Tutorial 6: Functional Dependency & Normalization (Solutions)

CS3402 Database Systems

Question 1

- Examine the **Branch** table shown below.

a) Why this table is not in 1NF?

b) Describe and illustrate the process of normalizing the data shown in this table to 3NF.

BranchNo	**BranchAddress**	**TelNo**
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618, 503-555-2727, 503-555-6534
B002	City Center Plaza, Seattle, WA 98122	206-555-6756, 206-555-8836
B003	14 – 8th Avenue, New York, NY 10012	212-371-3000
B004	16 – 14th Avenue, Seattle, WA 98128	206-555-3131, 206-555-4112

Question 2

- Examine the **StaffBranchAllocation** table shown below.
  - {StaffNo, BranchNo} is the primary key.
  - FDs: StaffNo $\rightarrow$ {Name, Position} and BranchNo $\rightarrow$ BranchAddress

a) Why this table is not in 2NF?

b) Describe and illustrate the process of normalizing the data shown in this table to 3NF.

StaffNo	**BranchNo**	**BranchAddress**	**Name**	**Position**	**HoursPerWeek**
S4555	B002	City Center Plaza, Seattle, WA 98122	Ellen Layman	Assistant	16
S4555	B004	16 – 14th Avenue, Seattle, WA 98128	Ellen Layman	Assistant	9
S4612	B002	City Center Plaza, Seattle, WA 98122	Dave Sinclair	Assistant	14
S4612	B004	16 – 14th Avenue, Seattle, WA 98128	Dave Sinclair	Assistant	10

Question 3

- Examine the **BranchManager** table shown below.
  - BranchNo is the primary key
  - FD: MgrStaffNo → MgrName

a) Why this table is not in 3NF?

b) Describe and illustrate the process of normalizing the data shown in this table to 3NF.

BranchNo	**BranchAddress**	**TelNo**	**MgrStaffNo**	**MgrName**
B001	8 Jefferson Way, Portland, OR 97201	503-555-3618	S1500	Tom Daniels
B002	City Center Plaza, Seattle, WA 98122	206-555-6756	S0010	Mary Martinez
B003	14 – 8th Avenue, New York, NY 10012	212-371-3000	S0145	Art Peters
B004	16 – 14th Avenue, Seattle, WA 98128	206-555-3131	S2250	Sally Stern

Question 4

- Examine the table shown below and the set of functional dependency on its attributes:
  - CourseRmAlloc (CourseId, CourseName, Year, Lecturer, Enrollment, RoomId, RoomCapacity, Day, Time)

a) Find all candidate keys of this table.

b) Decompose this table into a BCNF design.

FDs:
1. CourseId → CourseName
2. CourseName → CourseId
3. {CourseId, Year} → Lecturer
4. {CourseId, Year} → Enrollment
5. RoomId → RoomCapacity
6. {RoomId, Year, Day, Time} → CourseId
7. {CourseId, Year, Day, Time} → RoomId