1.
Define the following terms:

1a. Candidate key [2]

1b. Foreign key [2]

1c. Functional dependence [3]

1d. Transitive dependence [3]

2.
Give the primary key and the highest normal form of each of the following relations. State any assumptions made and give reasons for your answers.

2a. **Student** {Stud#, Name, Addr, Gender, DoB} [3]

2b. **Flight** {FlightNo, Date, Seats_Avl, FlightTime, FromCity, ToCity} [3]

2c. **Account** {AcctNo, CustNo, CustName, Balance} [3]

2d. **Supply** {PartNo, SupplyQty, SupplrNo, SupplrAddr} [3]

3.
The entity **Participation** consists of the following data elements: **Manager**, **Project**, **Hours** (spent on project(s) per month), and **Salary**. A manager's salary is fixed, and he/she can work on many projects.

3a. Draw a FD diagram of the entity. [3]

3b. Would you store **Participation** in its current state? Justify your answer. [4]

3c. Provide some sample data for the entity, so that the identified problem(s) is/are highlighted. [4]

3d. What is the highest normal form of **Participation**? Defend your answer. [3]

3e. Show how you would design a conceptual schema to store the data mentioned for entity. [11]

4.
A scientific research establishment organizes its work in projects, each project consisting of several experiments. For each experiment, the following data is recorded:

- Project number
- Project manager
- Project name
- Experiment number
- Experiment name
- Lab in which experiment is to be conducted
- List of scientists to work on the project

4 (continued).

Additionally, the following guidelines apply:

- A project manager may manage one or more experiments.
- A scientist may work on more than one experiment.
- An experiment may involve several scientists.
- A manager may manage more than one project.
- All participants (including project managers) are scientists.

4a. Based on the information given, develop an ERD. [12]

4b. Using the XR model as a frame of reference, derive a set of BCNF relations for the system. Use self- explanatory relation and attribute names (you may introduce new attributes). [28]

5.
The following relations represent a snapshot of a live database. Primary keys are highlighted. Based on the data, derive an ERD, showing all attributes (state any assumptions made). [10]

Warehouse PK[Wh#]			
Wh#	**City**	**Size**	
WH1	Kingston	37,000	
WH2	Bridgetown	50,000	
WH3	Rosseau	20,000	
WH4	Castries	13,000	
Employee PK [Wh#, Emp#]			
Wh#	**Emp#**	**Salary**	
WH2	E1	45,000	
WH1	E3	42,000	
WH2	E4	48,000	
WH3	E6	52,000	
WH1	E7	51,000	
Supplier PK [Sno]			
Sno	**SName**	**Location**	
S3	Wilson	Jamaica	
S4	Barnes	Barbados	
S6	Jones	St. Lucia	
S7	Lewis	Barbados	
Purch-Ord PK [Emp#, Sno]			
Emp#	**Sno**	**Order#**	**OrderDate**
E3	S7	O67	840623
E1	S4	O73	840728
E7	S4	O76	840525
E6	S6	O77	840619
E3	S4	O79	840623
E1	S6	O80	840729
E3	S6	O90	850622
E3	S3	O91	860713

Total Graded Points: 97