5.11. Suppose that each of the following Update operations is applied directly to the database state shown in Figure 5.6. Discuss all integrity constraints violated by each operation, if any, and the different ways of enforcing these constraints.

a. Insert <'Robert', 'F', 'Scott', '943775543', '1972-06-21', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1> into EMPLOYEE.

→ No violation

b. Insert <'ProductA', 4, 'Bellaire', 2> into PROJECT.

→ Constraints:

      i.   Referential integrity constraint because there is no tuple in the DEPARTMENT relation with Dnumber = 2.

→ Solution:

      i.   Change newly inserted Dnum in the PROJECT to either 1, 4 or 5.
      ii.   Or, Insert a new tuple with Dnumber = 2 in the DEPARTMENT relation(table).

c. Insert <'Production', 4, '943775543', '2007-10-01'> into DEPARTMENT.

→ Constraints:

      I.   Key constraint because there is already a Dnumber with value 4.
      II.   Referential integrity constraint because there is no Ssn 943775543 in the EMPLOYEE relation

→ Solution:

      i.   To solve Key constraint, insert a unique value in Dnumber in the DEPARTMENT relation.
      ii.   To solve referential integrity constraint, insert an existing Ssn value from EMPLOYEE relation, OR,
      iii.   Add new tuple in the EMPLOYEE relation with Ssn 943775543.

d. Insert <'677678989', NULL, '40.0'> into WORKS_ON.

→ Constraints:

      i.   Entity integrity constraint because Pno is a primary key in WORKS_ON relation, and it cannot have null value
      ii.   Referential integrity constraint because there is no tuple in the EMPLOYEE relation with Ssn 677678989

→ Solution:

      i.   To solve Entity integrity constraint, put a value other than null in the Pno column of the WORK_ON relation. Also, make sure that the new value is available in Pnumber attribute of PROJECT relation.

iii. Add new tuple in the EMPLOYEE relation with Ssn value 677678989.

e. Insert <'453453453', 'John', 'M', '1990-12-12', 'spouse'> into DEPENDENT.

→ Constraints:

i. No constraints

f. Delete the WORKS_ON tuples with Essn = '333445555'.

→ Constraints:

i. No constraints

g. Delete the EMPLOYEE tuple with Ssn = '987654321'.

→ Constraints:

i. Referential integrity constraint because there are many tuples in the DEPARTMENT, WORKS_ON, DEPENDENT and EMPLOYEE relation which uses the Ssn value of 987654321.

→ Solution:

i. Delete all tuples from the DEPARTMENT, WORKS_ON, EMPLOYEE and DEPENDENT relation which uses Ssn value of 987654321.

h. Delete the PROJECT tuple with Pname = 'ProductX'.

→ Constraints:

i. Referential integrity because the Pnumber value in the tuple with ProductX is being referenced in the WORKS_ON relation

→ Solution:

i. Delete the tuples in the WORKS_ON relation with Pno = 1.

i. Modify the Mgr_ssn and Mgr_start_date of the DEPARTMENT tuple with Dnumber = 5 to '123456789' and '2007-10-01', respectively.

→ Constraints:

i. No constraints

j. Modify the Super_ssn attribute of the EMPLOYEE tuple with Ssn = '999887777' to '943775543'.

→ Constraints:

i. Referential integrity constraint because there is no tuple in the EMPLOYEE relation with Ssn value of 943775543

→ Solution:

       i.   Insert new tuple in the EMPLOYEE relation with Ssn value of 943775543

k. Modify the Hours attribute of the WORKS_ON tuple with Essn = '999887777' and Pno = 10 to '5.0'

→ Constraints:

       i.   No constraints.