) changing the value of Mgr\_ssn to an existing Ssn value in EMPLOYEE, or (iii) inserting a new EMPLOYEE tuple with Ssn='987987989'. |
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| **d.** Insert <'677678989', NULL, '40.0'> into WORKS\_ON.  **Answer:**  Violates both the entity integrity and referential integrity. Violates entity integrity because Pno, which is part of the primary key of WORKS\_ON, is null. We may enforce this constraint by: (i) rejecting the insertion, or (ii) changing the value of Pno in the new WORKS\_ON tuple to a value of Pnumber that exists in the PROJECT relation. Violates referential integrity because Essn='677678989' and there is no tuple in the EMPLOYEE relation with Ssn='677678989'. We may enforce the constraint by: (i) rejecting the insertion, (ii) changing the value of Essn to an existing Ssn value in EMPLOYEE, or (iii) inserting a new EMPLOYEE tuple with Ssn='677678989'.  **e.** Insert <'453453453', 'John', 'M', '1990-12-12', 'Spouse'> into DEPENDENT. **Answer:**  No constraint violations. |
| **f.** Delete the EMPLOYEE tuple with Ssn = '333445555'.  **Answer:**  Violates referential integrity because several tuples exist in the WORKS\_ON, DEPENDENT, DEPARTMENT, and EMPLOYEE relations that reference the tuple being deleted from EMPLOYEE. We may enforce the constraint by: (i) rejecting the deletion, or (ii) deleting all tuples in the WORKS\_ON, DEPENDENT, DEPARTMENT, and EMPLOYEE relations whose values for Essn, Essn, Mgr\_ssn, and Super\_ssn, respectively, is equal to'333445555'. |
| **g.** Delete the WORKS\_ON tuples with Essn = '333445555'.  **Answer:**  No constraint violations. |
| **h.** Modify the Super\_ssn attribute of the EMPLOYEE tuple with Ssn = '999887777' to '987987988'.  **Answer:**  Violates referential integrity because the new value of Super\_ssn='987987988' and there is no tuple in the EMPLOYEE relation with Ssn='987987988'. We may enforce the constraint by: (i) rejecting the deletion, or (ii) inserting a new EMPLOYEE tuple with Ssn='987987988'. |
| **i.** Delete the PROJECT tuple with Pname = 'ProductX'. |

| **Answer:**  Violates referential integrity because two tuples exist in the WORKS\_ON relations that reference the tuple being deleted from PROJECT. We may enforce the constraint by: (i) rejecting the deletion, or (ii) deleting the tuples in the WORKS\_ON relation whose value for Pno=1 (the value for the primary key Pnumber for the tuple being deleted from PROJECT). |
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| **j.** Modify the Mgr\_ssn and Mgr\_start\_date of the DEPARTMENT tuple with Dnumber = 5 to '123456789' and '2007-10-01', respectively.  **Answer:**  No constraint violations. |