

**CS 5200**  
**Assignment - FD and Normalization**  
**Marks: 55**

**Ques 1.** [15 Marks] Consider the following relation with sample data.

AIRPORT KLX TABLE					
Date	AirlineID	AirlineName	TerminalID	NumberOfGates	NumberOfDepartingFlights
11-Dec	UA	United	A	20	34
11-Dec	NW	Northwest	A	20	17
11-Dec	AA	American	A	20	11
11-Dec	DL	Delta	B	15	20
11-Dec	JB	Jet Blue	B	15	6
12-Dec	UA	United	A	20	29
12-Dec	DL	Delta	B	15	20
12-Dec	SWA	Southwest	C	15	17

- *The AIRPORT KLX Table captures the data about daily departing flights at the KLX Airport.*
  - *Each airline operating at KLX airport has a unique Airline ID and an Airline Name.*
  - *Each terminal at KLX airport has a unique Terminal ID and a fixed Number of Gates.*
  - *Each airline is permanently assigned to one (and only one) terminal at the KLX Airport.*
  - *Each terminal at KLX Airport can have multiple airlines assigned to it.*
  - *Each day (Date), this table records the Number of Departing Flights at KLX Airport for each airline.*
- a) Using the Airport KLX Table, describe an example that illustrates the insertion anomaly.
- b) Using the AIRPORT KLX Table, describe an example that illustrates the deletion anomaly.
- c) Using the AIRPORT KLX Table, describe an example that illustrates the modification anomaly.

**Ques 2.** [40 Marks] Consider the following relation scheme and FDs:

Employee(EmpID, EmpName, Spl, Mgr, ProjNo, PTitle, SName, SLoc, Bonus)

Spl- Specialization

Mgr – Manager

ProjNo – Project Number

PTitle – Project Title

SName – Supervisor Name

SLoc – Supervisor Location

given the following functional dependencies:

- 1) EmpID  $\rightarrow$  EmpName
- 2) ProjNo  $\rightarrow$  ProjTitle, SName
- 3) SName  $\rightarrow$  SLoc
- 4) EmpID, ProjNo, Spl  $\rightarrow$  Bonus
- 5) EmpID, Spl  $\rightarrow$  Mgr
- 6) Mgr  $\rightarrow$  Spl

Answer the following questions:

- 1) Find all keys [10 Marks]
- 2) Obtain a lossless-join BCNF decomposition of Employee. [10 Marks]
- 3) Find a minimal cover for this set of FDs. [10 Marks]
- 4) Obtain a lossless-join dependency-preserving 3NF decomposition of Employee via 3NF synthesis. [10 Marks]